

> HEAd'18

4th International Conference on Higher Education Advances



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Scientific Editors

Josep Domenech
Paloma Merello
Elena de la Poza
Desamparados Blazquez

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Preface

Domenech, Josep; Merello, Paloma; de la Poza, Elena; Blazquez, Desamparados
Universitat Politècnica de València, Camí de Vera s/n, 46022 València, Spain

Abstract

The series of HEAd conferences have become a leading forum for researchers and practitioners to exchange ideas, experiences and research results relating to the preparation of students and the organization of higher educational systems. The fourth edition (HEAd'18) was held in Valencia, Spain during 20-22 June 2018. This preface gives an overview of the aims, objectives and scope of HEAd'18, as well as the main contents of the scientific program and the process followed to select them.

Keywords: Higher education; innovative materials, educational technology, evaluation and assessment, globalization in education.

1. Preface to HEAd'18

This volume contains the selected papers and posters of the Fourth International Conference on Higher Education Advances (HEAd'18), which was held in Valencia, Spain during 20-22 June 2018. This fourth edition consolidates the series of HEAd conferences as a leading forum for researchers and practitioners to exchange ideas, experiences and research results relating to the preparation of students and the organization of higher educational systems.

The selection of the scientific program was directed by Paloma Merello, who led a team of 246 program committee members representing 50 countries in all five continents. Following the call for papers, the conference received 319 full paper submissions from 48 different countries. All the submitted papers were reviewed by at least two program committee members under a double blind review process. Finally, 105 papers were accepted as full papers for oral presentation during the conference. This represents an overall full paper acceptance rate of 33%, in line with the acceptance rate of the previous editions. This selection ensures a high-quality program which is greatly valued by the research communities. Additionally, 39 submissions were accepted as short papers and 39 as poster communications, all of them receiving high review scores and published by UPV Press in this volume. The program committee chair congratulates all the authors for having their papers accepted in the proceedings of such a competitive conference.

HEAd'18 also featured three keynote speakers that overviewed important and actual topics: Prof. Jose G. Lepervanche Valencia (Florida State College) talked about how to be prepared to influence the instant knowledge generations to be engaged global learners. The talk by Patrick van der Bogt (Hogeschool Utrecht) focused on promoting the generative potential in educational design and in student's learning. Finally, Assoc. Prof. Cesar Ortega-Sanchez (Curtin University) dealt with the development of thinking skills in higher education.

The conference was hosted by the Faculty of Business Administration and Management of the Universitat Politècnica de València, which has been recently ranked as the best technical university in Spain by the Academic Ranking of World Universities (ARWU) 2017. Valencia is a city of culture and heritage. It is the third largest city in Spain and its location on the shore of the Mediterranean Sea provides their citizens and visitors with a privileged weather.

The organizing committee would like to thank all of those who made this year's HEAd a great success. Specifically, thanks are indebted to the invited speakers, authors, program committee members, reviewers, session chairs, presenters, sponsors, supporters and all the attendees. Our final words of gratitude must go to the Faculty of Business Administration

and Management of the Universitat Politècnica de València for supporting, once again, the HEAd conference, making it possible to become a great event.

This year, the PETRA Workshop was collocated with HEAd'18. This workshop, led by Elena de la Poza, focused on presenting the main research findings about the reform of teaching at higher education institutions in Azerbaijan. The papers presented in PETRA workshop are also included in this volume.

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Asking is not enough. A research study on teaching qualitative interviews in Italy

Pretto, Albertina

Department of Sociology and Social Research, University of Trento, Italy

Abstract

In the area of social research, it is not uncommon to come across qualitative interviews (transcribed or recorded) that present conduction strategies which seem to be in contrast to that is recommended by the literature on this subject. In order to understand the reason why this occurs, I present the results of a research carried out among Italian sociologists who use qualitative interviews for their research; I try to establish a connection between the conduction strategies used by researchers and their training. I found three different conducting styles, and divided my interviewees into three categories. But, only one of these categories presents a real positive attitude towards qualitative interviews. The problem is that all these researchers also teach qualitative methods at University or train new interviewers for their research and they pass down their same attitude to their students, for better or worse.

Keywords: *qualitative interviews; conducting styles; teachers.*

1. Introduction

In Italy, the qualitative research has become established in social sciences only in the recent decades, since making its way in the national scientific area has been hindered for a long time by different factors: hostility from fascism, reluctance on the part of dominant philosophical positions, the prevailing quantitative research (Gobo, 2008). Italian sociologists' attention turned towards qualitative research methods only at the end of the 70s and the reasons for this interest were both theoretical - due to the interest in the centrality of the subject and in the motivations behind people's actions - as well as technical-methodological, due to the 'seeming simplicity' of these approaches to research (Campelli, 1990). Notwithstanding, in the Italian Sociology, the stereotype of the non-scientific nature of qualitative method lingered and those methods were continuously excluded from courses on methodology, also because of the education and approach of the sociologists of that time (Gobo, 2008). In Italy, the first Department of Sociology (then Faculty of Sociology) was established in Trento in 1962 and those who taught there did not get a specific sociological background, because they studied other disciplines, such as Philosophy, Law, Political Science, Economy, Statistic; moreover, it should be considered that, in Trento - which has been for a long time the only University with a Department of Sociology in Italy - specific sociological courses were only 30% of the total course until the 80s (Gubert & Pollini, 2015). The academics with a background on Economy or Statistic humanities tended to teach methodological courses in which qualitative methods were not explained or adopted (Gobo, 2008; Gubert & Pollini, 2015). Those who carried on research with qualitative methods were autodidacts and had meagre support also from literature, since textbooks on qualitative methods written by Italian sociologists did not exist and those written by foreign academics and translated in Italian were scarcely available: unless one knew English (not so common language in Italy in that time), books on methodology attainable until the 80s were on statistics and quantitative methods (Gobo, 2008). Only since the end of the 90s, the Italian academic community created specific programs of study within degree and PhD courses, and institutionalized several schools of high training on qualitative methods (Pretto, 2011).

Despite this long and difficult path, qualitative methods and teaching them face to this day obstacles and prejudices: in many academics' current opinion, besides obviously acquiring a command of sociological theory, students should develop their skills first of all to deal with quantitative data, for instance, to know what the unemployment or aging rate is, to understand the data shown in a table and then be able to analyze second-level data (Pretto, 2015a). These are all fundamental skills; no one questions that. However, following this point of view, to be able to observe, to listen, and to interview through qualitative techniques seem to be skills to which little importance is attached (Becker, 1998). All these aspects, unfortunately, has generated - in Italy but not only - some 'distorted' attitudes: for

instance, regarding teaching and using qualitative interviews, some sociologists still believe that to carry out research and obtain information from people, ‘asking’ is enough (Kellehear, 1993) and this is an error which sometimes is taught to students and/or young researchers. On the contrary, a good training should be provided to the latter by their teachers, in order that they acquire the correct attitude and the skills necessary to gather good interviews and to avoid making mistakes (Lindlof & Taylor, 2011; Roulston, deMarrais & Lewis, 2003). Some authors describe as mistakes to ask lengthy questions or yes/no questions, to over-lead the participant, failing to pursue emergent references during the interview, to over-direct the narrative preventing the interview plot from developing, talking too much stifling the interviewee and so on (deMarrais, 2004; Gesch-Karamanlidis, 2015; Myers & Newman, 2007). Throughout my career, I have actually read more than a few transcripts of interviews that surprised or embarrassed me for the lack of respect or attention on the part of the interviewer towards the interviewee. The excerpt below, for example, shows how the interviewer ‘imposed’ a topic which had not yet emerged from the conversation on an interviewee and that woman was a possible victim of domestic violence.

Interviewer: “Now, tell me about your relationship with your husband...”

Mrs T.: “What do you mean?”

Interviewer: “You know what I mean. Tell me about your husband: how does he treat you?”

So, in some cases, the interviewer’s behavior contrasts with the main guidelines on conducting a qualitative interview, such as kindness, respect, careful listening, receptiveness, a nonjudgmental attitude, empathic comprehension and so on (see e.g. Denzin & Lincoln, 2017; Leavy, 2014; Saldana, 2016). In this way, they produce interviews of poor quality making mistakes that negatively impact the data collection process.

Then, the question is: why does the behavior of some researchers and young interviewers differ so much from what is recommended even in the most common methodology textbooks? Taking into account that in Italy all researchers who work at the University are compulsorily also lecturers, might an erroneous attitude in gathering qualitative interviews depend on lack of training or on the attitude itself of those who teach?

2. Research design

I have not found any Italian studies focused on this topic so, I would aim to answer to this question through this research and trying to establish a connection between the teachers and interviewers' training and the strategies they adopt in collecting qualitative interviews.

At the beginning of my study, I asked, obtained and read transcriptions of qualitative interviews collected for different research projects by a number of interviewers (who differ according to age, academic position and training). Then, I contacted and interviewed some of the interviewers who surprised me with the strategy of interview conduct they had adopted, both in a positive and in a negative way. I also interviewed professors and researchers who were responsible for the project concerned.

I interviewed 28 people: I collected 6 *récits de vie* (Bertaux, 1998) of experienced professors and/or researchers with a strong academic background in Italian universities. I selected this group through personal knowledge of their qualitative research works or upon advice of other members of the academic community. I also collected 4 *récits de vie* of their students/interviewers.

Due to time constraint, I have conducted 18 more semi-structured interviews with questions focusing on the main areas of interest (training and experience in qualitative interviews and research, training in the conduction of qualitative interviews, attitude towards the interviewees). Of this group of interviews, 10 concerned the interviewers and 8 involved professors and/or expert researchers. Of this latter group, 6 were professors and/or researchers who do not conduct interviews personally but rely on interviewers.

I also collected opinions and thoughts of professors, researchers and students/interviewers in informal conversations during national meetings or conferences.

In the analysis phase, for every interview, I tried to find and examine information and indexes concerning the interviewees' cultural and professional background in qualitative methods, their relationship with their teachers and/or other significant trainers and their attitude towards people they interview.

3. Findings

As I examined all this material, three different conducting styles came to light, which allowed me to create three categories that I defined as second choice qualitative interviewers, qualitative-quantitative interviewers and authentic qualitative interviewers.

I have defined the first group as second choice qualitative interviewers just because it seems that they have chosen qualitative research as their second choice.

Ms F.: “... you might find yourself in front of a mythomaniac, or of people who have been in psychological analysis for years, and are therefore veterans, professionals of narration, and you have to pretend you're interested in what they are saying and you wait for something interesting to be said to you...”

Mr P.: “The point is that I don’t have the ability to do quantitative research, so I started working with qualitative inquiries which are easier ...”

Often they did not study quantitative research techniques and therefore, without any training in Statistics, they thought that qualitative research was the lifeline that allowed them to carry out their studies anyway. They often have a negative attitude towards the interviewees: as researchers, they feel superior and usually have the same way of relating to them. They take what is offered and then blame the interviewees when the narration is not satisfactory for the research goal. These researchers/interviewers have never mentioned the great importance of listening and it seems they fail to establish any relationship with the narrator.

The second group is that of the qualitative-quantitative interviewers: they have received good training in quantitative techniques, but - throughout their career - they have also understood the value and importance of research carried out through qualitative methods.

Mr I.: “I don’t do them [qualitative interviews] because it takes too much time and I don’t have enough patience... I send my students to collect them and I’m not strict about the conducting strategy, they can do whatever they want as long as they bring back the things we need...”

Ms L.: “I’m a hard methodologist; I must make them talk, take about what I need. If I see that they aren’t telling me what I want, after a while, I ask them directly. I can’t stay there for hours and hours, and possibly for nothing, because, you see, some people are redundant and need many more words than others who tell you the same thing with few words...”

However, although they discovered the intrinsic value of qualitative interviews, they conduct the latter as if they were carrying out a survey using a questionnaire: they ask their questions in such a direct and formulaic manner, that it sometimes seems that they are simply unable to listen to the narrator’s words. They don’t consider the relationship with the interviewees as an important element for the interview and they are not interested in deepening the discussion with them. When I was listening to these researchers/interviewers, I had the impression that they were used to maintaining a very detached relationship with the interviewees. The interviews they conduct this way are very accurate, but in the end they are meaningless in many cases because the implicit and explicit motivations of the interviewees are lost, as there is no interactive process.

I have defined the last group as authentic qualitative interviewers: they can be considered natural-born listeners.

Ms B.: “A good interviewer [...] is a person who is curious about the other, one who can grasp in the other’s talk all the right elements and new subjects

to introduce. It is therefore a person who, on the one hand, has a human characteristic, the ability to comprehend the other; and, on the other hand, on the scientific side, has the ability to recognize the areas of meaning of the interviewee...”

Mr B.: “During a face-to-face interview, you must remember that you are both a researcher and a human being. You see, in my opinion, when you rely on the qualitative approach [...] the depth of the discussion is essential, and I’m not referring to research only, but to the human and personal side as well...”

They make the interviewees feel at ease, they respect their silences and they try to interpret, rather than to force them. If the narrator doesn’t want to discuss a certain topic, for instance, they make a note on the perception of their discomfort. They combine respect for the person with the objective detachment, without being cold. Many of these researchers/interviewers have received proper training in quantitative techniques, and they use it when necessary for their studies; however, they have chosen qualitative research, often learning its techniques on their own because there were not specific courses on qualitative methods when and where they went to university.

So, what has emerged from my study, is that only people belonging to this last group rely on proper qualitative methods.

I suppose there can be different reasons to explain why so many researchers use qualitative techniques the wrong way but, in my opinion, one of these reasons is that many of them had not received proper training. And the lack of training in qualitative methods is a sore point in the Italian academic community (and not only): as I wrote above, until the 90s, qualitative research played a minor role in Italy compared to quantitative research and it is only in the last twenty years that the Italian academic community created specific programs of study within degree and PhD courses, and institutionalized several schools of high training on qualitative methods. So, people I interviewed that were over 45 (more or less) openly stated that they have never received any practical training. All that they have learned, was the result of personal effort. Only the youngest said they had participated in some specific training course or specialization schools.

I must add that, unfortunately, in Italy quantitative research is still considered more ‘scientific’ and is commissioned more often by government institutions and by other agencies, which allocate more funds to it. Quantitative data still prevails in respect of qualitative data (Gobo, 2008; Silverman, 2000) and qualitative researchers are still considered soft scientists (Pretto, 2015b).

This background allows us to better understand the attitude of the qualitative-quantitative interviewers, the second group: they don't want to leave the quantitative approach because they find it reassuring and because it increases their credibility in the scientific community also when they use qualitative techniques.

On the other hand, I am not able to find any justification for the behavior of the researchers of the first group, the second choice qualitative interviewers.

4. Brief discussion and conclusion

As I wrote before, according to Italian norms, every academic working in a university must also teach. Each researcher or professor must teach in one or more courses. Thus, all academics I interviewed were also teachers, oftentimes of Methodology courses which are more or less focused on qualitative methods. But what kind of teaching can the academics of the first two groups give to their students? And the answer is that they pass down their same attitude.

As a matter of fact, in the excerpts above, the second quote is always of a former student of the academic who stated the first quote. In fact, younger researchers and 'simple interviewers' that I interviewed, were former students of such academics and they presented an attitude similar to that of their masters, for better or worse. But some of these current interviewers will probably be tomorrow's researchers and teachers (if they work at the Italian universities). So, if we want to have good qualitative researchers and teachers tomorrow, we have to be good teachers right now.

To conclude, since I have not found other studies on this specific topic, I believe that it would be interesting and worthwhile to Social Sciences in general to conduct more research of this kind, in order to verify the state of the art of qualitative research. I think that it would be useful to investigate the ways in which qualitative methods are applied to contribute to this debate and to disseminate best practice in teaching.

References

- Becker, H. (1998). *Tricks of the Trade*. Chicago, IL: Chicago University Press.
- Bertaux, D. (1998). *Les Récits de vie*. Paris, France: Editions Nathan.
- Campelli, E. (1990). Le storie di vita nella sociologia italiana: un bilancio. *Sociologia e Ricerca Sociale*, 31, 179-195.
- deMarrais, K. (2004). Qualitative interview studies: Learning through experience. In K. deMarrais & S. D. Lapan (Eds.), *Foundations for research* (pp. 51-68). Mahwah, NJ: Erlbaum.

- Denzin, N. Y., & Lincoln, Y. S. (2017). *The SAGE handbook of qualitative research (5th edition)*. Thousand Oaks, CA: SAGE Publications Inc.
- Gesch-Karamanlidis, E. (2015). Reflecting on Novice Qualitative Interviewer Mistakes. *The Qualitative Report*, 20(5), 712-726.
- Gobo, G. (2008). Con giustificato ritardo. La nascita della sociologia in Italia. In D. Silverman, *Manuale di ricerca sociale e qualitativa* (pp. I-XVII). Rome, Italy: Carocci.
- Gubert, R., & Pollini, G. (2015). L'evoluzione della formazione sociologica. In A. Perino & L. Savonardo (Eds.), *Sociologia, professioni e mondo del lavoro* (pp. 105-125). Milano, Italy: Edizioni Egea.
- Kellehear, A. (1993). *The unobtrusive researcher: A guide to methods*. St Leonards, NSW: Allen and Unwin.
- Leavy, P. (2014). *The OXFORD handbook of qualitative research*. New York, NY: Oxford University Press.
- Lindlof, T. R., & Taylor, B. C. (2011). *Qualitative communication research methods (3rd ed.)*. Thousand Oaks, CA: Sage.
- Myers, M. D., & Newman, M. (2007). The qualitative interview in IS Research: Examining the craft. *Information and Organization*, 17, 2-26. doi:10.1016/j.infoandorg.2006.11.001
- Pretto, A. (2011). Italian Sociologists' approach to qualitative interviews. *Bulletin of Sociological Methodology/ Bulletin de Methodologie Sociologique*, 112(1), October 2011, pp. 71-83.
- Pretto, A. (2015a). Professione sociologo: quale possibile formazione per il futuro? In A. Perino & R. Savonardo (Eds.), *Sociologia, professioni e mondo del lavoro* (pp. 141-152). Milano, Italy: Edizioni Egea.
- Pretto, A. (2015b). Sociólogos numerólogos. In A. Marradi (Ed.), *Las ciencias sociales ¿seguirán imitando a las ciencias duras? Un simposio a distancia* (pp. 239-244). Buenos Aires, Argentina: Editorial Antigua.
- Roulston, K., deMarras, K., & Lewis, J. B. (2003). Learning to Interview in the Social Sciences. *Qualitative Inquiry*, 9(4), 643-668. doi: 10.1177/1077800403252736
- Saldana, J. (2016). *The Coding Manual for qualitative researchers. 3rd edition*. London, UK: Sage Publications Ltd.
- Silverman, D. (2000). *Doing Qualitative Research: A Practical Handbook*. London, UK: Sage Publications Ltd.

The museum as an educational support in a Civil Engineering context

Sampaio, Alcinia Zita

Department of Civil Engineering, University of Lisbon, Lisbon, Portugal.

Abstract

A Museum, when inserted in a Technical University, is a privileged place for the preservation of the historical memory concerning the construction techniques evolution along ages. The construction industry have been evolved in teaching methods, in the use of specific equipment and applied technologies, and in the way of presenting and making drawing. The Museum presents a reminder of how the technology advanced to the current methodologies of work. The Museum of Civil Engineering of the Instituto Superior Técnico (IST) contains a significant collection of elements offered by teachers and entities which is in exhibition, in a proper room, inserted within the University space. Elements such as: a model of the Pombaline cage, illustrating the constructive technique anti-seismic applied after the earthquake of 1755, that occurred in Lisbon, or the wooden models of roof frames are examples that are preserved and kept in adequate conditions, contributing to the dissemination of the technical heritage and to the memory and history of the Construction. In the context of the congress some elements used to support teaching and related with traditional building technologies are described in detail.

Keywords: *Museum; Construction; Education; Technology; Heritage.*

1. Introduction

The Museum of Civil Engineering of the Instituto Superior Técnico (IST), placed in Lisbon, Portugal, contains a collection of elements related to the construction activity. The elements were restored and maintained, scheduled and organized properly. Each piece is identified and characterized, namely, its place of origin or the identification of the donor and the conservation status at the reception date. The inventory cataloging process follows a thematic organization related to the different areas involved (Sampaio, 2016): Transports, Bridges, Topography, Architecture, Construction techniques and materials, Drawings, Hydraulic and Soil mechanics. For all the pieces on exhibition in the room it was drawn up a descriptive text of its features, functionality, time of use and the number of inventory.

Within the Congress, focuses on higher education, some of the most remarkable elements related to the fields of Architecture, Construction techniques and Drawings, supporting the education activity, are described in detail:

- A wooden model reproducing the **anti-seismic structure** called "Pombaline cage" forming St. Andrew's crosses, created for the reconstruction of Lisbon, devastated by the earthquake of 1755. This element is frequently used to support the visit of national and foreigner seismic specialist, as the model represents with fidelity the structural organization of the innovative structural solution created to rehabilitation of Lisbon after. The cage supports the introduction to the reinforced concrete anti-seismic structure currently applied;
- In addition several wooden models of roof frames of buildings and samples of carpentry interior elements like stairways and doors, are exposed. Those models made in wood identifies interior details applied in staircases and body guards, used in buildings design in the beginning of sec. XIX, so it is used to introduce this architectural era frequently used at that time in aristocratic houses in Portugal;
- The Museum has a wide collection of drawings executed by students, representing components, dating back since the formation of the IST until after the Second World War. Currently, the discipline of technical drawing promotes, in each semester, a session presented at the Museum, so students can confront the contemporary track, based on current standards, with the held at the time. Drawing devices are also exposed, clarifying, students and visitors, with the use of scale rulers, squares and "T" rulers;
- The Museum contains the re-creation of the work room of the architect Álvaro Machado, first professor of architecture at the IST, and a collection of drawings of their projects. The Museum also contains plaster models of masonry vaults and portals and wooden models of decorative and functional emblematic elements, that are currently used in Art of History classes. The drawings are used to support old

methodologies of representing projects as they are confronted to current definitions of technical drawings.

2. The Museum

The Museum of Civil Engineering was inaugurated on December 20th, 1993, on the ground floor of Civil Engineering Pavilion of IST. Until the creation of the Museum, educational materials, not in use, were found in professor's offices, laboratories and classrooms. Other elements of interest related to the areas of knowledge developed in the Department, have been donated to the Museum. The Museu room presents regularly exhibitions of pedagogical character and is regularly changed in order to allow the exhibition of all its spoils (Figure 1). The students are invited to attend lectures on the diverse type of theme that supports the exhibitions' opening.



Figure 1: Out-side and in-side views of the Museum.

As the school is a space of several international events, namely, conferences and technical meetings, the Museum became an interesting place for national and international visitors. Supporting this interest, the current direction promoted the identification of all elements and the linked text, in Portuguese and English languages. So the Museum provides to:

- Students, an organized documentation of interest for research works conducted by graduate or PhD students,.
- Teachers, the complementarity of disciplines providing support to the programmatic curriculum, with the description of old equipment. Namely concerning hydraulics, construction process or technical drawings;
- Visitors, an important collection of books, photographs, drawings, models and equipment related to the construction industry.

3. Wooden models

3.1. Pombaline cage

The wooden model of a *Pombaline* cage reproduces the anti-seismic structure type, designed for the reconstruction of Lisbon, devastated by the earthquake of 1755. It was created under the Ministry of Marquis of *Pombal*, in the reign of king José I, and it was applied in buildings until the end of the first quarter of the 20th century. The *Pombalin* buildings presents a structure composed of vertical, horizontal and sloped wooden elements, allowing a good capacity to resist to seismic loads (Figure 2).



Figure 2: The Pombaline cage.

The structure draws a St. Andrew's cross: the *frechais* are horizontal wooden beams, allowing the support of vertical elements; the horizontal locking way is established by *travessanhos*, enclosed in vertical panels, and by spars located over the spans; the link between the cage and the masonry is achieved by *hands*, which are pieces of wood presenting a tooth shape (LNEC, 2008). From a structural point of view, the Pombaline cage consists of a three-dimensional truss structure in wood, resulting from the interconnection of several flat structural panels. Each one consists of a set of wooden bars forming triangles. This is the only geometric figure that cannot be deformed without varying the length of their edges. This is still the same concept used today in metallic structures. This still is a correct structure, that needs to be preserved in refurbishing works applied over old buildings, and students see the real structural organization of wooden elements established at that time. The cage presents the capacity to withstand the horizontal forces in any direction, as earthquakes induce in the building structure. As the bars resist well to this type of deformation, the cage allows an adequate resistance to horizontal forces, caused by seismic vibrations of the soil. So, with this wooden truss the buildings have the ability to transmit horizontal forces to the foundations, surviving to the earthquakes effect

with more or less damage raised in the building (Lopes & Bento, 2005). So, this issue is frequently supported by the cage shown and described by teachers.

3.2. Roof coverings trusses

The typical Portuguese wood coverage uses trusses as the main structural element, with a pending variable between 20° and 30° (Figure 3). Typically, the wood coverings consist of simple trusses, born probably in the Renaissance, or the truss of Palladio that emerged in the 16th century, with average spans between 6 and 7 meters. The simple trusses have an elementary geometry, triangulation, consisting of a horizontal line, by two sloped legs, for the formation of the roof shed, by a middle vertical element, tight at the apex of the roof by the legs, and Palladio truss with more two sloping struts connecting the legs to the base of the vertical element. The ancient form of interconnect elements is through finger joints, which have teeth and, eventually, even of gleaning and mecha (Figure 4). From the 19th century, the links have been replaced with metallic elements such as: nails, screws, bolts, metal bands, chicken feet and "T"s.



Figure 3: Wooden coverings trusses.

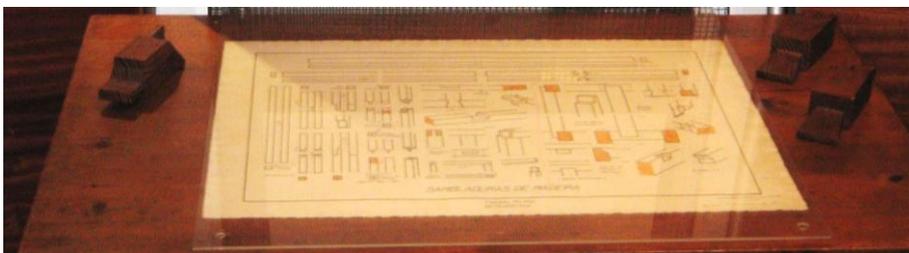


Figure 4: Ancient form of interconnect elements: models and drawing.

The models represent various type of bearing structure used in old roofs, serving to support the teaching of subjects related to Construction Processes and Structures. The spatial organization of the linear elements is still the basis of the project of metal structures. Civil engineering students often carry out visits to the Museum in order to understand the structural organization applied in old roofs. The templates serve to complement the students' training.

4. Atelier of architect

The architect Álvaro Machado (1874 - 1944) was the first teacher of Architecture at the IST of the Technical University of Lisbon, from 1911 to 1936. The room recreates the atelier of the architect, installed in one of the room of their house, in Lisbon, and the contents of the room were offered to the IST, by their daughters, in 2000. The work place was meticulously built by Machado, since 1910, over years of use. All the furniture was designed by him, and it composed of desk, tripod support, bookcase and banks. The organization of the walls was the target of a careful record left by him, facilitating the reconstitution presented in a specific room built inside the Museum space (Figure 5). The selected elements includes: paintings and drawings of their architectural projects; drawings and paintings made by colleagues and friends, namely Raul Lino, Ezequiel Pereira and Miguel Queriol; draft scenarios designed by his father; portraits of masters like José Luis Monteiro and from himself painted by Constantino Fernandes and Ferreira da Costa. The drawings are made with pencil, ink and watercolor on paper. Some of their architectural designs are placed in the archive of the IST (Caldas & Pera, 2002).



Figure 5: The re-creation of the work room of the architect Álvaro Machado.

5. Technical drawings

5.1. Architectural drawings

According to the publication co-hosted by John v. Caldas, on the occasion of the opening of the replica of the atelier, the architect, in the designer, he was the author of a vast work (Caldas & Pera, 2002). Some of the designs, organised in the framework of competitions, works were also donated, complementing the furniture and belongings.

Figure 6 presents pencil drawings, ink and watercolour on paper of architectural projects.



Figure 6: Pencil drawings, ink and watercolour on paper of architectural projects.

In the same booklet, António Ressano Lamas says that "the quality of the drawings and the aesthetic and historic interest of the environment preserved were notable and could not immediately be dispersed" and so the IST zela "for your documents and projects and open to researchers to study his work".

5.2. Construction drawings

The Museum has a huge collection of drawings executed by students, dating back since the formation of the IST until after World War II. Currently, the discipline of Technical Drawing promotes, in each semester, a session at the Museum, so students can confront the current way of representing technical documents, based on current standards, with the mode of drawing at that time. Teacher exposes the key aspects of differentiation between old and new drawings, in particular, the format of the drawing sheet, the type of stroke and the applied colors, the mode of doing annotations and how to insert the dimensions, as well as the evidence rigor of the old drawings execution (Figure 7).

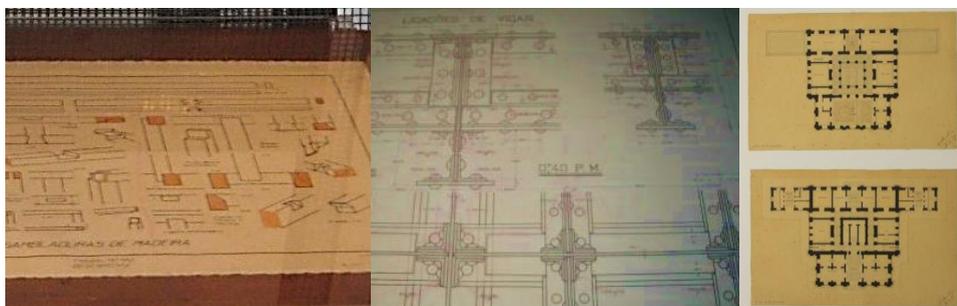


Figure 7: Drawings of masonry and metallic structures and of a Machado's project.

5.3 Material and tracing tools

Diverse type of tools used to trace drawings is also in exhibition in the Museum. The vast set of elements clarify, students and visitors, about the old process of making drawing, based in the use of pencils, ink or watercolor, and how to use scale rulers, squares and "T"

rulers (Figure 8). The presentation of these drawing devices allows students and visitor to follow the evaluation of the way of tracing technical drawings.



Figure 8: Drawing tools.

6. Conclusions

In the history of the construction, process methodologies and scientific knowledges about material and its behavior, have been evaluating to the actual mode of construct buildings. The set of elements described in the text, was collected and kept in a Museu, and they are in exhibition in a proper space, integrated in an engineer school, the IST. The Museu has an important role in the dissemination of old construction methodologies contributing to a better understanding of the current building processes and applied materials. The described elements confirm the effective advances that occurred in construction knowledge, methodologies and material. The Museu also supports the historic identity of the school.

The Museu contains several models made in wood probably executed by students in the workshops implemented in the school by Bensaude, his founder, and as a new pedagogical methodology more practical. In the context of the present Congress some constructive processes were described in detail (a Pombaline cage, a set of wooden trusses, two models of stairs and railings) as well as an *atelier* of the architect Álvaro Machado, and its drawings. These elements illustrate processes and methodologies that are not in use today but they should be known to support teaching of old uses and methodologies concerning civil engineering and architecture activity. The Museum is currently used as an educational space, as a research archive of old construction technologies and as a room where engineering-related events take place. The Museum serves the community and preserves the historical memory of the construction activity.

References

Bensaude, A. (1922) *Historical-pedagogical notes about the Instituto Superior Técnico*, Lisbon, <http://alfredobensaude.ist.utl.pt/nucleos/nucleo/id/3/paginaid/24>

- Caldas, J. V. & Pera, M. T. (2002) *Álvaro Machado, first professor of architecture of the IST-exhibition of the donated estate*, Instituto Superior Técnico (IST), Museum of Civil Engineering, Lisbon, Portugal.
- LNEC (2005) *The cage as the genesis of the Anti-Seismic Construction*, (in portuguese), Department of seismic engineering and structural dynamics, http://www-ext.lnec.pt/LNEC/DE/NESDE/divulgacao/gaiol_const_sism.html.
- Lopes, M., Bento, R. (2005) *The Pombaline building* (in portuguese), workshop *History and science of catastrophe*, Institut of Contemporary History, Lisbon, 2005. http://www.civil.ist.utl.pt/~rbento/css/CursoIHC_2005.PDF
- Sampaio, A. Z. (2016) *The Museum of Civil Engineering of the IST*, Museum of Civil Engineering, Instituto Superior Técnico, Lisbon, Portugal, 2016, <http://museudec.tecnico.ulisboa.pt/>
- Silva, P., Pereira, M. F., Soares, F. (2011). *The genesis of the Instituto Superior Técnico – Alfredo Bensaude*. Ed. Althum.com, <http://narq.tecnico.ulisboa.pt/extensao-cultural-e-educativa/exposicoes-fisicas-eou-virtuais/a-genese-do-tecnico-alfredo-bensaude/>

Introduction of BIM methodology in education: Concept and application

Sampaio, Alcinia Zita

Department of Civil Engineering, University of Lisbon, Lisbon, Portugal.

Abstract

Teaching Civil Engineering and Architecture requires a permanent updating of knowledge concerning procedures and technologies used in Construction industry. In this sense, the school should seek to adapt its curriculum to include innovative issues to support a better construction. The methodology Building Information Modelling (BIM), involving the concept of information centralized in a unique geometric model and of collaboration of all participants in a project, is strongly supported in advanced technology. An important role of teaching is to organize actions to promote the insertion of new issues in school. The text presents several examples of BIM applications developed by students in the context of MSc researches. The objective is to add competitive skills in the training of future architects and civil engineers.

Keywords: BIM training; Constuction; 3D BIM model; 4D BIM model.

1. Introduction

The Building Information Modelling (BIM) methodology covers various sectors of the Construction industry. A BIM project constitutes a complete and full database, considering not only the digital geometric model, the most visible part of the process, but also the type of materials projected to be applied in the building and its mechanical properties and physical characteristics (Tardif & Smith, 2009). BIM interferes with all aspects involved in a building project: the initial stage concerning the generation of a form (architecture); the different phases of the structural study (structural solution design, analysis and production of technical drawings); the quantification of materials and budgets; the construction planning process (definition of geometric model for each construction phase); the usage of the building (management and maintenance), in a later stage (Singh *et al.* 2011).

In a more traditional process of developing a project, each player uses a different and non-integrated work methodology, as there is not a common base of complete and updated information for the overall project. This lack of process integration is one of the main drivers for the loss of information and, causing a loss of value through each stage. Information is a key factor in management in the internal context, as well as the relationship with the exterior. The BIM methodology, which combines the parametric design, three dimensional (3D) models, element level information, coordination, communication and visualization within the whole building lifecycle, is changing deeply the way how information is managed within the construction sector (Eastman *et al.* 2011). This new approach is based essentially in the integration of processes, supported by an information rich 3D model which allows to seamlessly tracking the whole lifecycle of the enterprise. As such, it is also expected that the whole process becomes more accessible to the multiple entities that collaborate in the enterprise either while developing the design and later in the management of the building.

In the context of the education activity in a Civil Engineering and Architectural school some topics of BIM application were developed by students within MSc researches. The main issue concerns the construction activity (Figure 1): Construction planning based on 4D/BIM models; Coordination and preparation of construction project using 3D/BIM models; Analysis of conflicts over an architectural, structural and MEP model.

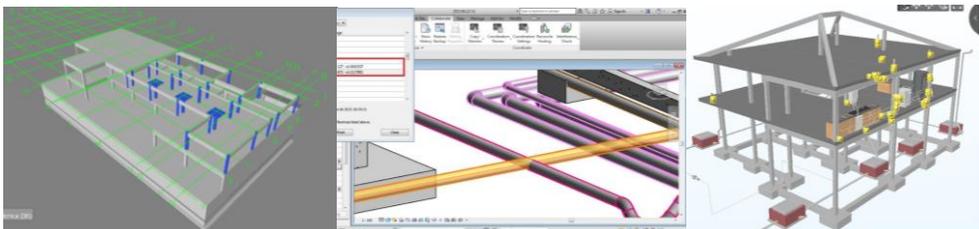


Figure 1: BIM uses – construction planning and coordination and conflict analyses.

2. Conflict analysis based in an 3D/BIM model

The BIM methodology and the associated tools present themselves as a n usefull asset to support the process of conflict analysis, as they make it possible to merge all disciplines in an integrated virtual environment, the 3D/BIM model. The high level of detail and visualization provided by a BIM model leads to a better collaboration between those involved throughout the design. The aim of the first study was to evaluate the practical capabilities of the BIM concept in the conflict analysis between building services, namely, the water supply and drainage systems design, and the architectural and structural design (Berdeja, 2014). As such, it was developed a 3D/BIM model containing the components: architecture, structures and building services. The model was analysed oriented to the clash detection between elements from all disciplines. The student learned to handle a BIM tool and how to use it in the development of a specific task within the construction activity.

2.1 Generating the 3D/BIM model

The selected case study consists of a building of two floors, comprising the garage and entrance hall, in the ground floor, and, the living room, kitchen, three bedrooms, two bathrooms, one utility room and hallways, in the upper floor. In the generation process of the BIM model's architectural and structural components, all elements, such as walls, windows, doors, floors, columns, roofs and footings, were created by adapting the 3D parametric objects existing in the Revit library, in order to resemble closely the real case (Figure 2). When modelling, the student has the first contact with a BIM tool improving its skills.

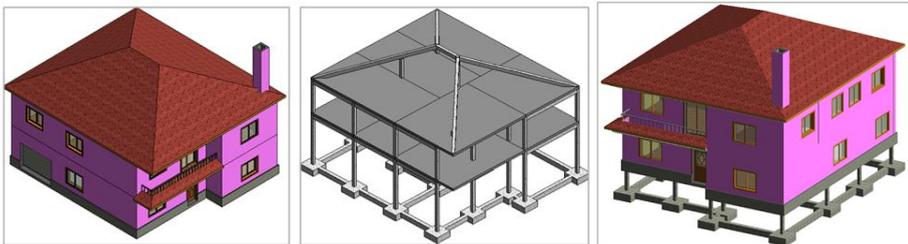


Figure 2: Architectural and structural components of the 3D/BIM model

Next, the MEP (mechanical, electrical and plumbing) component of the BIM model was generated, namely, the domestic hot and cold water supply system, the domestic wastewater system and the rain water drainage system (Figure 3). The modelling process requires the selection of appropriate parametric object and demanding for specific equipment concerning the MEP component within internet networks, made available by software houses. This way of working researching in internet networks became normal when new technologies are used.

The modeling was initially performed solely based on the architectural component of the house, with no visual guidance from the structural component. The architectural model was then supplemented with the plumbing fixtures. The piping diameters used in this work are approximate values of those present in the real design, for it was decided that the predefined nominal diameters from Revit were to be used.



Figure 3: The water supply and the wastewater drainage systems of the BIM model.

2.2 Clash detection

The BIM modelling process requires overlapping multiple disciplines that coexist in an integrated manner, forming a complete model of the design. After each discipline is modelled forming a unique BIM model, the collision detection can be performed. Conflict analysis is an integral and very important part in the development process of a 3D BIM model. This process consists in searching objects belonging to different disciplines that are using the same physical space. The analysis of these inconsistencies is a critical task, since they could eventually severely impact the construction process, causing delays, design changes and increased expenses in materials and surpluses in the budget. The clash detection analyses is another issue, very helpful in BIM methodology, that the students, after developing the MSc study, is allowed to resolve in real and more complete project, after in its activity as a professional.

As a first step, the modelling of the MEP component was carried out using only the architectural component as guidance. That is, the structural component was not visible during the MEP modelling. After through the handling of the components structures and MEP, some of clashes were detect. Overlapping all the disciplines it is possible to change some of the elements of the MEP services, in order to obtain a correct model with no conflicts. Figure 4 presents some the realized changes needed to improve the complete 3D/BIM model of the house. The existing Clash Detective function in Revit is of great help in conflict analysis and project coordination. This work contributes to demonstrate the advantages of BIM in the conciliation and coordination between different specialties, as well as the benefits of its application in conflict analysis in an engineering design.

With this exercise the student learns: to model 3D BIM disciplines, forming a complete 3D digital BIM model; to export the model to specific tools in order to perform conflict analysis between BIM components; to judge the correction of information handled in the process; to point out the main limitations found in the work; to use BIM tools as a support on the development of a project.

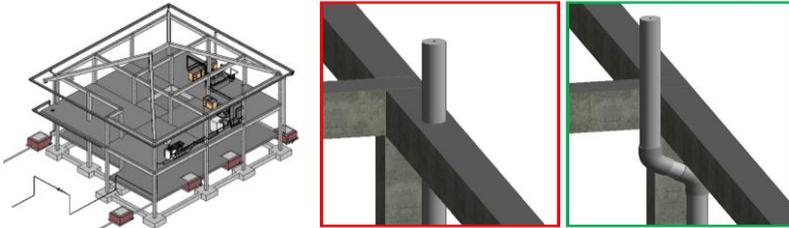


Figure 4: Coordination of structural and MEP disciplines.

3. 4D/BIM model for construction planning

Another example of modelling and work developed over the 3D/BIM concerns the creation of a 4D/BIM model addressing the construction project. The planning of the construction activity is a crucial stage in the conception of a design, and involves the selection of technologies, definition of work activities, estimation and resource management, logistics and duration of each individual task, as well as all the dependencies amongst the different tasks. Planning and scheduling in construction, involves the sequence of activities both in space and in time, taking into account the allocation and resource acquisition, quantities and space constraints amongst others (Pitake & Patil, 2013). The estimation for the duration of the activities is a decisive stage for a good project and building planning, as the control of the schedule, depends on the proper effort and duration estimation (Mukherjee & Clarke, 2012). Planning construction work is another discipline that can be supported in BIM viewers and BIM modelling tools. The student is able to develop similar projects after in its activity as an engineer.

3.1 Generation of a 4D/BIM model

In order to explore the BIM tools, as a support to construction planning, a 3D model of a second study case was first created. Using the Revit software only the architectural and infrastructure models of the project were generated. To create a 4D model the time factor must be linked to the 3D/BIM model elements. After, by running the defined 4D model, it allows the visualizations and analysis of the activity sequence for the construction. So, to generate the 4D model for the present case, the Navisworks software was used (Mota, 2015). This software allows the interconnections amongst sets of 3D elements of the BIM

model, with the planned tasks established in MS Project software. Briefly, the steps for the preparation of the 4D/BIM model are: Export the Revit 3D model, saved in the NWC format, to the Naviswork software as well as the MS Project planning file to the Naviswork timeliner; In the Naviswork, the 3D elements of the models were grouped according to the tasks defined in the planning. For this purpose, adequate “sets” were created. These "sets" can be created by selecting the elements directly over the model, by executing "tree selection" or by searching for its properties; Next the created "sets" were associated to the planning and schedule of tasks and set for each task its category, that is, whether it is construction, demolition, temporary activity or another.

3.2 Using the 4D/BIM model

By running the 4D/BIM model it is possible to visualize the planning simulation. Figure 5 shows a couple of frames, extracted from the simulation of this project. The practical part of this work fell mainly in study of the 3D modelling using Revit, and applying a model for 4D construction planning. The simulation will probably never match the reality, with its unforeseen, but this motivates the development of visualization technologies, trying to reduce the gap amongst the digital world as the reality. The aim is to minimize the number of execution errors, at least those believed to be predictable.

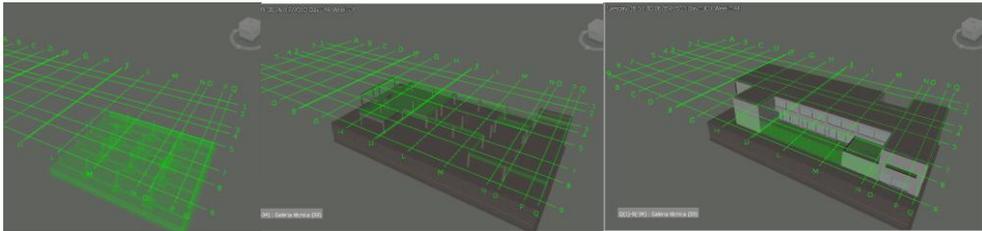


Figure 5: Construction simulation visualized in a 4D/BIM model.

In the process of modelling and application of the BIM model, the student had the opportunity to learn how to handle a new tool, to judge what is the most appropriate methodology of shaping the structure, to learn what are the requirements when using a BIM Viewer (Navisworks), how to associate tasks to groups of elements in order to achieve the simulation of the construction sequence. With this exercise the student learn several aspects concerning planning the construction of a building, that will be useful in its future activity as an engineer.

4. Coordination of construction project supported on a BIM model

In a BIM process, the execution of a building project network would be superimposed to the structure of buildings. Because the elements are delivered to the construction company,

with the elements of the network components modelled with a high level of detail, during the project development. In addition, in the BIM collaboration environment, the construction company could be an integral part of those projects, according to the Integrated Project Development methodology (IPD). In this 3rd study case a 3D/BIM model was created. The model allow to support the coordination of phases of construction, the extraction of maps of quantities, the input and deleting elements of the model, to change slopes and coupling pipes, among other situations. The networks considered in the case study were: sewage, water supply network and power grid. As part of the design review of this another case, it was necessary to start the process by developing the 3D/BIM model of the project (Silva, 2015). This item describes the various situations that occurred in the workplace and conducts analysis of its resolution on a BIM methodology base, using the capabilities of the BIM software used.

4.1 Building networks and analyses of conflicts

The software used checks and alert for the occurrence of transgressions between objects, therefore, any errors that may appear in the construction are previously identified during the design phase, reducing the number of errors and additional costs. The preparation work of building networks on the basis of structure is a fundamental process that is performed on site, because changing the path of the tubing is constrained due to the presence of the structure elements. The analysis of the situation on the BIM model is done automatically. Figure 6 presents one of the conflicts identified during the development of the model, in this case, a conflict resulting from the interference between the pipe and a bunker foundation.

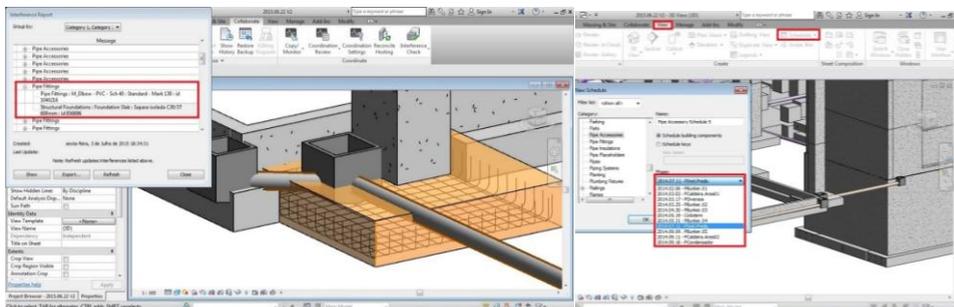


Figure 6: Conflicts between a piping and a bunker structural element

4.2 Coupling elements

Changing elements, because they fulfill the same space in the same instant, it is a recurring situation in Design-Build project delivery, because while the work is in progress some projects are still being created. This led to one of the already implemented elements that

had to be chopped in a certain area to allocate a coming slab foundation. Figure 7 (left) presents the chipping area of concrete represented in a AutoCAD drawing and Figure 7 (right) shows the modelling of these foundations, in the BIM model created.

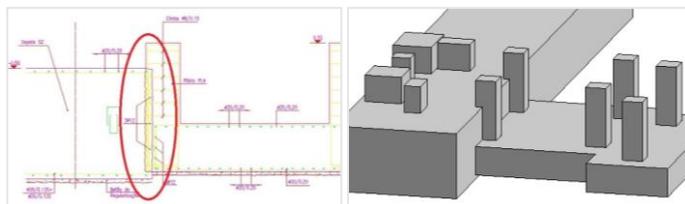


Figure 7: Docking area of the two foundations, in a CAD drawing and in a 3D/BIM model

5. Conclusions

The work enabled the knowledge of the subject BIM within a education context but oriented to the real activity. Research on the subject has exposed several objects of study covering BIM, from its origin to its application in the Construction sector, seeking to know the reasons for his development and how this methodology has been developed. The use of this methodology for the development of construction management emerged several situations that expose the benefits of using BIM. All students have learned to handle a new tool and how to use it for various purposes. In each case a 3D/BIM model is created and applied oriented to different points of view, contributing to improve student's skills. These research papers are MSc thesis and they are made available on school website. This kind of works contributes to the spread of BIM applied in several dimensions.

References

- Berdeja, E. P. (2014) *Conflict analyses in a BIM based design*, MSc thesis in Construction, University of Lisbon, Lisbon, Portugal.
- Eastman, C., Teicholz, P., Sacks, R. & Liston, K. (2011) *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors*, Hoboken, New Jersey: John Wiley & Sons, Inc.
- Mota, C. S. (2015) *4D works planning based on BIM technology* MSc thesis in Construction, University of Lisbon, Lisbon, Portugal.
- Mukherjee, K. & Clarke, R. (2012) *4D Construction Planning*. 66th Annual Conference Melbourne. Beca AMEC, New Zealand.
- Pitake, S. & Patil, D. (2013) *Visualization of Construction Progress by 4D Modeling Application*. International Journal of Engineering Trends and Technology (IJETI) – Volume 4 Issue 7, 2013.

- Silva, D. S. (2015) *Management of construction supported in BIM model: practical case study applied to a central energy recovery of solid waste*, MSc thesis in Construction, University of Lisbon, Lisbon, Portugal.
- Singh, V., Gu, N., & Wang, X. (2011) *A theoretical framework of a BIM-based multi-disciplinary collaboration platform*. *Automation in Construction*, 134-144.
- Tardif, M., & Smith, K. D. (2009) *Building Information Modeling: A strategic Implementation Guide*. Hoboken, New Jersey: John Wiley & Sons, Inc..

Competency-based learning: Music education, the great forgotten

Vernia Carrasco, Ana Mercedes

Department of Education and Specific Didactics, Jaume I University, Spain

Abstract

Adapting to the European framework in education, without thinking about the approaches of UNESCO, assumed that there was no type of exclusion, neither by subjects nor by profiles, however, we find a clear void regarding the competencies that a professional of music must acquire, in their training and for their employability. Not only in the strictest areas such as the Conservatories, but also in elementary schools and at the University. Our work required the help of professionals from music schools, because current laws do not refer to work in the area of competences, except in some decrees where professional competences are mentioned, or in other cases, where reference is simply made to integrate the basic skills of primary schools. The results were a proposal of basic Competences in music, which could include both conservatories and music schools, regardless of the instrumental specialty, which is a first step to establish a criterion that unifies the criteria for this group of teachers.

Keywords: *Competences; Skills; Music Education; Conservatoire; Music Schools*

1. Introduction

Music Education in both Conservatories and Music Schools, is still adapting to the European framework for learning, so it is not surprising that public administrations in the field of education, be worried for a common framework in terms of training and education is concerned. In the European framework, basic competences, questions and options for curricular areas or subjects have been defined, as well as special classes, among which music is found, for which it is necessary to define the key or basic competences in Music that they are related to the basic competences to have a greater significance and quality in education, attending to the diversity of training and employability.

The Conservatories and Schools of Music share a common student profile to Primary and Secondary Education, and in some cases also Infantile Education, where the Basic Competences are present in all their subjects, therefore, to duplicate contents means to load the student of insignificant work at the same time you waste time and effort. The Didactic Programming in the Conservatories went from being simple bibliography, to carrying out a relevant elaboration with the LOGSE addressing the preparation of Didactic Units that covered what was established in the Curriculum. Even today we continue, too many cases, with the same programs, while in other educational levels and areas they have adapted to what has been established by Bologna.

2. Theoretical framework

Music education in Spain, says Longueira (2011), is developed in three areas: professional training, teacher training and music education in general training, these areas can be adapted to the competence framework:

- a) the skills that professionals from specialized music education should have. These are areas that belong to professional music training and teacher training.
- b) contributions of music education to the development of basic skills in general education;
- c) properly musical skills that are developed in general education as part of artistic education.

Also the Music Teacher National Association (MTNA) (s/d), approved in the annual meeting of 2003 a proposal on the competences that should be acquired in Essential Skills for the promotion of a lifelong love of Music, of which we quote some:

- Ability to internalize basic rhythms and pulse
- Ability to read music literacy
- Possibility of performing with physical ease and technical efficiency

- Ability to work creatively, improvise, compose, harmonize and play by ear
- Ability to understand the basic elements of the theory, the harmony form, etc.
- Ability to respond to the interpretative elements of the composition to express the emotional character of the music
- Ability to work independently and to solve problems

Lake and Downs (1984), long ago argued that the area of music involves creative expression, skills in rhythm, communication skills, re-establish speech patterns, recall memory, gross motor skills, sensory awareness, strengthening of the lungs .

We understand that the competition approaches or reduces the distance between theory and practice, bringing together the procedural and attitudinal conceptual contents, thus responding to traditional learning. In this sense, Bunk (1994, in Ribes, et al., 2004) believes that a competent person in the professional field is one who possesses the knowledge, skills and aptitudes necessary to develop a profession, solves problems flexibly and autonomously, and is trained to collaborate in their professional environment and in the organization of work. In the following figure, a comparison is established between the skills that Bunk defends and the competences considered by Delors:

COMPETENCES (BUNK, 1994)	LEARNING (DELORS, 1996)
Techniques: related to owning and developing professional knowledge.	Learn to know (know) to understand.
Methodological: application of knowledge to educational situations.	Learning to do (knowing how to do) in order to influence the environment.
Participatory: related to resources for work in and with the group.	Learning to live together (knowing how to be) to participate and cooperate with the other
Personals: related to human resources to face professional challenges.	Learn to be (know how to be) to live in the first person.

Figure 1. Tipos de Competencias y aprendizajes. Source: Ribes et al. (2004).

From the previous figure we can understand that already at the end of the 20th century, there was a clear relationship between competences and learning, today we still continue with this debate in the context of music education, then, Delors' proposal is overcome or understood, we continue trying to apply the Bunk's proposal, adapting it to the specific and special field of music.

The only competition we find related to music in the educational context is the one known as Cultural and Artistic, which changes its name according to Autonomous Communities and adapts to its different decrees. But in no case does this competence refer to the acquisition of theoretical-practices content, as it does in other subjects or subjects.

3. Methodological framework

To collect information, we use, on the one hand and for the proposal of competences, the exchange of information, sharing among all the participants, the proposed definitions. On the other hand, and to know the profile of the participant, we used the on-line survey, which allowed anonymously.

Our proposal went through different training courses, among whose objectives was to know the opinions of professors of Conservatories and Music Schools, so that they could discuss a first draft of basic skills in music.

Among the centers visited were 4 Professional Music Conservatories and 3 Music Schools, with teachers from different specialties participating, both in common and instrumental subjects. In addition, a course with the same characteristics was offered from the Regional Ministry of Education of the Valencian Community, addressed to all the Professional Conservatories of Music and Dance.

4. Results

Of all the reflections and proposals that contributed the results of the courses, finally a general list of competences was made with their respective definitions, thus leaving the following list:

- Rhythmic competence
- ditory / perceptive competence
- Vocal Competition
- Reading and Writing Comprehension Competence
- Interpretive / Communicative Competence
- Body Expression Competition (expression)
- Personal and Emotional Competence (relationship with oneself and with others, group work, etc.)
- Competence to Learn to Learn
- Technological Competence
- Cultural, Artistic (know other artistic manifestations) and Musicological competence.

Among the reflections that we gathered from some teachers who wanted to participate, we find:

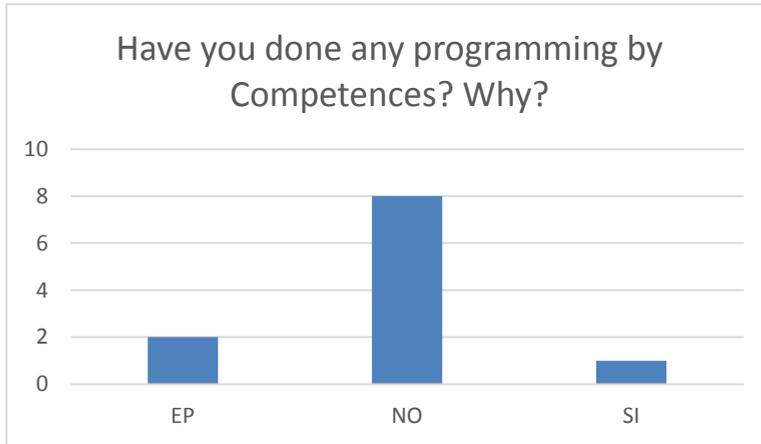


Figure 2. Have you done any programming by Competences?. Source: own elaboration

When we ask if they have ever done programming by competences, we find a majority of negative responses. The participants who did, did a programming by competences, or are in process, in most of the cases, are because from the workplace has been required.

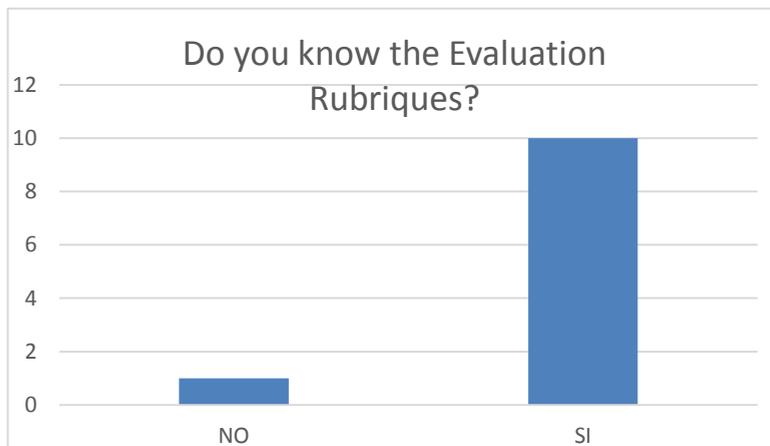


Figure 3. Do you know the Evaluation Rubriques?. Source: own elaboration

When the participants were asked, if they knew the rubrics of evaluation, they mostly agreed, however, as we can see in the following figure, very few people use the rubrics to evaluate.

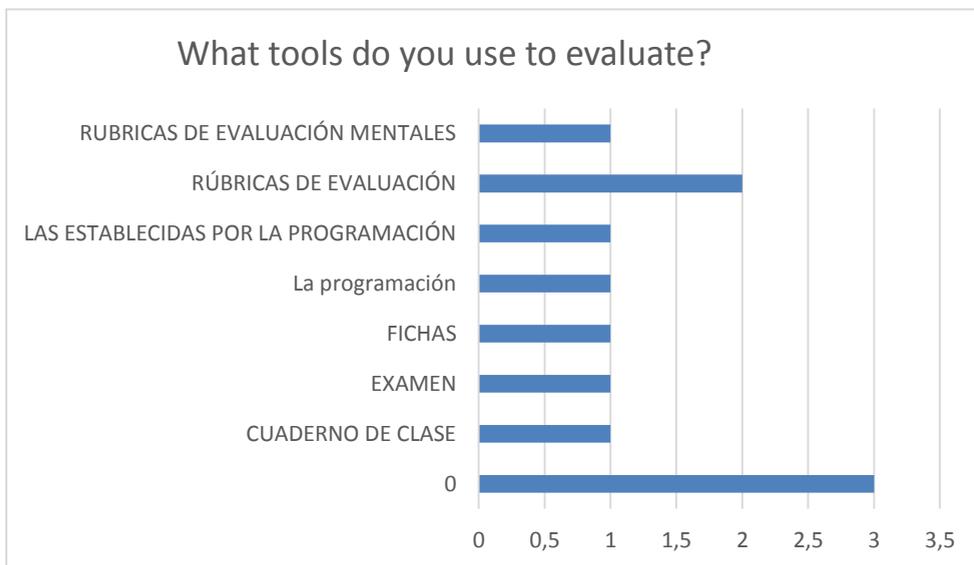


Figure 4. Tipos de Competencias y aprendizajes. Source: own elaboration

For the question: Do you see the need to improve our training in terms of programming and preparation of teaching materials? All the participants said yes

5. Conclusions

The first conclusion is that, with these competences, the participating teachers considered that they covered all the necessary needs and abilities that the students should assume and assimilate, when they finished their professional studies.

On the other hand, and attending to the results, we understand that it is necessary a specific training for music teachers, in terms of didactic programming by competences, according to their profile as a specialist and broadening their vision to be able to meet the European framework in educational matters. We also verified that although the rubrics of evaluation are known, there are very few teachers who apply them, some recognizing that they follow the evaluation system by traditional exam, or taking into account what their didactic program dictates.

In addition, a training is required in this regard, both for Conservatorios Profesionales as for Music Schools, because clearly it is that they are different from the educational areas where the key competences are already implemented, which are far, as has been appreciated, by the opinions of the specialists, of which should be applied in Education and Musical formation.

References

- Lake, J. and Downs, J. (1984). Educational activity programs for older adults. A 12- month idea guide for adult education instructors and activity directors gerontology. New York. The Haworth press.
- Longueira (2011) Adquisición de competencias a través de la educación musical. Aproximación al desarrollo de la responsabilidad y la autonomía en la educación general. XII Congreso Internacional de Teoría de la Educación. Barcelona: Universidad de Barcelona.
- Music Teacher National Association (MTNA) (s/d). Recuperado de: <https://www.mtna.org/>
- Ribes, R., Agulló, M.J., Corduras, J., Ribes, G.R., Marsellés, M.A., y Valls, J. (2004). “Quiero enseñar... ¿me enseñan?”. El desarrollo de competencias personales durante el período de prácticum en la formación inicial de maestro EE. Revista de Enseñanza Universitaria 24, 99-115.

Successfully planning and implementing peer-to-peer lecture films – “Making it work”

Pfennig, Anja

Department of Technical Studies and Life Science, HTW Berlin University of Applied Sciences Berlin, Germany.

Abstract

Since summer 2015 lecture videos are implemented in “inverted classroom” teaching scenarios to teach material science to first year students studying mechanical and automotive engineering at HTW Berlin. Lecture videos so far cover subjects such as material testing, corrosion, composites, defects in crystals, hardening mechanisms and materials families. These videos were initially inspired by students. Each semester a set of lecture videos is conducted during a one term semester project supervised by lecturers and film experts (peer-to-peer approach). The peer-to-peer approach is an important aspect because students` needs and their perspective on teaching material is directly included in the videos. Recordings of lectures were also successfully implemented teaching general phase diagrams and the iron-carbon-phase diagram. Both, lecture films and recordings of lectures were used to study themes after class, prepare for classes (inverted classroom scenarios) and the final exam. Students are familiar with videos as learning source, enjoyed to work independently and not only according to contact hours and were generally more active and better prepared during class resulting in better grades. The teaching method “inverted classroom” and class results directly relate to the quality of the video material. Practice examples introduce the teaching method and evaluation of both, videos and teaching method.

Keywords: *lecture films, peer to peer approach, inverted classroom, first year students, material science.*

1. Introduction

Lately, there has been a great deal of interest in using various types of media in conjunction with more traditional teaching methods. One type of media is the use of audio or video recordings comprising at least 5 different techniques: Crooka (2017), the other is establishing short lecture videos of relevant course material: Pfennig (2016). Video provides an audio and visual stimulus covering different learning methodologies.

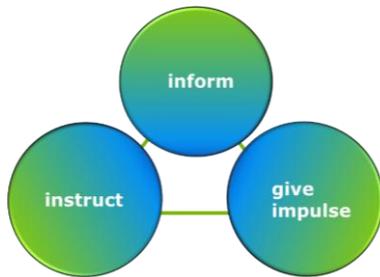
There is questioning whether both lecture videos and video lectures might outgrow traditional teaching methods. However, lecture videos are definitely a reinforcement, rather than a replacement for lectures: Havergal (2015) so long as any video included is analogous to the desired learning outcomes of the lecture: Al-Jandan (2015). Students place significant value on the use of videos: Gulley (2016), Kon (2015) and viewed them as easy to use and effective learning tools: Kay (2012). Regardless of lecture technique (in-front teaching or video support: Saun (2017)) lectures demonstrating practical work enhance learning outcome: Sarihan (2016). Lecturers must be aware that students tend to be overconfident in their learning from video-recorded modules. Interpolated questions within online videos were preferred by students and may increase the learner's engagement with the material: Rose (2016) and help to boost actual performance: Szpunar (2014).

Material Science for mechanical engineering students at HTW Berlin is taught via the "design-led" teaching approach: Ashby (2013), Pfennig (2016) following the "inverted classroom" teaching scenario: Berret (2012), Pfennig (2016), Pfennig (2017-1/2) having positive effect on self-efficacy beliefs and intrinsic motivation in a blended learning setting: Thai (2017).

Class results indicate that involving students directly into teaching activities (preparation of lecture videos) can be very effective in getting students to engage in critical thinking: Colorado State University (2015), Lord (2012); thus, producing deeper learning outcomes: Goto and Schneider (2010). Well known methods are for example peer instruction: Ware (2015), reciprocal peer tutoring: Simon et. al. (2010) or undergraduate teaching assistance: Fingerson and Culley (2001). Therefore peer-to-peer lecture videos are successfully implemented in teaching scenarios of the first year materials science course at HTW Berlin.

2. Concept of film making – the peer-to-peer approach

As "peer-to-peer": Ware (2015) literally means "from students for students" this concept was applied for planning and completing lecture videos. Since 2014 the 3I-model has been developed at HTW Berlin: OLP Online Lehre Plus /Online Teaching Plus (2016). This model defines video as a channel in teaching by its intention:

inform, instruct, give impulse**Information**

Short video inputs to replace the traditional frontal type of teaching basic knowledge for inverted classroom setups: Ashby (2013)

Instruction

"How-to videos" to qualify students to work with machines/setups respectively theoretical models for quantitative or qualitative research.

Impulse

Short documentary videos for advanced students serve as an additional motivation and affirmation. These videos encourage the individual to critically examine his or her own views and promote cross-border collaboration.

Fig. 1. 3I Model Overview

All the teaching benefits are included when students are involved in the film making according to the peer to peer teaching approach which applies well for films as lecture. Effective operation of the lecture films is based on student`s experience and their special needs when preparing for graded lab courses and specific topics in material science. Based on students` initiative films (lecture videos not video lectures) were produced to make materials science lectures come to life. Up to now there are 43 lecture films ready available on Moodle HTW and YouTube for students enrolled in material science classes. Therefore 4-6 students worked on a full concept and implementation and integration of three to six lecture films, each of two to eight minutes long. Different film formats are chosen, such as: power point, comic, swipe-technique or animation. The lecture screen play was proof read carefully by lecturers, because each word has its weigh and needs to be fully correct. The overall sense of sentences has to be clear and precise enough to be understood without pictures. The film making was supervised by an OLP-film team of the HTW OLP Online Lehre Plus /Online Teaching Plus (2015).

3. Setting the scene - lecture films in material science

Students enrolled generally come from multiple different educational backgrounds, which is a benefit and a great challenge at the same time. For all students is necessary to study the scientific background of material properties in order to understand the material behavior in a mechanical design. Discussions are encouraged, but each student is responsible for her/his own learning process with a great variety of teaching material being provided: Pfenning (2016), Pfenning (2017-2). Still, so far students did not find these appealing enough to study

properly so that courses were very challenging, often chewy and disappointing for lecturers. Starting winter semester 2015, lecture videos -appealing to all students- had to be prepared via self-studying according to the inverted classroom scenarios. Interpolated tests along with lecture videos, micro-lectures and group homework accompanied by many other teaching resources: Pfennig (2017-2) helped students prepare for the specific topics. In class questions were answered and hands-on problems were solved preparing students for graded activities adding to the entire course grade: Pfennig (2017-2).

It is very important to outline the inverted classroom method, course rules and the assessment of lectures and lecture videos beforehand. So students were instructed in how to work with the Moodle-course, what impact teaching sources may have on their learning outcome and what was expected from their self-study periods right from the beginning of the course. A summary of graded activities was given to the students so that they were able to know exactly what percentage of the grading the particular lecture video test will have and when it had to be taken. The plenum agreed on night exams contributing to the individual study time of the class setting the time from 4 pm to 2 am the next morning.

The following lecture scenarios were chosen because these were stand-alone topics with no accompanying lecture before or after.

3.1. Lecture scenario: Fiber reinforced polymers

Fiber reinforced polymers (frp) were introduced to first year students using 6 lecture films using Moodle to provide the films and communicate with the students in winter semester 2015/16 as a voluntary study topic:

<https://www.youtube.com/playlist?list=PLUOIzMSZYz5y8XYE1S09HIH60tSxIUERe>

Groups of 4 students had to prepare one lecture film being able to explain the scientific background properly. Other lecture films were subject of own responsibility accompanied by voluntary lectures and small quizzes. In class questions were answered in plenum and the open-source software "invote": invote (2016), Simon et al. (2010), was used for peer reviewing. In a first session students, who prepared the same lecture film worked as one of six group given 30-40 minutes to summarize the main points of the lecture film on a special template. During this time the lecturer was open for all questions arising in the teams answering those properly and helping to understand complicated scientific backgrounds. This guaranteed the correctness of the teams` final summary which was copied for all students in class and uploaded in Moodle as a summary worksheet to prepare for the nightly exam. In a second session students were divided into groups with 6 students each, so that each team had one expert for each of the lecture film topics. All students were then asked to briefly present their most important issues for the other team members and explaining open question arising from the summary sheets.

The voluntary nightly online exam via Moodle gave the opportunity to gain extra credits to the course and was taken by 19 students out of 36. All students taking the exam passed. 20% of the students scored with 70% or more (Figure 2) which accounts for a very good result considering that this test was voluntarily.

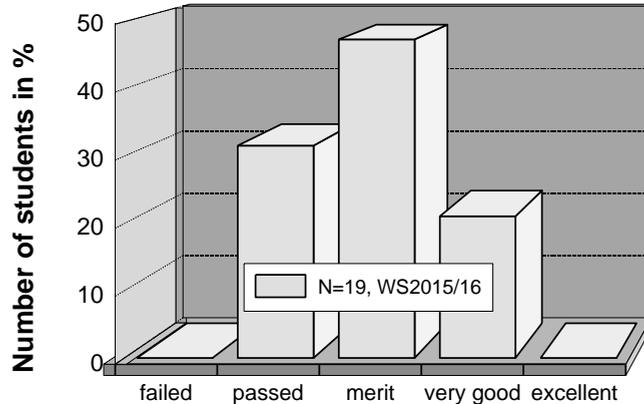


Figure 2. Results of voluntary nightly online exam on fiber reinforced polymers.

3.2. Lecture scenario: polymer structures

Polymer structures are only briefly discussed in a first year material science course for mechanical engineers. However, students feel the need to study the differences compared to metals more in depth. Therefore polymer structures was included in the curriculum, but declared as self-study lectures based on lecture videos (Figure 3):

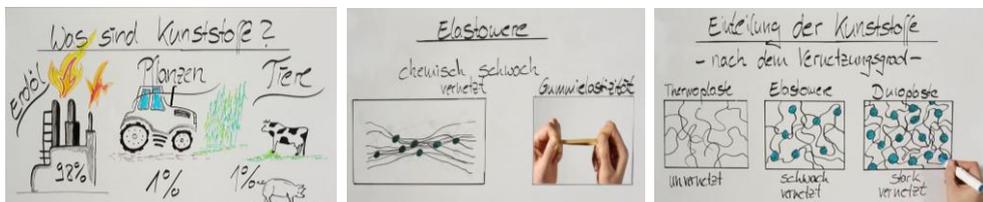


Figure 3. Lecture films: fiber reinforced polymers (6 lecture films) (35:31 min), (<https://www.youtube.com/playlist?list=PLUOIZMSZYz5y8XYE1S09HIH60tSxlUERe>)

In class questions were answered in plenum and the open-source software “invote”: invote (2016), Simon et al. (2010), was used for peer reviewing. The compulsory nightly online exam via Moodle (open until 2 am the next morning) added to the credits of the course (2 out of 60 possible grade points). In general most students passed the exam and more than 60% of the students score very good or excellent accounting to their good study skills and deep learning outcome (Figure 4).

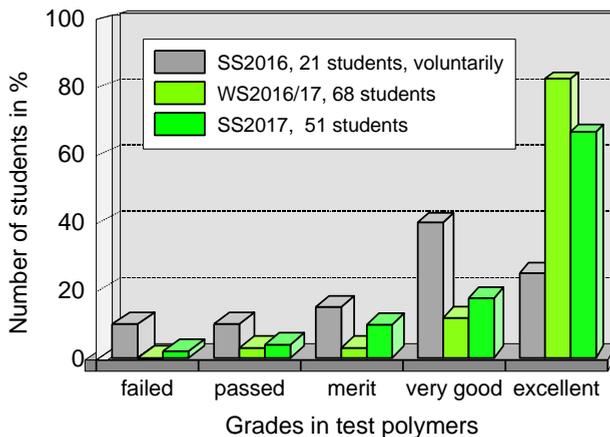


Figure 4. Results of voluntary nightly online exam on polymer structures.

Students working on the lecture films found themselves deeply involved in polymers, fiber reinforced polymers and film making techniques, both skills never being part of the official curriculum. Thus contributing to high learning outcome and self attentiveness.

4. Evaluation and Discussion

Lecture videos appeal to many students and are therefore a probate media to encourage students to self-study und gain good results for material science courses. These films may also provide excellent requirements when inverting the classroom. Watching introductory videos for lab courses and lecture videos to prepare different topics seem to lead to more download activity and actual studying of the lectures. Notes and handwritten summaries were brought along, mind maps and summary sheets were downloaded and memorized. The additional learning material helped the students to understand the science behind the results introduced in class or produced in the lab. Pre-test results (classroom response) were partly improved and during group work groups worked homogenously with lots of inspiration. Students asked important questions, initiated discussions, were eager to dispose their knowledge and learn more of the details and even those students, who did not attend the lecture classes increased their understanding of complicated correlations.

Since most lecture films are strictly under 5 min lack of interest was not an issue. E.g. 24 students averagely clicked 68 times on the polymer lecture films indicating that they watched every lecture video approximately 3 times. Moreover, once the students started to watch the films they completed it – with exception of the end titles.

Students involved in the making of the film found that they gained substantial knowledge in material science. The students found themselves capable of analyzing and applying the

suitable parameters to give profound information on mechanical properties. Moreover the students were able to explain why materials behaved in a certain way, which they have not been able to earlier when taking the traditional material science course.

5. Conclusion

Different lecture film formats were produced as guided student projects preparing necessary self studying teaching material for “inverted classroom” lecture scenarios in an interdisciplinary concept of teaching materials science. This peer-to-peer approach of involving students into the implementation of teaching material was assessed as beneficial in terms of student grades, concentration and attentiveness as well as ongoing lecture procedures during class. Students were generally well prepared and able to work on strategies to solve hand-on problems. The growing procedure of film making requires dedicated students and lecturers, a very good concept and screen play as well as professional guidance in film making. Students involved in the making of the film gained substantial knowledge in material science.

References

- Al-Jandan, B.A., Farooq, I. and Khan, S.Q., Students’ perspectives on the relevance of internet-based educational videos in dental education, *Journal of Taibah University Medical Sciences* (2015) 10(3), 288-292
- Ashby, M., Shercliff, H., Cebon, D.: *Materials Engineering, Science, Processing and Design*, 2013: ISBN-13: 978-0080994345 (3rd edition)
- Berrett, D.: How ‘flipping’ the classroom can improve the traditional lecture, *The Chronicle of Higher Education* (2012)
- Colorado State Universtiy, Using Peer Teaching in the Classroom, (2015), <http://teaching.colostate.edu/tips/tip.cfm?tipid=180>
- Crooka,C., Schofield, L., The video lecture, *The Internet and Higher Education* 34 (2017) 56–64
- Fingerson, L. & Culley, A., Collaborators in teaching and learning: Undergraduate teaching assistants in the classroom. *Teaching Sociology*, 29(3) (2001) 299-315.
- Goto K, & Schneider, J., Learning through teaching: Challenges and opportunities in facilitating student learning in food science and nutrition by using the interteaching approach. *Journal of Food Science Education* 9(1) (2010) 31-35.
- Gulley, O.D., Jackson, A.L., A case study on using instructor-recorded videos in an upper level economics course, *International Review of Economics Education* 23 (2016) 28–33
- Havergal C., Videoing lectures ‘has no impact’ on attendance, says study, 2015, <https://www.timeshighereducation.com/news/videoing-lectures-has-no-impact-attendance-says-study>

- Kay, R., Kletskin, I., Evaluating the use of problem-based video podcasts to teach mathematics in higher education, *Computers & Education* 59 (2012) 619–627
- Kon, H., Botelho, M.G., Bridges, S., Chiu Man Leung, K., The impact of complete denture making instructional videos on self-directed learning of clinical skills, *Journal of Prosthodontic Research* 59 (2015) 144–151
- Lord, T., 101 reasons for using cooperative learning in biology teaching. *The American Biology Teacher* 63(1) (2012) 30-38.
- OLP Online Lehre Plus / external fund: Berliner Qualitätsoffensive für die Lehre/
https://www.berlin.de/sen/wissenschaft/wissenschaftspolitik/finanzierung/vereinbarung_berliner_qualitaetsoffensive_fur_die_lehre_2012_bis_2016.pdf
- Pfennig, A., Inverting the Classroom in an Introductory Material Science Course, *Procedia - Social and Behavioral Sciences* 228 (2016) 32-38, ISSN: 1877-0428, doi:10.1016/j.sbspro.2016.07.005
- Pfennig, A. Flipping the classroom and turning the grades – a solution to teach unbeloved phase diagrams to engineering students, 3rd International Conference on Higher Education Advances, HEAd'17, 23-25 June 2017
- Pfennig, A. Improvement of learning outcome in material science through inverted classroom techniques and alternative course assessment, 3rd International Conference on Higher Education Advances, HEAd'17, 23-25 June 2017
- Rose, E., Claudius, I. Tabatabai, r., Kearl, L., Behar, S., and Jhun, P., The flipped classroom in emergency medicine using online videos with interpolated questions, *The Journal of Emergency Medicine*, Vol. 51, No. 3 (2016) 284–291
- Sarihan A., Colak Oray N., Güllüpinar B., Yanturali S, Atilla R., Musal B., The comparison of the efficiency of traditional lectures to videosupported lectures within the training of the Emergency Medicine residents, *Turkish Journal of Emergency Medicine* 16 (2016) 107-111
- Saun, T.J., Odorizzi, S., Yeung, C., Johnson, M., Bandiera, G., and Dev, S.P., A Peer-Reviewed Instructional Video is as Effective as a Standard Recorded Didactic Lecture in Medical Trainees Performing ChestTubeInsertion: A Randomized Control Trial, *Journal of Surgical Education*, Vol. 74 No. 3 (2017) 437-442
- Szpunar, K.K., Jing, H.G., Schacter, D.L., Overcoming overconfidence in learning from video-recorded lectures: Implications of interpolated testing for online education, *Journal of Applied Research in Memory and Cognition* 3 (2014) 161–164
- Thai, N.T.T., De Wever, B., Valcke, M., The impact of a flipped classroom design on learning performance in higher education: Looking for the best “blend” of lectures and guiding questions with feedback, *Computers & Education* 107 (2017) 113-126
- Simon, B., Kohanfars, M., Lee, J., Tamayo, K., & Cutts, Q., Experience report: peer instruction in introductory computing. *Proceedings of the 41st ACM Technical Symposium on Computer Science Education* (2010) 341-345
- Ware, M., Peer review: benefits, perceptions and alternatives, Publishing Researching Consortium, www.publishingresearch.net/documents/PRCsummary4Warefinal.pdf 2015

Successfully planning and implementing peer-to-peer lecture films – “Making of”

Pfennig, Anja and Maier-Rothe, Jörg

Department of Technical Studies and Life Science, HTW Berlin University of Applied Sciences Berlin, Germany.

Abstract

Videos implemented in higher education are widely used by students and provide an audio and visual stimulus covering different learning methodologies. Lecture videos that are analogous to the desired learning outcomes of the lecture are considered a reinforcement. These videos covering scientific background on short sequences need to be of a certain standard to gain students' interest and become a fully accepted learning material. Since summer 2015 lecture videos are implemented in “inverted classroom” teaching scenarios to teach material science to first year students studying mechanical and automotive engineering at HTW Berlin. These videos were initially inspired by students resulting in the conduction of a set of lecture videos during a one term semester project each semester. The “making-of” is supervised by lecturers and film experts (peer-to-peer approach). The peer-to-peer approach is an important aspect because students' needs and their perspective on teaching material is included directly in the videos. Because we were asked many times: what does it take to prepare successful peer-to-peer lecture films this paper practically contributes to those who are thinking about producing lecture videos and implementing these in face-to-face lectures or online/blended learning scenarios.

Keywords: *lecture films, making of, peer to peer, material science.*

1. Introduction - Setting the scene

Material Science is taught to first year mechanical engineering students at HTW Berlin via the "design-led" teaching approach: Ashby (2013), Pfennig (2016). In the blended learning setting implementing lecture videos into "inverted classroom" teaching scenarios: Berret (2012), Pfennig (2016), Pfennig (2018-1/2) has a positive effect on self-efficacy beliefs and intrinsic motivation: Thai (2017). In general students viewed lecture videos as easy to use and effective learning tools: Kay (2012) and place significant value on the use of videos: Gulley (2016), Kon (2015). Videos provide an audio and visual stimulus covering different learning methodologies. Presupposed the video included is analogous to the desired learning outcomes of the lecture: Al-Jandan (2015) lecture videos are definitely a reinforcement, rather than a replacement for lectures: Havergal (2015). Note, that there is a difference between audio or video recordings of lectures and short lecture videos of relevant course material: Pfennig (2016). This "making-of"-paper deals with the latter only with students being involved according to the peer-to-peer approach: Ware (2015) where 4-6 students worked on a full concept and implementation and integration of three to six lecture films, each averagely two to six minutes long.

2. Getting started

Because the workload is quite high to our experience the production of lecture films is only profitable for content that is not subject to change over at least a medium period, such as basic scientific knowledge. The authors want to state that you do not have to have professional skills or professional technical equipment to produce good lecture videos. Most important is that the aim of the lecture video is included into the learning outcome of the course and that the content is clear and well prepared.

At HTW Berlin lecture films are content of a voluntary semester project during the 5th semester of mechanical engineering (5 ECTS = 180 hours of workload). The highly motivated students generally have no skills in film making. Required average outcome is 4-5 minutes video of high quality per student. This appears to be little, but it is a very good output measured by the sum of work packages comprising of:

1. Writing a script / scribeplay
2. Preparation of assets e.g. illustrations
3. Text / Voice-over recording
4. Camera setup and shoot
5. Editing and post-production
6. Finish and delivery

Usually one student has illustrating skills. Voice recording is done by interested students and all project members usually learn filming and cutting throughout the project.

In a kick-off meeting all the boundary conditions, such as deadlines, length of films, content and type of lecture video, composition of the script, etc. are explained in detail. Children books help students understanding the necessity of the correlation between text and illustration, with text explaining exactly what the viewer sees in the picture. Complicated scientific background knowledge has to be explained in a simple – but not trivial – way and at the same time visualized in detail. For example: “Lattice defects raise the strength of an engineering material”. Here not only the defect has to be illustrated because the increased strength is the more important detail (Figure 1).

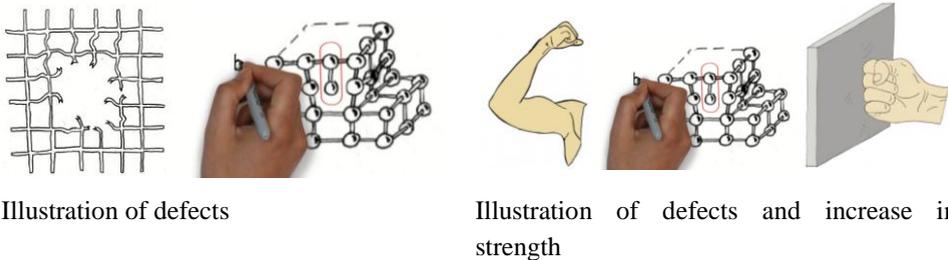


Fig. 1. Illustrative interpretation of the text: “Lattice defects raise the strength of an engineering material”

3. “Making-of” peer-to-peer lecture videos

3.1. Equipment

Concerning all studio and production equipment we promote the KISS (“Keep it simple, stupid”) principle, reducing overall costs and efforts. In our projects we try to focus on the product not on production where ease of use of the equipment is most important. Even a smartphone, maybe with a dedicated photo/filming app, can be sufficient. Good content makes a good film, picture quality is secondary.

Camera: To recommend a specific camera model would be inappropriate. Basic demands at the time of writing are (most modern smart phone cameras meet these requirements):

- Aspect ratio of 16:9
- Picture size of at least HD 720p (1280 x 720 pixels).
- Recording of standard formats, that are transerable to a PC for post-production
- A framerate of at least 25 frames per second (fps)
- Compression rates not too high. A higher bitrate means better picture quality. YouTube recommends 5 Mbps for 720p and 8 Mbps for 1080p footage.

Stabilising the camera is of great importance. When doing a cutout animation you usually have a so called top shot, which means the camera is filming a table from the top. You can help yourself and realise a top shot with a camera on a side arm with a standard tripod and basic tools from a hardware shop (Figure 2).



Fig. 2. DIY setup of a top shot

Software: The set of features needed for simple post production tasks is pretty straightforward: e.g. transitions, filtering and basic color correction, text tools, maybe time lapse and slow motion, simple animation of graphical content, audio syncing and editing, and finally the export into popular end formats for delivery. The learning curve in using the editing software shouldn't be too steep. There are products on the market aiming towards exactly these users, and most of them are reasonably priced. We have been using several software solutions in post production. A good option is Black Magics DaVinci Resolve. Being a professional colorist tool, the recent versions have been extended with editing tools and the basic version is even free of charge.

Lighting: Lighting the scene is important because, if a set is well illuminated any filming can be done with a faster shutter speed, i.e. shorter exposure times, which lead to less motion blur. The effect is quite subtle, but a picture with more contrast is simply more interesting than a flat picture. Expensive lighting equipment isn't necessary. The smart use of available light like daylight is one trick to get this done. Any set of strong lamps can be suitable as long as they match in colour; a mix of differently coloured light sources is not recommended. Setting white balance correctly during production is very important. Trying to match recorded material with different white balances in post production is very tedious.

3.2. Treatment and Script

Words before picture! This order produces a successful lecture video meaning that the script becomes the most important vulnerable and agile part in the “making-of” production pipeline. Once the text has been recorded, changes that have to be done in the post production are time consuming, often of minor quality and a hassle throughout the entire workflow, leaving students motivation behind. Our advice is to thoughtfully take care of the development of the script and only accept it if all criteria of the lecture videos content is met.

It helps the student group to consider the script as means to deliver a podcast where the overall sense of sentences has to be clear and precise enough to be understood without explaining pictures. Language has to be clear, sentences rather short than convoluted, easy words and extra explanations for technical terms are highly advised. The lecture screenplay is proof read carefully by lecturers, because each word has its weigh and needs to be fully correct. Abbreviations should be avoided because an external voice-over artist not emerging from the student group only reads what is written.

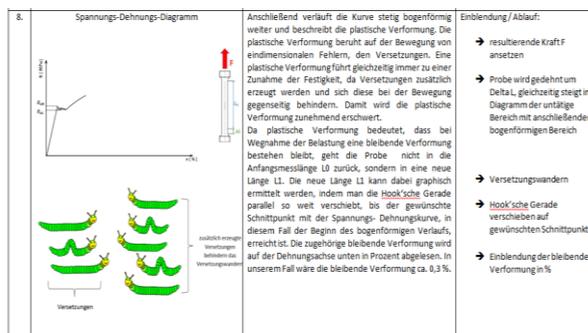


Fig. 3. Typical script, here: stress-strain-diagram

The script itself contains the content, the setting of the scene, embedded texts and drafts of the illustrations as well as the time of the scene (Figure 3). This helps the students to focus on the text, but already visualize roughly how they want to produce a scene. Documenting the time, actually measuring the time while reading the text out loud, helps to stay focused on the 5 minute limit and the most important contents.

3.3. Voice-over

The text and its content sets the frame and the pace of the film. Therefore the use of plain, concise language while not speaking too fast or too slowly is highly recommended. Having a great script read by a boring voice would be a waste. This doesn't mean you have to hire a

professional voice actor. The genuineness of an amateur who is all over into the topic can radiate a lot of sympathy. Sympathy is one important key to the audiences attention and therefore to the audiences willingness to learn about the content. When redording voice overs in the studio there are some things to keep in mind:

1. The text printed out for a voice-over recording should use font size (16 pt) to guarantees better readability. Pauses should be indicated by blanks.
2. For the recording understandability - not the perfection - is most important. We used a semi-professional plug & play USB large diaphragm microphone Rode NT-USB.
3. When choosing a room for recording, most important features are as little reverb and ambient noise as possible. A rather small room with carpet and curtains, upholstered furniture and maybe some soft material, like foam material on the wall as sound absorbers will do the trick.

3.4. Production – The film shoot

Depending on how streamlined pre-production is and how efficient post-production is, the shoot itself seldomly eats more than 40 % of the overall time budget. However, anything that hasn't been planned, wasn't paid attention to, misjudged, forgot in pre-production will slow down, delay the production even to a degree where it comes to a standstill. Having to do a pickup shot can be tedious, and a re-shoot is in most cases awfully painful, sometimes even impossible. Therefore it's highly important to not only stick to the script 100% and execute it well, but to double check, wether something is possibly missing in the script. Always do alternate takes, just to have a choice later in post production.

Having a dedicated studio gives you more freedom and planning security and therefore makes production processes smoother. We had to set up the scene for every film series separately on different locations. This is not ideal, but doable. We did film shoots in sprints in rather short time frames. It's just a lot more efficient, especially if you produce more than one film in one go. Once the scene setup has been done, we recommend to leave it as is, until the shoot is done. Setup and deconstruction during a production is counterproductive.

4. Examples of lecture film techniques and evaluation

Up to now there are 43 lecture films ready available on Moodle HTW and YouTube for students enrolled in material science classes. These comprise of different film formats, such as: power point, paper cutout animation, comic, swipe-technique or animation (Figure 4):

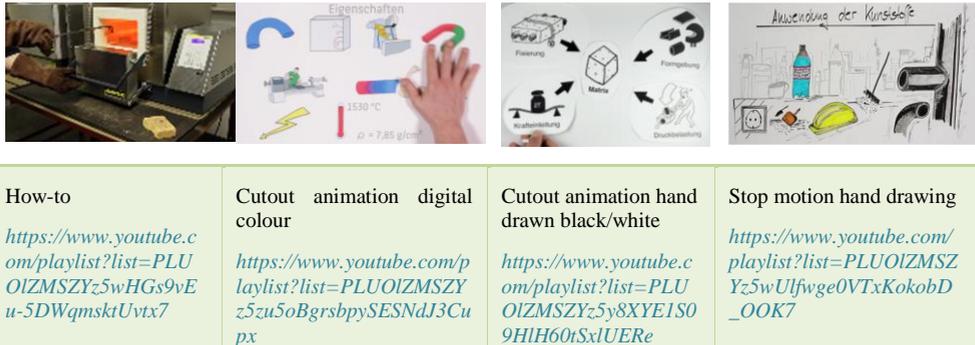


Fig. 4. Film formats realized at HTW Berlin according to the peer-to-peer approach.

Based on our experience Table 1 summarizes the needs and the chance of success in the procedure on deciding on the film format:

Table 1: film formats realized at HTW Berlin according to the peer-to-peer approach.

Film format	Set up and production	Recommended content	Definitely requires			
			Illustr. Phot.	Speak.	Cut.	Dir.
Cutout animation	Easy to medium	all	X	X	X	X
Adding motion pictures	medium	Samples and examples		X	X	X
Fast motion real time drawing,	medium	all	X	X	X	X
How to video Live-action movie	easy	Laboratory, manuals		X	X	X
Screenplay	advanced	overview	(X)	X	X	X
Handdrawing Stop-motion technique	advanced	All, detailed scientific information	X	X	X	X
Power-point animation	easy	All, detailed scientific information	(X)	X	X	X
Video scribe using hand drawn sketches	Easy to medium	all	(X)	X	X	X

In general the choice of a lecture film format has to suit 3 boundary conditions:

1. Learning outcome of the lecture (e.g. overview, introduction or precise instruction)
2. Technical support and surrounding (e.g.: professional illustrator or artist for sketches, equipment, guidance by professional director)
3. Motivation of the student group to decide on a technique (if they are generally happy with one technique the lecture film will be a success no matter of the technique)

Students state that the film format has nearly no influence on the “joy of use” and on their learning progress (Figure 5).

Lecture videos were preferred by a factor of three compared to books or the face-to-face, because they may be used time and place independent and the explanation is given directly. 33% percent of the students state that lecture videos give an extra degree of freedom in their learning methods. In general the combination of interactive online lectures and quizzes with the videos provides a highly appreciated learning environment: Pfennig (2018-2).

Students working on the lecture films found themselves deeply involved gaining substantial knowledge in material science as well as in film making techniques. Both are skills never being part of the official curriculum, but contributing to high learning outcome and self attentiveness. The students found themselves capable of analyzing and applying the suitable parameters to give profound information on mechanical properties.

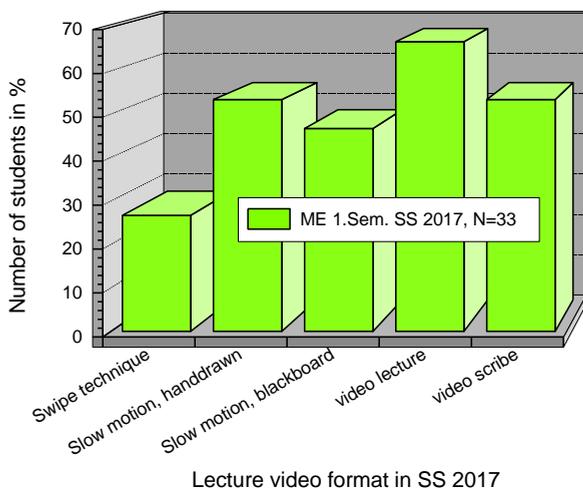


Fig. 5. Preference of video format in first year material science. (multiple choices were possible).

5. Conclusion

Lecture videos can be successfully produced by guided student project groups preparing necessary self studying teaching material for “inverted classroom” lecture scenarios in an interdisciplinary concept of teaching materials science (peer-to-peer approach). Different film formats such as: power point, comic, cutout animation of avaragely 5 minutes of high quality video is produced per student. These videos need to be of a certain standard to gain students` interest and become a fully accepted learning material. Therefore lecture screenplay was proof read carefully by lecturers, because each word has its weigh and needs to be fully correct. The overall sense of sentences has to be clear and precise enough to be understood without pictures. Filming can be done with any kind of camera of sufficient quality. Suggestions for lighting, pre-/ and postproduction equipment are given with respect to a tight budget, always keeping in mind the teaching outcome, not the perfection of film production. The following suggestions help to produce successful lecture videos:

1. Peer-to-peer approach: involve students in the film making and benefit from their learning experience
2. 5 min length the most
3. KISS: keep it simple: applying to equipment, language and pre/post production
4. Screencast/treatment is perferct before starting to illustrate
5. Always illustrate the meaning of the sentence not the keyword (example: bone has high strength: not the bone, high strength is the meaning).

References

- Al-Jandan, B.A., Farooq, I. and Khan, S.Q., Students’ perspectives on the relevance of internet-based educational videos in dental education, *Journal of Taibah University Medical Sciences* (2015) 10(3), 288-292
- Ashby, M., Shercliff, H., Cebon, D.: *Materials Engineering, Science, Processing and Design*, 2013: ISBN-13: 978-0080994345 (3rd edition)
- Berrett, D.: How ‘flipping’ the classroom can improve the traditional lecture, *The Cronicle of Higher Education* (2012)
- Gulley, O.D., Jackson, A.L., A case study on using instructor-recorded videos in an upper level economics course, *International Review of Economics Education* 23 (2016) 28–33
- Havergal C., Videoing lectures ‘has no impact’ on attendance, says study, 2015, <https://www.timeshighereducation.com/news/videoing-lectures-has-no-impact-attendance-says-study>
- Kay, R., Kletskin, I., Evaluating the use of problem-based video podcasts to teach mathematics in higher education, *Computers & Education* 59 (2012) 619–627

- Kon, H., Botelho, M.G., Bridges, S., Chiu Man Leung, K., The impact of complete denture making instructional videos on self-directed learning of clinical skills, *Journal of prosthodontic research* 59 (2015) 144–151
- Pfennig, A., Inverting the Classroom in an Introductory Material Science Course, *Procedia - Social and Behavioral Sciences* 228 (2016) 32-38
- Pfennig, A. Flipping the classroom and turning the grades – a solution to teach phase diagrams to engineering students, *JFLET*, Vol 3, No 1 (2018), 18-34
- Pfennig, A., Improvement of learning outcome in material science through inverted classroom techniques and alternative course assessment, *JFLET Journal of Foreign Language Education and Technology*, Vol 3, No 1 (2018), 148-162
- Thai, N.T.T., De Wever, B., Valcke, M., The impact of a flipped classroom design on learning performance in higher education: Looking for the best “blend” of lectures and guiding questions with feedback, *Computers & Education* 107 (2017) 113-126

Autonomous Learners' Metacognitive Awareness Development with the Help of Trello Board

Kalizhanova, Anna^a; Ibrayeva, Bayan^b and Ishmuratova, Margarita^c

^aForeign Languages and Intercultural Communication Department, Bolashak Academy, Kazakhstan, ^bForeign Languages and Intercultural Communication Department, Bolashak Academy, Kazakhstan, ^cBotany Department, Karaganda State University named after academician Ye.A. Buketov, Kazakhstan.

Abstract

This article focuses on the necessity and inevitability of organization of ESL students' self-work with the help of free online platform Trello Board. The authors point out that the use of such information and communication technology as Trello Board increases learners' metacognitive awareness of self-regulation and self-assessment in ESL. The authors also indicate the facilitation of active feedback between ESL learners and their instructor as well as peer-review. The authors share their experience of the use of Trello Board in the educational ecosystem of Bolashak Academy in Kazakhstan. According to the authors, Trello Board provides a broad range of features to control students, maintain their level of motivation, and develop their collaboration in various project works or academic writing tasks.

Keywords: *Trello Board, metacognitive awareness, self-regulation, self-assessment, autonomy, feedback.*

1. Introduction

The modern educational process involves the teacher-student interaction, peer-review, and students' autonomy. The context of contemporary education makes students actively participate in the educational process, get involved in all types of assessment, determine the specifics of learning, based on their needs and interests. University rating system considers higher education ESL students' self-work as an essential part of the entire educational process and, therefore, allocates at least 50% of the total amount of all academic hours to it.

In the development of students' self-work, teachers are looking for new innovative ways by the attraction of information and communication technologies to develop learners' metacognition for maintaining motivation, foster reflective thinking, and self-regulation. However, any teacher should thoroughly pick the suitable technology; otherwise, the wrong choice would cause such inconveniences as a lack of time to adopt a chosen technology to working autonomously as well as constantly changing requirements. Furthermore, not all technologies may become immediately introduced and should be understood not only as a means to surprise or an extraordinary product creation but also as a way of efficient performance control and teacher-student or peer communication.

2. Literature Review

Foreign-language students' self-work involves the research and design of works that should be carried out, working out the material that should be covered, or picking the additional material on the passed topic to elaborate on them. However, without the direct participation of the teacher, supervising the process of independent training of students, self-work is not efficient because even the most diligent students need control, recommendations, right planning, estimation of the quality of the found sources and systematization of all information. Also, the homework should be timely checked and commented to help students be on track. Otherwise, students' motivation will decrease as well as little self-regulation and critical thinking skills will be developed.

Students' self-work involves setting goals and selecting relevant sources through the internet as well as assisting in students' self-reflection and providing feedback on peers' works. It, consequently, leads to analysis and evaluation related to Bloom's Taxonomy proposed by Benjamin Bloom in 1956 of the 20th century as the classifier of six levels for the structuring of educational purposes while designing lessons and scoring systems (Bloom, 1956). Having taken Bloom's findings as a basis, two researchers Apaydin and Hossary (2017) linked "metacognitive instructional techniques" with "students' self-awareness and performance, which has immediate practical implication for student learning and success." So, learners' metacognition cannot be developed without the help of teachers'

instructions, and as Wei (2008) claims, learners' autonomy development depends on teacher's role not only in teaching language but also in cultivating students' metacognitive awareness. Wei (2008) also adds that learner's autonomy is not shaped in the classroom but when working independently with the help of skilled teachers' support and guidance.

Meanwhile, Pombriant (2013) argues that students, who learn subjects without teachers, soon start suffering from the lack of motivation because nobody can inspire or encourage. In other words, nothing can substitute personal presence of a teacher and his or her contribution to the educational process (Pombriant, 2013). Additionally, some analysts ensure that learning exciting things assisted by teachers' presence and timely measures directed to explanation and clarification does not require any gaming elements, whereas boring or difficult subjects will hardly ever be fulfilled even with various badges or other appraisal forms (Stamford, 2012). So, students' metacognition can hardly be developed without the assistance of more experienced and qualified specialist. At the same time, according to Ajideh (2009), autonomous learning and metacognitive awareness can be interconnected and suggested as essentials for teaching and learn foreign languages only if the teaching approach meets learners' assumptions and expectations.

Unfortunately, for the last several years, researchers have indicated the severe crisis in education caused by the rise of interest to different games. According to infographics of Knewton Project, annually, 1,200,000 students drop off colleges and universities because of the lack of interest in the educational process and chosen subject. At the same time, each human spends three billion hours a week for playing computer games. Moreover, five million people allocate forty-five hours a week to engage in online arcades and strategies. At the same time, students suffer from their unwillingness to spend time at the computers for their learning purposes but for playing games or chatting in social nets. Hence, teachers should find an efficient instrument to help overcome the crisis in education connected with the unwillingness of students to be taught due to the extinction of interest and desire but using their passion to the elements of gamification such as colorful marks, deadline set, and visualization of the process of implementation of self-work tasks.

3. Hypothesis

In this regard, favorite among testing engineers and developers web technology Trello Board was chosen as a way to facilitate the assigned for students' self-work fulfillment of tasks and effective control in the educational space of the university. Copyright, as of October 17, 2016, fixed the form of students' self-work organization on Trello Board before used for project management (Kalizhanova, A.N. et al., 2016).

Such Trello Board's features as fragmented information and access to the new content only after the consolidation of the already learned; an optical reflection of students' progress and synthesis of new skills, were expected to strengthen learners' interest and motivation. They should also make learners self-evaluate their abilities for further learning and allocate time to complete assigned tasks (Figuroa, 2015). Hence, Trello Board seemed to be entirely coincided with students' needs and allowed creating various courses in line with the annual curricula (see Figure 1).



Figure 1. This figure demonstrates one of the classes designed by the teachers

The elements of gamification were expected to help students cover the most prominent part of target material during their self-study – more than a half of a total amount of all academic hours in the first semester.

For the students from other districts or regions, Trello Board was expected to solve the issue of management and control of homework assignments that had to be fixed efficiently by English teachers and university authorities; otherwise, the allocating for self-study hours would have been wasted, and students would have taken that as a given.

4. Objectives and Methods

The following research took place in the Private Institution Bolashak Academy and Karaganda State University named after academician E.A. Buketov, which three teachers had been first among local educators, who decided to introduce the Trello Board in the educational ecosystem for full-day and part-day students (Kalizhanova, A.N. et al. 2016). The study aimed for thorough examining of Trello Board effectiveness for ESL students' metacognitive awareness of autonomy development. The total number of ESL learners involved in the study equaled 18 four-year grade graduates, divided into two groups of 9

persons each – the control and the experimental respectively. The control group consisted of ESL learners, who checked their homework assignments at the beginning of each class and get the tasks from the instructor by email. The students of the experimental group were invited to join ESP C1 (Critical Thinking Reading and Writing), where all self-work tasks had already been organized in weeks with set deadlines and colorful marks for each week designation.

5. The Flow of the Experiment

Trello Board attracted students of the experimental group to join the particular course, designed by their teachers for self-work realization. Once joined, students could create new cards independently, comment on each other's tasks, prolong deadlines, and receive comments from teachers even staying at home. Invitations for students to join the board were sent by e-mail, after which each student, following the link, had to register on the site www.trello.com to become a participant of the course, developed by the teacher. Trello board allowed monitoring all spectrum of students' work, either in class with the teachers or at home independently, without any additional financial contribution from all parts involved in the educational process. The system of creating as many cards with various topics as needed made the process of studying productive and time-friendly because all necessary for covering themes could be arranged on one board with scheduled dates for checkups and final tests.

Trello Board elements of gamification were implemented through creating checklists, colorful marks, and deadlines where the color of the card changed as students approached the scheduled date of submitting the assignment (see Figure 2).

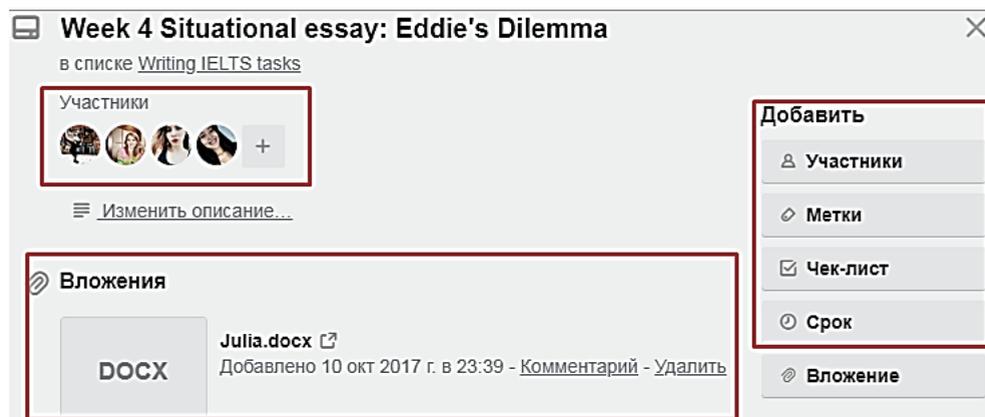


Figure 2. This figure demonstrates the elements of gamification implementation of the educational process on Trello board.

Teachers could follow their students' ongoing and summative progress, provide feedback and comments, and organize peer-review interaction and cooperation where any board participant or a teacher could be easily reached any moment despite the physical location. The mentioned above Trello Board features made the process of learning more intensive, motivating, and engaging that allowed the students to move further in their self-learning. Trello board assisted in building students' autonomy by providing a space for teachers' creativity by assigned for self-study material organization at one place. The teachers decided to focus on speaking and listening ESL activities; therefore, they organized grammar practice as a homeschooling system, creating cards with grammar topics for self-practice (see Figure 3).

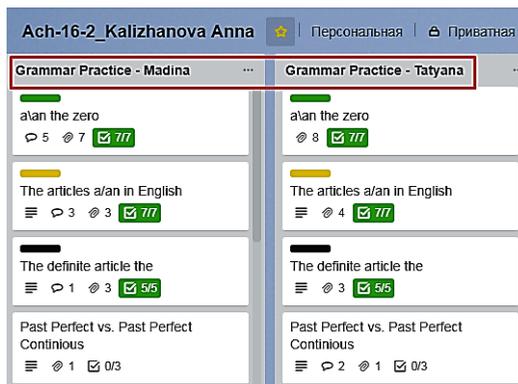


Figure 3. The figure demonstrates the organization of grammar practice for students.

Trello Board provided not only a metacognitive awareness of learners' autonomy but also such higher order thinking skills or HOTS as analysis, evaluation, and synthesis (Bloom, 1956). The students managed to allocate their time to one or another task accomplishment and further self-work planning by analyzing strengths and weaknesses. Moreover, peer-review and mutual collaboration developed the learners' capability of evaluating peers that, in turn, improved the ability to synthesize (Bloom, 1956). For example, the task to work on a particular listening topic, according to Bloom's Taxonomy, was for lower thinking skills' production (Bloom, 1956). However, teachers asked students to record their voices while shadowing or repeating after the native speaker, submit the tracks to the Trello board, and evaluate each other's recordings for accent, fluency, or accuracy; therefore, the activity turned into HOTS oriented.

6. Results and Criticism of Trello Board

Interestingly, almost all students of the experimental group rejected Trello Board as a comfortable working instrument, claiming that they would better to work as the control

group students. The students of the experimental group complained about the necessity to enter the Trello Board website required the password that had often been forgotten. Interestingly, the generation born with mobile phones in their hands and spent all their time on Instagram and other social nets found challenging to work on the web-platform. At the same time, the students of the control group asked teachers to assign self-work tasks on Trello Board too, indicating an excellent visual effect from the availability of all material at one place. Nevertheless, when, in three months, the groups traded areas, the situation repeated: the students of former experimental group regretted leaving Trello Board, whereas the ones of previous control group started complaining about difficulties with password memorization and necessity to enter the Trello Board website.

Although the teachers considered Trello Board as excellent for facilitating the educational process and making it more entertaining and autonomous, they did not expect that such a distant approach requires even more control from their side because students tended to cheat having been tempted by things provided by Trello. For instance, learners could mark checklists as done without spending time on the task; therefore, the teachers had to return some traditional forms of control such as tests or discussions in the classroom. This fact proved that visual elements could easily tempt both students and teachers to start using them everywhere without any point (Zaino, 2013).

7. Discussion

Nevertheless, the teachers of Bolashak Academy' example with Trello Board and its exciting features proved the possibility to succeed in achieving high educational results if it is used in moderation under adequate control from the side of educational authorities. Thanks to Trello Board, the teachers could remove computers from English classes devoting all class time to discussing and debating various topics while working with the experimental group. At the same time, the use of Trello Board as a connection between the learners and the teachers improved both personal and professional mutual attitude and relationships: the students highly accepted the teachers' credibility due to latter's dedication to the learners' self-work. Moreover, the teachers' hard work and 24/7 communication with the students made the last more responsible for their self-work than before the experiment. So, Trello Board was recognized as a fantastic tool for metacognition development because it made possible to regulate students' self-work more efficiently due to the interconnection of interactive approach and such traditional forms as a teacher's presence and teacher-student collaboration.

The educators' expertise was spread among different departments of their university to provide students with the more qualitative organization of self-practice with or without teachers' presence in the classroom. Moreover, the same teachers organized the flow of the

project Creation of Trilingual Electronic Dictionary of Biological Terms with Linguacultural Components within the framework of grant funding of the Kazakhstani Department of Education on Trello Board and helped all Project participants join for their active mutual collaboration for the next three years.

References

- Ajideh, P. (2009). *Autonomous Learning and Metacognitive Strategies Essentials in ESP Class. English Language Teaching*, 2(1). doi:10.5539/elt.v2n1p162.
- Apaydin, M., Hossary, M. (2017). "Achieving Metacognition through Cognitive Strategy Instruction," *International Journal of Educational Management*, Vol. 31 Issue: 6, pp.696-717, <https://doi.org/10.1108/IJEM-05-2016-0130>
- Bloom, B. S. (1956). *Taxonomy of Educational Objectives*. New York: David McKay.
- Figuroa, J. (2015). *Using Gamification to Enhance Second Language Learning*. Retrieved 2017, from <http://greav.ub.edu/der/>.
- Kalzhanova, A.N. et.al. (2016). *Avtorskoe Proizvedenie*. Retrieved 2017, from <http://avtor-web.com/new/index.php/elektronnyj-depozitarij/2170-programma-evm-21?format=html>.
- Pombriant, Denis. (2013). *The Pros and Cons of Gamification*. Retrieved 2017, from <http://www.destinationcrm.com/Articles/Columns-Departments/Reality-Check/The-Pros-and-Cons-of-Gamification-86626.aspx>.
- Stamford, Conn. (2012). *Gamification Trends and Strategies to Help Prepare for the Future*. Retrieved 2017, from <http://www.gartner.com/newsroom/id/2251015>.
- Wei, C. (2008). Developing Learner Autonomy through Metacognitive Awareness Training in ELT (Master's thesis, Guangdong Pharmaceutical University). *CALEA Journal (Bimonthly)*, 31(4), 110-120.
- Zaino, J. (2013). *The Pros and Cons of Gamification in the Classroom*. Retrieved 2017, from <http://www.edtechmagazine.com/higher/article/2013/07/pros-and-cons-gamification-classroom>.
- Zichermann, G. (2012). *Kids, Brains, and Games: a Ted Talk*. Retrieved 2017, from <http://www.gamification.co/2011/11/21/kids-brains-and-games-a-ted-talk/>.

Supporting lecturers to demystify learning in a science faculty

Louw, Ina

Department for Education Innovation, University of Pretoria, South Africa.

Abstract

Pedagogical competence is not always part of the skills set of science educators at research intensive universities. Thus, the Academic Developer (AD) in the Faculty of Natural and Agricultural Sciences (NAS) at the University of Pretoria makes use of the Pedagogical Competence Model in order to help develop lecturers' pedagogical competence. The overall aim of the study is to support lecturers to have a clear focus on student learning; assist them to development their pedagogical skills over time; and to adopt a scholarly approach to teaching and learning. Peer reviews are compulsory for probation candidates (newly appointed) as well as staff applying for promotion. In 2017 a total of 58 lecturers were reviewed by the AD, and 26 of these lecturers completed an online questionnaire that was intended to establish the influence the AD's reviews had on their teaching practices. Subsequently interventions were planned aligned to the perceived needs for development. The project is still in progress, but results from the 538 members who already received training during 2018 indicate improved understanding of student learning and great appreciation for the support.

Keywords: *Science education, pedagogical competence, continuous professional development, student learning.*

1. Background

The University of Pretoria (UP), a research intensive university in South Africa, has adopted a hybrid teaching approach and lecturers are expected to augment face-to-face lectures with online material. However, not many lecturers have knowledge about learning styles, learning theories, questioning- or engagement techniques. Thus, the Academic Developer (AD) in the Faculty of Natural and Agricultural Sciences (NAS) at the University of Pretoria conducts training workshops and presents lectures in order to help develop lecturers' pedagogical competence.

At UP every academic staff member needs to submit a teaching portfolio when they reach the end of their probation period or when they apply for promotion. A peer review is part of that portfolio and it involves a class visit from the AD on invitation from the lecturer. The AD does an observation based on an observation sheet with pre-determined aspects, such as how: the mood is set during the introduction, connections are made to prior knowledge and the big picture, students are motivated, students are engaged, and how learning is monitored, and finally how the conclusion of the lecture is conducted. The AD then compiles a written report and shares it with the lecturer. Suggestions for improvements are discussed and follow-up visits are arranged where needed.

The AD also conducts training sessions to guide the compilation of a teaching portfolio and that offers an ideal opportunity to share educational principles such as learning styles, learning theories and classroom management skills in a stealthy way. The combination of practical advice from the peer reviews and theoretical advice during the writing of their teaching portfolios allows the AD to tailor her training based on actual needs (see Table 1). The AD is aware of the fact that teaching practice can be hard to change (Olsson, 2015), but through personal involvement and enthusiasm from her part, as well as making it practical the possibility is increased that conceptual change strategies can "become part of teachers' normal routines" (Duit & Treagust, 2003: 684).

Although the Academic Developer (AD) supports lecturers in their teaching capacity, the extreme pressure to perform in their research outputs, often causes lecturers to not recognise the need, or make the time to receive assistance. Therefore, in order to ensure that the lecturers participate, the Deputy Dean for Teaching and Learning in the Faculty of Natural and Agricultural Sciences suggested continuous professional development aiming at the attendance of sessions on teaching skills to be included as one of the key performance indicators for lecturing staff. The Academic Developer has suggested a list of topics to train and support lecturers individually and in departmental contexts. This list is based on her observations during peer reviews of teaching that were conducted during 2017 (n=58).

2. Theoretical Approach

The theoretical framework for the project is based the Pedagogical Competence Model (Olsson & Roxå, 2013), but adapted to the local context, see Figure 1. The **theory** component is the starting point for this project, because lecturers need some theoretical foundation. In the **planning** step, faculty members plan the implementation of the new knowledge in their classes, with the help of the AD. In the **practice** step they implement an intervention or changed strategy, supported by the AD and finally in the **observation** step they collect evidence about their students' learning and perceptions. They can collect data with questionnaires, focus group interviews and observations to interpret with the student grades.

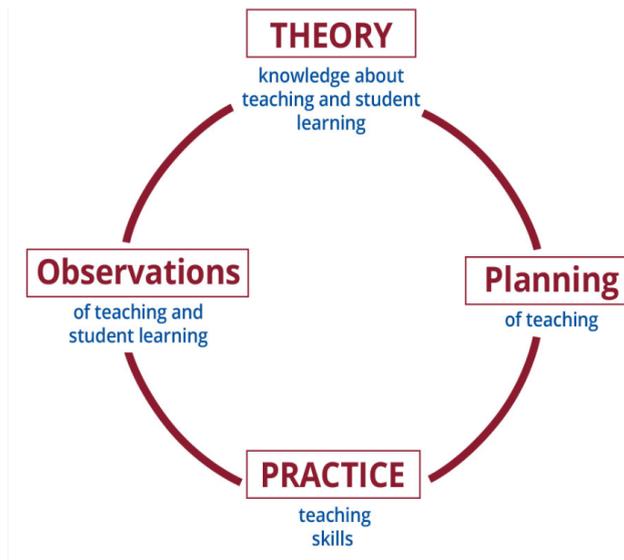


Figure 1. Pedagogical Competence Model. Adapted from Olsson and Roxå (2013).

3. Methodological Approach

3.1. Phase 1: Conducting Peer Reviews

The first set of data that informed the establishment of the project was collected from 58 peer reviews done in the faculty during 2017. Faculty members invited the AD to attend a lecture and the AD observed the lecture according to pre-set criteria that were known to the staff member.

3.2. Phase 2: *Questionnaire to participants of peer reviews*

When 45 peer reviews were conducted, a questionnaire was sent out by the Deputy Dean to these colleagues to establish their perceptions about the experience. The instrument was in Qualtrics (online survey instrument) and included structured and open questions. We received 26 responses back (58%).

3.2. Phase 3: *The Training Interventions*

The AD planned the training sessions to address the needs as identified during the peer reviews. The book by Ambrose, Bridges, DiPietro, Lovett & Norman (2010) was used to facilitate sessions of “how learning works”, and the work by Dweck (2006) was used to explain the importance of a growth mindset. The AD started training sessions in February 2018 (see Table 1). The following topics were presented, in different formats: 1) learning theories: in printed format via the Learning Management System (LMS) to supply theoretical knowledge; 2) “The art and science of presenting a lecture”: presentation format, 3) writing good learning outcomes: as a workshop. Faculty members were required to sign up for the session(s) they wanted to attend, but can also request a specific session and format, such as a workshop to revise study guides for a particular program. The teaching assistants were also identified as a group that needs training and they are included in this project.

Table 1. Table 1. Conducted training session between February and April 2018.

Session	Targeted audience	Number of attendees	Data collection
Soft skills in tutorials and practical sessions	Student assistants & demonstrators	246 (7 departmental sessions)	Feedback form
Compiling a teaching portfolio	Open to all	48 (4 sessions)	Feedback form
Introduction to the CPD menu at departmental meetings	Departments that invited the AD	134 (6 departmental sessions)	Feedback form
The art and science of presenting a lecture for anyone	Open to all	36 (2 sessions)	Minute papers
How learning works (workshop)	Newly appointed staff	15 (2 sessions)	Feedback form
How learning works (lectures)	Open to all	42 (3 sessions)	Minute papers
Using the growth mindset for learning	Open to all	17 (1 session)	Minute papers
Total:		538	

Source: Constructed by author (2018).

The project is ongoing and new sessions will be added as the AD identified relevant topics or as requests are made by departments.

4. Results

The project has multiple phases and is a work in progress, but will now be discussed in terms of the phases that has been completed.

4.1. Phase 1 Results

Thematic analysis of the reports written by the AD revealed the need for development in the following areas listed in Table 2:

Table 2. Areas identified for training

Area	Perceived problem
Structure of the lecture	No introduction or conclusion
Learning outcomes	Not shared with students at all and poorly formulated
Activating prior knowledge	Lack of prior knowledge not realised or managed
Themes	Not identifying and highlighting the big ideas in the module
Connections	Not assisting students to form connections
Teaching style	No clear indication that different learning styles are accommodated
Monitor learning	No attempt to monitor learning by including some formative assessment activities
Engagement	Lack of student engagement
Class climate	No attempt to create a positive class room climate/safe learning space
Relevance	Work is not made relevant. No relevant examples are used.
Student questions	Not handled appropriately

Source: Constructed by author (2018)

The themes were recognized as basic pedagogical knowledge that was not in action in some lectures and an appropriate intervention was planned. It is worth mentioning that excellent examples of student engagement, use of clickers to monitor learning, positive class climate and group work were observed.

4.2. Phase 2 Results

The results from the questionnaire conducted with reviewed colleagues in Phase 2 were positive and encouraging. One participant said: *“Meaningful time to reflect on my teaching practices with someone who understands student learning, which is something most lecturers have no clue about themselves”*. The results also indicated that there was trust placed in the AD as shown by the following quotation made by another colleague: *“I realise that the AD is busy. Follow-up sessions (even uninvited) would be appreciated and constant feedback on how to improve for the benefit of the students. Suggesting creative*

ideas on how to present 'boring' sections of the work to not only inspire the lecturer but to motivate the lectures to inspire the students." The comments in the survey assured the AD that the intervention is needed and welcomed.

4.2. Phase 3 Results

The results from Phase 3 were collected during each training event in the format indicated in Table 1. The teaching assistants (n=246) completed a Likert scale (4-way) question about the six different topics discussed in the training and on average 91.6% marked the "valuable" or "absolutely necessary" options. The departmental introduction feedback had a 4-way scale as well (from strongly agree to strongly disagree) and 93% chose the two agree-options indicating the training menu has a "variety of sessions" to choose from, similarly 92% voted positively that there are "more than one session they would like to attend". The fact that 75% indicated positively that "there are topics that they have never heard about" indicated the need for CPD.

The minute papers required the attendees to provide a response to the following question: "What have you learned today that you will implement in your lectures?" The participants mentioned that they would use minute papers to get their students' voices more regularly; they will utilize muddiest point papers to determine misconceptions; make an effort to connect topics to the big picture; and actively ensure that students' prior knowledge is appropriate and correct, instead of assuming it is relevant. Some mentioned that they will negotiate ground rules for their groups in an effort to create a safe classroom environment. They also plan to motivate students more deliberately, by using some examples from the training sessions. Many realised for the first time how important timely feedback is for learning. Some of the quotes are shared in Table 3.

Table 3. Quotes from the training sessions

Session	Quote
Student assistants	<i>The session was amazing. It was a fresh perspective of the importance of the tutor and the well-being of the student.</i>
Workshop for newly appointed faculty members	<i>Enthusiastic, lively, engaging and knowledgeable. She knew the content and transferred her knowledge very well.</i>
Session on “How learning works”	<i>Really organized & showing teaching as a science and gives very useful and practical tips about how to conduct learning.</i>
Session on the growth mindset	<i>You gave me more ideas to improve myself first! Thank you.</i>
Session on the art and science of presenting	<i>I learned the importance of audience engagement and that my lecture should build suspense and be relevant to students.</i>

Source: Constructed by author (2018)

5. Conclusion

The potential significance of the work is that lecturers are becoming aware of the fact that their students are millennials (Nevid, 2011) with a short attention span, (Furner, Yahya & Duffy, 2005) and a need for immediate results (Spary, 2015). The importance of prior knowledge was recognized as important in the diverse student population (Ambrose et. al. 2010). The importance of timely feedback in the forming of neural connections were understood (Jensen, 2005:53) and I created an awareness about the “growth mindset” as explained by Dweck (2006). Lecturers need to understand what the growth mindset entails and support their students in creating growth mindsets and to develop grit (Duckworth & Gross, 2014). Lecturers will hopefully experience noticeable positive change in their pedagogical competence and job satisfaction. This in turn should impact positively on student engagement and learning, perhaps achieve better class attendance and improved retention.

References

- Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C., & Norman, M. K. (2010). *How learning works: 7 research-based principles for smart teaching*. San Francisco: Jossey-Bass.
- Duckworth, A., & Gross, J. J. (2014). Self-control and grit: Related but separable determinants of success. *Current Directions in Psychological Science*, 23(5), 319-325.
- Duit, R., & Treagust, D. F. (2003). Conceptual change: A powerful framework for improving science teaching and learning. *International Journal of Science Education*, 25(6), 671-688.
- Dweck, C. S. (2006). *The new psychology of success: How we can learn to fulfil our potential*. New York: Ballantine Books
- Furner, J. M., Yahya, N., & Duffy M. L. (2005). Teach mathematics: Strategies to reach all students. *Intervention in school and clinic*, 41(1), 16-23.
- Jensen, E. 2005. *Teaching with the brain in mind*, 2nd ed. Virginia: Association for Supervision and Curriculum Development.
- Langa, M.(Ed.). (2017). #Hashtag: An analysis of the #FeesMustFall Movement at South African universities. Retrieved November 10, 2017 from <https://www.csvr.org.za/pdf/An-analysis-of-the-FeesMustFall-Movement-at-South-African-universities.pdf>
- Nevid, J. (2011). Teaching the millennials. Retrieved November 8, 2017 from <https://www.psychologicalscience.org/observer/teaching-the-millennials>
- Olsson, T. (2015). A Model Promoting the Scholarship of Teaching and Learning in Higher Education. Quality Enhancement Project: Workshop, Durban, 1-2 June.
- Olsson, T., & Roxå, T. (2013). Assessing and rewarding excellent academic teachers for the benefit of an organization. *European Journal of Higher Education*, 3(1), 40-61.
- Schön, D. A. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.
- Spary, S. (2015). Millennials' demand for instant gratification is shaping the future of retail. Retrieved October 8, 2017 from <https://www.campaignlive.co.uk/article/millennials-demand-instant-gratification-shaping-future-retail/1331511>
- Tsai, C-C. (2004). Conceptions of learning science among high school students in Taiwan: a phenomenographic analysis. *International Journal of Science Education*, 26(14), 1733-1750.
- Zuber-Skerrit, O. 2015. Action research. In O. Zuber-Skerritt, M. Fletcher, & J. Kearney, *Professional learning in higher education and communities: Towards a new vision for action research* (pp 102-133). London: Palgrave.

Participation of the students of Riga Technical University in the Olympiad in mathematics

Cernajeva, Sarmite and Volodko, Inta

Department of Engineering Mathematics, Riga Technical University, Latvia.

Abstract

There is much discussion recent years about teaching mathematics at school and universities. It is talked about how to interest pupils and students to turn to studying mathematics more. One of the ways to attract the best students to additional studies of mathematics is to invite them to participate in the Olympiads in mathematics. Student Parliament of Riga Technical University in cooperation with the Department of Engineering Mathematics organized the university Olympiad in mathematics for 6 years. There is an international Olympiad of mathematics in Latvia already for 6 years, which is organized by the Department of Mathematics of Latvia University of Agriculture. Students from Baltic universities participate in these Olympiads, and within their scope, students not only compete individually, but also discuss among themselves the content of mathematics and teaching methodology in their universities, evaluate it and express their suggestions for the improvements. Since 2012, students from Riga Technical University also participate in these Olympiads and get award-winning places. Such Olympiads promote interest about mathematics among young people, develops cooperation skills between like-minded people, as well as, give an opportunity for pedagogues to listen to the opinion of the best students about teaching methodology of mathematics and to improve it.

Keywords: *Olympiad of mathematics for students, promotion of interest in mathematics, improvement of teaching methodology of mathematics.*

1. Introduction

There is much discussion recent years about teaching mathematics both at school, and universities. Up until now, mathematics in universities was viewed as a tool for a successful acquisition of other subjects, but now, a question about the use of the acquired mathematical knowledge in the professional actions of the specialists is becoming topical. Answers to these questions are being searched for: what is it that needs to be taught, and how it should be done so that the acquired knowledge is useful for the professional work. To attract students to the studies of mathematics, Riga Technical University (RTU) had Olympiads in mathematics for 6 years. Latvia University of Agriculture, to promote the attractiveness to the studies of mathematics among young people, for the last six years also has an international Olympiad for students, which is organized by the Department of Mathematics. This Olympiad is one of the activities, which follows from an international cooperation agreement in the sciences that was signed between deans of the University of Siauliai, Faculty of Mathematics and Information Technologies and Latvia University of Agriculture, Faculty of Information Technologies on 14th December, 2012.

2. Short overview about the history of Olympiads in mathematics in Latvia

The beginnings of the Olympiads in mathematics for secondary schools can be searched in academic year 1945/ 1946, when the Department of Mathematics of the State University of Latvia (now University of Latvia) organized the first Olympiad. This type of mathematical contest for pupils happens regularly since the academic year 1949/1950, but the numbering of the Olympiads began with the academic year 1950/1951, when the castle of Riga Pioneers (now castle of Riga Pupils) took part in its organization (<http://nms.lu.lv/olimpiades/olimpiazu-rasanas/>). Pupils Olympiads of mathematics happen also nowadays, they happen in different levels, starting with school Olympiads in mathematics, then city, country and state Olympiads in mathematics. In 2017, 5 pupils from Latvia took part in an international Olympiad of mathematics in Brazil. To attract students to additional studies of mathematics, RTU Student Parliament in cooperation with Department of Engineering Mathematics organized students' Olympiad of mathematics in 2006. These Olympiads happened for 6 years, but, with the decrease of interest from students, were stopped.

Whereas, tradition to organize an International students' Olympiad in mathematics was established in 2011, in frames of a cross-border cooperation project between Latvia – Lithuania “Cross-border cooperation net to include the competences of mathematics in the social economical development of the region” (MATNET), and this year it was organized for the 6th time.

The aim of the Olympiad is to promote interest in mathematics among young people, strengthen the education gained at school, ensuring a creative way using it, as well as, promote cooperation skills between young people with similar interests. That is why, to take part in the Olympiad are those who are good at mathematics, who are interested in a problem of a specific matter, who like “hard nuts”, as well as, all those who wish to try out their strength in mathematical contest.

At the beginning the Olympiad was organized only for students from the University of Siauliai and Latvia University of Agriculture. Then the next year students from Riga Technical University also joined. Number of participants of the Olympiad in the last two years has grown. Last year there was 81 participants from 18 educational institutions.

3. Olympiads of mathematics in Riga Technical University

The biggest “stumbling block” in Riga Technical University, as in other technical universities, is general subjects – mathematics and physics. In 2006, RTU Student Parliament came with an idea to organize students' Olympiad in mathematics and physics with an aim to interest students in acquiring these subjects. Teaching staff of the Department of Engineering Mathematics supported this idea and were willing to create tasks and evaluate students' works. Responsiveness from students was unexpectedly huge. At the beginning there were more than 200 students who applied for the Olympiad, that is why, it was decided to organize a selection round, and only the 50 best ones send to the final. Though, not all the students who had applied for the Olympiad came to the selection round. Number of participants of the Olympiad in years from 2006 to 2011 is seen in Figure 1.

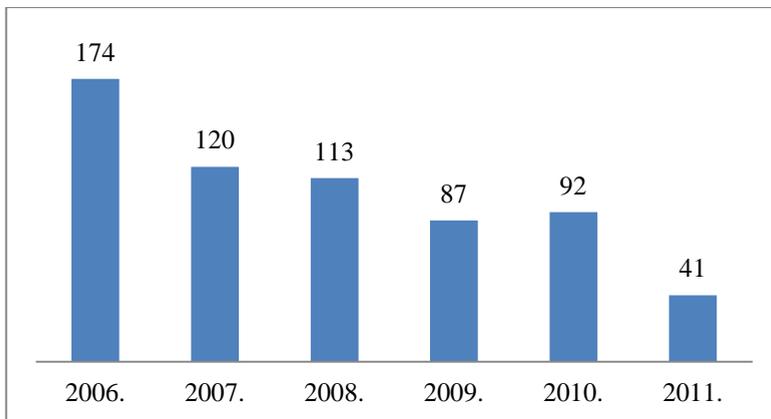


Figure 1. Number of participants of the RTU Olympiad in mathematics.

As it is seen from the Figure 1, interest from students started to disappear, that is why, organization of the Olympiad in mathematics (also in physics) was stopped. Now we are thinking of renewing this experience, but, in a new, different way, maybe by organizing team contests.

Parallel to students' Olympiad in mathematics, there was also an online Olympiad for pupils, where pupils were offered to solve the same tasks. Interest from pupils about the Olympiad was rather high – about 200 pupils sent in their works every year. These online Olympiads in mathematics promoted interest in mathematics and Riga Technical University.

4. International Olympiad of mathematics in Latvia

As mentioned before, International Students' Olympiad in mathematics in Latvia is held once a year since 2011, and main organizers are Department of Mathematics in Latvia University of Agriculture (LLU). Students from Riga Technical University participate in these Olympiads since 2012, in addition, showing good results and receiving some of the award-winning places every year.

In 2017, 81 participant applied to participate in the Olympiad from 18 different educational institutions: 22 local (LLU) students, 19 students from Lithuania (University of Siauliai and University of Alexander Stulginsky), 3 students from Estonia (EMU), as well as, students from several universities from Latvia, such as, Riga Technical University (RTU), Ventspils University College, Liepaja University, and LLU Erasmus+ exchange students from Portugal (Instituto Politecnico Braganca) also took part in the Olympiad.

As the level of Olympiad does not exceed secondary school knowledge but knowledge gained at university can be used – system of equations and extremes, pupils from cooperation secondary educational institutions of Faculty of Information Technologies of LLU were invited to participate for the third year. This year pupils from 7 Secondary school participated in the Olympiad. Olympiad was organized in 2 parts. First part includes individual contest and is an hour long. There were some jigsaw puzzles included, but the second part - group work. Groups are selected randomly at the time, so that there are different educational institutions represented in the group. Work in teams of five – seven students involved solving the schemer geometry tasks, as well as, linking students' hobbies with the validation of mathematics. Group work also includes experience exchange between students about learning and teaching of mathematics at their universities, what is common, what is different, as well as, what is good, what should be improved in the study process.

Individual tasks each country had in their own language, group tasks – in Latvian, Lithuanian and English, communication between students – in English.

Starting from 2012, RTU students participate in these Olympiads every year, and every year receive award-winning places. Although, last year the first prize received a student from the Faculty of Physics and Mathematics of University of Latvia, but in the total evaluation of the teams, RTU received the highest points. Received points of each team can be seen in Figure 2, abbreviation under the graphics mean: RTU – Riga Technical University, LLU – Latvian University of Agriculture, LU – Latvian University, VA – Ventspils University College, LiepU – Liepaja University, ASU – Aleksandra Stulginska University (Lithuania), Siauliai University (Lithuania), EMU – Estonian University of Life, IPB – Polytechnic Institute Braganca (Portugal).

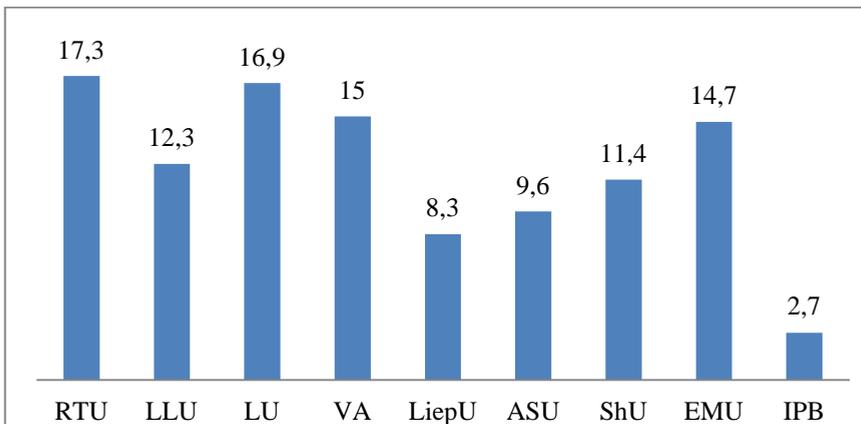


Figure 2. Average points that each university team received in the Olympiad.

Teams were given additional tasks, too – share their experiences about math studies, set common and different in the mentioned educational institutions, as well as, express their suggestions to improve mathematical studies. The link of the course of mathematical studies with real life situations and usage of the acquired knowledge is the main topic for discussions. To improve the studies of mathematics, students suggest customizing the course of mathematics to a certain specialty, use more interactive materials, as well as, simulation and logic tests and tasks. In turn, theoretical approach promotes general skills in their opinion. Interesting is also a fact that both students from LLU, and RTU see the necessity of mathematical studies, but students from Siauliai University and Technical school of Jelgava doubt the usage of taught mathematics to them in future. Students from Vidzeme University find only some topics interesting and useful in their chosen profession.

Common in mathematical studies in all universities are homework, tests, practical works in relatively small groups, as well as, access to an electronic study materials (e-studies and other study platforms). Although, homework is a requirement for credit points in several

universities, in RTU they are evaluated and give extra points. Students admit that it makes it easier to get a successful evaluation of the course. RTU students also welcome additional course to revise secondary school knowledge. These courses are compulsory for those students who have failed test about elementary knowledge of mathematics. But, other students are also allowed to attend these courses both to revise the forgotten secondary school topics, and to acquire topics of higher mathematics additionally.

It should be noted that for the Siauliai University, the highest value is a student friendly environment, access to technologies, good relationship with teaching staff, also the fact that pedagogues are very welcoming and during the study process give a lot of good examples. In turn, students from Vidzeme University are surprised that pedagogue not only asks if all students understood everything and if there are any suggestions or wishes after the lectures, but also take their suggestions into consideration.

After the discussion, students confidence strengthen that mathematics is not only a complicated and precise science, which is necessary for scientific researches, but it is also used in everyday life. To improve mathematical studies, students suggest varying tasks that are offered for an individual work, in practical classes create even smaller groups to have all students being involved, as well as, use more visual materials. Students would also like a slower pace of the studies.

Interest about the Mathematics Olympiad grows every year. The number of participants has been limited and has remained in the range of 55 - 64 students for all eight years as merely one hour has been provided for assessment of an each work. Nonetheless, the number of Universities sending students to the Olympiads is increasing almost every year. The number of Universities participating in the Olympiads is depicted in the Figure 3.

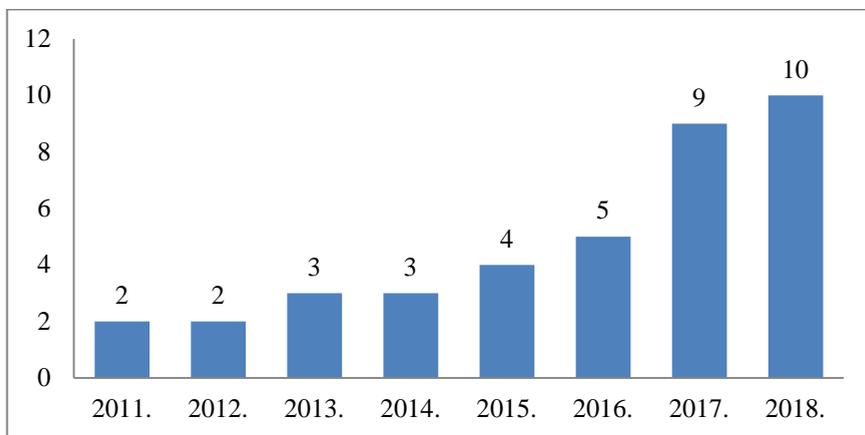


Figure 3. The number of Universities participating in the Olympiads from 2011 to 2018.

Ability of finding smart solution to the mathematical problems not only eases students' everyday life, but also smooth the way of finding a job. Many organizations require potential employees filling out tests prior to a job interview, which usually contain mathematical problems as well. For example, the European Personnel Selection Office requires filling the pre-selection tests when looking for new staff for the EU institutions. Among the others, there are included ten mathematical problems, which shall be solved within 20 minutes. These problems are used for testing the following mathematical abilities: data interpretation, reasoning, estimation, calculation. Some mathematical problems of the Olympiads are similar to the ones included in these tests. Consequently, participation at the Mathematics Olympiads not only develops students' abstract and logical thinking, but also trains them "think smart", which in turn facilitates their abilities of finding a prompt solution to the tests of this kind.

In the International Olympiad in Jelgava, not only students get some new insight, but also pedagogues. Firstly, a lot can be taken from students' evaluation on curriculum of the mathematical subject, evaluation of the teaching and their suggestions for improvement. Secondly, parallel to the Olympiad, there was a seminar-discussion for mathematics teachers and pedagogues about mathematical education at university in context of sustainable development. Starting with next academic year – 2018/2019, a gradual change to a perfected curriculum and an appropriate changed teaching approach will begin in schools and per-schools of Latvia (from age of 1.5 to 18), for students to, as a result, develop “necessary knowledge, skills and abilities for life in the 21st century” (school 2030). Project of the State Education Content Centre (SECC) “Competence approach in the curriculum” foresees to create support mechanisms in five years period for schools, municipalities and parents for a successful change of the teaching approach (<https://www.skola2030.lv/> 2017.15.09.). The shift of a paradigm in the school study program will create a row of changes both in university programs of mathematics, and their implementation.

While implementing the competence approach, study program of the subject will remain, but teachers' cooperation in a school level, in planning the work and its implementation will increase. “Changes are necessary because pupils have changed themselves!” (<http://www.iespejutilts.lv/> 2017.20.09.) It is essential to switch from giving a ready knowledge and a frontal learning form, where pedagogue gives information in front of the class, to a leading the learning, teach and learn differently is possible already in frames of an existing curriculum, and in many schools it is already happening.

4. Conclusions

1. Olympiads in mathematics promote interest about mathematics among young people, develops cooperation between like-minded young people.
2. International Olympiad for students is an example of good practice for a sustainability of the results of international projects.
3. International Olympiads for students, where students can share their experience about mathematical studies and express their suggestions for the improvement of the mathematical studies, give pedagogues a chance to listen to the opinion of their best students about methodology of teaching mathematics and improve it.

References

<http://nms.lu.lv/olimpiades/olimpiazu-rasanas/> (In Latvian)

<https://www.skola2030.lv/> (2017.15.09.) (In Latvian)

<http://www.iespejutilts.lv/> (2017.20.09.) (In Latvian)

Digitization of Analog Phonic Archives in a University Lab: A Report on a Young Apprenticeship Initiative

Ludovico, Luca Andrea^a; and Presti, Giorgio^b

^aLaboratorio di Informatica Musicale, Dipartimento di Informatica “Giovanni degli Antoni”, Università degli Studi di Milano, Italy ^bLaboratorio di Informatica Musicale, Dipartimento di Informatica “Giovanni degli Antoni”, Università degli Studi di Milano

Abstract

This paper discusses an initiative of young apprenticeship for Italian secondary school students, carried out in a university lab rather than in a traditional working environment. The practical aim of the proposal was to make participants digitize phonic archives on analog media, such as open-reel tapes and vinyl records. The goal of the paper is to provide a comprehensive review of this experience, highlighting the educational value of young apprenticeship activities in an academic context and critically analyzing its strengths and weaknesses. The work will also discuss the feedback received from students.

Keywords: *Young apprenticeship; music; audio; digitization; secondary school.*

1. Introduction

Young apprenticeship is an educational approach in which students are trained to consider knowledge and skills (the means) as tools to gain expertise in resolving concrete problems (the goal). During this experience, the professional skills acquired by imitation and manipulative experience are reciprocally subject to self-reflection and critical re-elaboration (the means) in order to enucleate the knowledge and abilities that are implied on an operational level (the goal). The idea is to overcome the traditional assumption “learn first, do later”: from this point of view, the school environment should be less distant from real life, as well as work experiences should be part of the development of students. In this vision, theoretical knowledge and practical skills are not antithetical, but they cooperate in the process of teaching and learning (Gentili, 2016).

Apprenticeship can be an experience of high educational value that allows students to reflect on their training and professional future thanks to a controlled and time-limited experience. As stated by Gardner (2010), during secondary school students acquire abstract thinking abilities. This experience let them form an idea of the world of work and of the responsibilities that citizens have, so that they can begin to act accordingly.

In Italy, the exchange between the education system and the labor market is a crucial part of Law 107/2015, also known as the “Good School” reform. This document promotes and introduces in the school system a number of hours (ranging from 200 hours for high schools to 400 for professional and technical institutes) to be spent during the final three years of studies on the workplace, at private or public institutions. The young apprenticeship program, addressing participants aged from 16 to 19, was established to provide secondary school students with the opportunity to gain knowledge, competences, and skills in a specific vocational area and to achieve a relevant qualification outside classrooms. The reform establishes the mandatory nature of young apprenticeship for all secondary-school students, who will not allow to obtain their diploma without completing a 200 or 400 hour-long path. At the moment of writing, in Italy there is a clear discrepancy between supply and demand, which inevitably leads to misconceptions and forced interpretations: examples are professional assignments having very little educational value (e.g., serving in a fast food restaurant) and the promotion of non-vocational initiatives to the rank of young apprenticeship experiences (e.g., classroom presentations by external professionals). These problems have recently led to student demonstrations and strikes, culminating in the marches of 13 October 2017 in 70 Italian cities.

The reform is in its early stages, and in this evolving context a particular role is played by universities and research laboratories that are launching young apprenticeship proposals. Due to the intrinsic nature of these institutions, students’ work is not seen as a goal, but rather as a means to acquire scientific knowledge and highly-specialized know-how, using

the scientific method to face and solve problems, under the expert guidance of researchers and scholars. This is the case described in the present work, namely an experience of young apprenticeship at the Laboratory of Music Informatics (LIM) of the University of Milan.

Even if the proposal discussed below implies the use of ad-hoc equipment and digital technologies, the purpose of the paper is not to detail technical processes. Rather, our goal is to provide a critical review of an apprenticeship initiative occurring in a university environment, describing both the achieved educational goals and some unexpected practical implications, as well as a number of issues that emerged during the experience.

This paper is organized as follows: Section 2 describes the background of the proposal, Section 3 gives details about the goals of the initiative, Section 4 provides details on the activities proposed and carried out, Section 5 reports student feedbacks, and finally Section 6 summarizes the achievements and draws conclusions.

2. Background

Young apprenticeship has been conceived to make students operate in a work environment, and an experience in an academic context could seem a forced interpretation. Nevertheless, there are good reasons to head in this direction: first, a mutual exchange between secondary school and university can seal the partnership of education and culture. The idea of education as an experience to support culture, and culture as an experience to boost education has inspired the Memorandum of Understanding between the Italian Education and Culture Ministries, aiming to create opportunities to access knowledge through the structural cooperation between education and cultural institutions, in order to develop a society of knowledge. Moreover, a young apprenticeship program within an academic environment is coherent with the emerging trend known as *third mission* of universities, which includes dissemination or outreach activities aimed at promoting their public engagement. This dimension recalls the changing role of knowledge diffusion and circulation in its growth (Laredo, 2007), also in relation to the entrepreneurial model promoted by policy makers and university decision makers (Gulbrandsen & Slipersaeter, 2007). Launching such an initiative in a university implies a vision of apprenticeship as an initiative of high educational value, where young students do not simply acquire practical skills, but they are also administered theoretical and methodological principles, research perspectives and early training experiences.

In this context, the LIM launched in January 2017 a proposal aiming at the digitization of phonic material from analog media, i.e. vinyl records and magnetic tapes. The know-how acquired by the staff thanks to past prestigious collaborations (e.g., Bolshoi and La Scala theatres) and the availability of suitable technologies and devices make this lab a privileged

place to conduct hands-on experiences on music equipment, under the guidance of skilled domain experts. Finally, working inside a university lab gives students the opportunity to explore more theoretical aspects, such as the bases of information theory and the historical/technological evolution of music encoding, preservation and experience. In this way, music becomes a bridge towards multidisciplinary educational subjects, including math, physics, history, computer science, and cultural heritage.

3. Goals of the Proposal

Concerning students' growth, the main educational goal [G1] was to provide them with a comprehensive overview of the lifecycle of analogically recorded sound, including physical cleaning and mounting of media over ad-hoc equipment, fine tuning of parameters for analog-to-digital conversion, simple editing operations in the digital domain, file naming policies, and the choice of digital formats to preserve information. In doing so, students were required to adopt scientific methods and approaches, to learn procedures and good practices, to break down single problems into sub-problems (*divide and conquer*), to use self-reflection, peer cooperation and expert assistance, when required. Another goal, connected to the third mission, was to offer high schools and vocational institutions a valid alternative with respect to other working environments, hard to involve in young apprenticeship initiatives [G2].

Finally, within the Department of Computer Science of the University of Milan, the LIM is the reference lab for the three-year degree course in Music Informatics. Despite orientation and dissemination activities, this educational proposal is little known to secondary school students. So, another aim of the initiative is to attract future students, make them experience this environment, and foster the most motivated ones to enroll in the course of Music Informatics [G3]. Moreover, let us mention the need in STEM-related academic world to overcome the gender gap that typically afflicts ICT courses (Sax et al., 2017). Schools were explicitly invited to send an equal number of male and female students. Even if the current proposal was attended by only 30% of female participants, this number is relevant if compared with students' applications to 2016/2017 courses: 115 males (87%) vs. 17 females (13%) in Music Informatics, 190 males (90%) vs. 21 females (10%) in Computer Science.

4. Young Apprenticeship Work Plan

The experience at the LIM was planned to span over 40 hours, including an initial training lesson focusing on three aspects: i) organizational and logistic issues, ii) fundamentals about sound definition, production, digitization, editing and preservation, and iii)

explanations and practical demonstrations about the use of available devices. The purpose of the introductory lesson was to give students the scientific background to mindfully accomplish their work. The provided conceptual tools should help them avoid mistakes and handle critical situations autonomously (in any case, throughout the apprenticeship activities, domain experts were always physically present in the lab, and ready to intervene on theoretical and practical issues). The small number of students involved (max. 8 at a time) allowed to turn a traditional lesson into a continuous dialogue among teachers and learners, also encouraging peer discussion. One of the goals of this session was to build a common knowledge base for students presenting heterogeneous backgrounds. As shown by the results of a questionnaire administered to participants, only 62% of them declared to have a musical background, either vocational or non-professional. Concerning their studies, 24% of participants came from musical and vocational institutes, 76% from classical and scientific lyceums; 52.5% of them affirmed to attend the third year (in Italy, superior education lasts 5 years), 42.5% the fourth, and the remaining part other grades. Topics were organized into 6 units, providing in a limited timespan (about 4 hours) an overview of the core subjects of sound music handling: Acoustics; Electronics (transducers, amplifiers, analog recording technology); Psychoacoustics (hearing thresholds, masking effects); Information theory (Nyquist-Shannon theorem, Fourier transform, quantization); Computer science (data formats, statistical compression, databases); Restoration good practices (noise sources, equalization and dynamics compression, spectral processing). Theoretical explanations were interleaved with acoustic experiments and live demos. Besides, some topics encouraged discussions about cultural aspects, such as the evolution of music experience and its transformation.

After this theoretical part, students were instructed about the use of available hardware and software digitization equipment. Functions and operations (such as calibration, analog media cleaning and mounting) were explained through a hands-on approach, delegating a better comprehension to experiential learning (Kolb, 2014). All devices, grouped into a sound-proof dedicated space, included: two Fostex B 77 MKII and an Otari MX-55 tape recorders; a Thorens TD 166 MKVI turntable; a Digidesign Digi 002 Rack analog-to-digital audio interface; an Epson Expression 10000XL A3 professional scanner for iconographic materials. Concerning software tools, participants mainly had to use: Reaper, a multi-platform Digital Audio Workstation (DAW); iZotope RX, a software suite for audio restoration; PgAdmin 4, an open source management tool for PostgreSQL used to input data and metadata into a database.

The practical goal of this proposal was to make participants produce a number of digital objects from the original analog media, working autonomously but with the possibility to ask for expert support. Järvelä and Järvenoja (2011) and Zimmerman (2008) describe self-regulation as the key for a successful learning process, since it helps students to create their

own method and strengthen their skills, to apply the best strategies to reach their goals, to control their performance and to evaluate their progress (Wolters et al., 2011).

The heterogeneity of proposed activities, ranging from media cleaning and mounting to digital restoration and metadata classification, aims at presenting the complete lifecycle of information entities during a digitization campaign. Students were assigned quite general tasks, such as “Today you will focus on vinyl-record digitization” or “In the next hours you will have to improve the organization of the file system”, leaving them free to form groups, identify parallelizable subtasks, and manage their time. When working in specialized subgroups, students were invited to rotate day by day on multiple tasks, to achieve a complete view of the digitization process.

During their apprenticeship period, participants faced numerous critical situations (e.g., broken tapes, scratched vinyl records, overloaded audio levels, mismatch in track lists, etc.). Even if working in unsupervised mode, thanks to self regulation and peer cooperation they were able to manage most situations. The need for expert supervision, usually in the form of additional explanations, emerged above all in the very first days. As some students reported, the occurrence of non-standard situations and critical issues to solve on the fly challenged them, fostering problem-solving skills and making the experience more engaging.

5. Feedbacks from Students

Participation to the initiative was extensive, well beyond the initial expectations of the proponents: in the period from February to July 2017, 14 institutes and 91 students joined the proposal. In order to understand the efficacy of the initiative under various perspectives (improvements in knowledge and skills, interest, suggestions and critical issues, etc.), at the end of the experience a survey was administered to all participants in the form of an anonymous Google form. Where possible, answers were mapped onto a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree); conversely, in some cases, students were encouraged to express their ideas through free-text fields.

Concerning self-assessed computer skills and musical knowledge, declared self-confidence with computer science was 3.1 ± 0.9 , the one with music 3.5 ± 1.0 . The two resulting Gaussian distributions shown that participants initially felt more confident with music than with computer science. Analyzing the self-attributed scores at the end of the experience, the aggregated result (hardware skills, software capabilities and people interaction) scores a remarkable 4.0 ± 0.8 . The duration of the experience was positively evaluated: lasting on average 42.1 ± 7.6 hours, it was perceived as a good choice by 82% of students, and too short by 14%, who would willingly prolong their stay; only 4% found it too long for their

expectations. About students' satisfaction, the overall score (available HW/SW tools, location, staff, and proposed activities) was 4.1 ± 0.9 . The worst average score (3.7), was assigned to the location, the best one (4.7) to the lab staff. The level of students' satisfaction was impressively high, as demonstrated by the affirmative answers to the questions: "Would you join again this initiative?" (93.8%), and "Would you suggest it to other students?" (95%).

A methodologically relevant in-depth study started from the identification of two groups: highly-engaged students (HES) vs poorly-engaged students (PES), defined as follows. The former group included participants whose overall appreciation was equal or greater than 4, and answering affirmatively to the general questions: 1. "Would you repeat the young apprenticeship at the LIM?"; 2. "Would you suggest it to other students?"; 3. "Do you feel that this experience enriched you from the scientific and/or cultural point of view?"; and 4. "Do you feel that this experience enriched you from a professional point of view?". The HES group was composed by 69% of the participants; the PES group was formed by all the other students (31%). Considering only the answers with statistically significant differences (effect size $\theta > 0.8$) between HES and PES, what emerges in the latter group is a poorly perceived usefulness for theoretical aspects and some practices (tapes and scans).

Probably, the most interesting evaluations have been expressed as free-text suggestions. Unfortunately, reporting them entirely would go beyond the scope of this work. In our analysis process, we tried to group them by subject. The proposed tasks raised interest, both from a cultural and from a scientific point of view, and our staff emerged as the added value of the initiative. Students appreciated to feel more responsible in a self-regulation context, and some of them asked for more computer-related activities, such as coding. Among the downsides, some participants found activities too repetitive and boring, the dedicated space too dirty and crowded, and asked for a better organization. These issues will be addressed during a future re-design of the experience.

6. Achievements and Final Remarks

With respect to the aims listed in Section 3, goal G1 was successfully achieved: almost all students, after 40 to 80 hours of hands-on activities dealing with phonic material, showed a sufficient degree of competences and skills in mounting, ripping, and restoring analog phonic materials. Digitized media (more than 250 vinyl records and 50 magnetic tapes) were progressively published on line in a reserved section of LIM web site, thus increasing the motivation of students. During their daily activities, young participants demonstrated responsibility, willingness to cooperate with peers and with the lab staff, and even interest towards other research subjects. Although students worked in an isolated sound-proof room, their behavior was irreproachable: timetables were respected, no equipment or media

was damaged, no theft occurred, and the assigned tasks were successfully carried out. Goal G2, i.e. involving local institutions and creating synergies, has been achieved too, as demonstrated by the high interest raised in the first year, by the renewal of collaborations during this school year, and by the request for additional dissemination activities. Finally, as it concerns goal G3, the consequences in terms of an increased enrollment to our courses, more realistic expectations towards the disciplinary context, better motivation, and the reduction of gender gap cannot be evaluated after a one-year experience, rather they have to be monitored in the medium and long term.

In conclusion, thanks to this initiative we have been able to engage about 100 young students, providing them with insights on scientific research, intangible cultural heritage, and professional skills; we obtained some practical results, by an extensive digitization campaign lasting about 3500 hours; and, finally, we revitalized activities, competences, and equipment that once characterized our lab making it an international point of reference. But a young apprenticeship initiative does not come at no cost: integrating young and inexperienced students has a profound impact on available resources in terms of time, space, and equipment, and it involves a rethinking of consolidated logistical processes and resource management.

References

- Gardner, H. (Ed.). (2010). *Responsibility at work: how leading professionals act (or don't act) responsibly*. John Wiley & Sons.
- Gentili, C. (2016). L'alternanza scuola-lavoro: paradigmi pedagogici e modelli didattici. *Nuova secondaria*, 10, 16-37.
- Gulbrandsen, M., & Slipersaeter, S. (2007). The third mission and the entrepreneurial university model. *Universities and strategic knowledge creation*, 112-143.
- Järvelä, S. and Järvenoja, H. (2011). Socially constructed self-regulated learning and motivation regulation in collaborative learning groups. *Teachers College Record*, 113(2), 350-374.
- Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT press.
- Laredo, P. (2007). Revisiting the third mission of universities: Toward a renewed categorization of university activities? *Higher education policy*, 20(4), 441-456.
- Sax, L.J., Lehman, K.J., Jacobs, J.A., Kanny, M.A., Lim, G., Monje-Paulson, L., & Zimmerman, H. B. (2017). Anatomy of an enduring gender gap: The evolution of women's participation in Computer Science. *The Journal of Higher Education*, 88(2), 258-293.
- Wolters, C. A., Benzoni, M. B., & Arroyo-Giner, C. (2011). Assessing strategies for the self-regulation of motivation. *Handbook of self-regulation of learning and performance*, 298-312.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American educational research journal*, 45(1), 166-183.

Being there?: A Collaborative Inquiry into Attendance

Menendez Alvarez-Hevia, David; Lord, Janet and Naylor, Steven

Department of Childhood, Youth and Education Studies, UK, Manchester Metropolitan University

Abstract

There is a growing concern among universities over the levels of student absenteeism at teaching activities. Attendance is an increasingly important issue in the UK, but also internationally, for its impact on the student experience, academic performance and engagement. This article explores the topic of poor attendance in one of the larger universities in the UK, through a collaborative action research methodology that includes Education Studies lecturers and students as research partners. Initial findings suggest that attendance is conceptualised in different ways by different actors. We found that a key theme in understanding attendance and engagement was that students' identities are multi-layered and complex, and that their identities as students are often interwoven. We also found that technology and the virtual world play a fundamental role in understanding practices and conceptualising attendance and engagement. Concerning this, the way that a Virtual Learning Environments is approached in our study illustrates how physical attendance is challenged (but also supported) as a privileged form of getting access to the knowledge presented in taught sessions.

Keywords: *Attendance, engagement, collaborative research, student experience.*

1. Introduction

It is clear from the literature that non-attendance at teaching sessions affects students in different ways (Kelley, 2012; Barlow & Fletcher 2011; Massingham & Herrington, 2006) and is a matter of considerable importance for lecturers and higher education institutions (Morgan, 2001; Moore, Armstrong & Pearson, 2008; Bowen et al., 2005). Although attendance is generally studied in relation to performance achievement (Arulampalam, Naylor & Smith, 2012; Chamberlain, 2012; Allen & Webber, 2010), this study aims to take a more critical approach, examining practices to improve attendance, their implications and possibilities and illuminating different ways of conceptualising the “problem of attendance” at lectures, seminars and other academic activities. Whilst there is a tendency to represent students as consumers (economic subjects), rather than being reflective or productive – (economic character) or individualistic (economic citizenship) (Brown, 2015; Molesworth, Scullion and Nixon, 2011), through this project on attendance, we also take a political standpoint by committing ourselves to uncover narratives that contribute to challenge that form of representation and contribute generating new ideas and positions.

The notion of attendance for us, also alludes to larger contemporary debates around physical and non-physical presence. It has been recognised that many people, both young and old, are often spending a lot of time managing multiple presences through online or virtual identities and this creates an strange sense in which being together with other people is not as straightforward as being in their physical presence (see Turkle, 2012). This research aims to go beyond a debate that is seen, for example, in terms of student disaffection with lecture content. We interrogate the notions of being present and challenge the idea that attendance is just about ‘being there’, in order to develop a more nuanced understanding of what this means for learning in higher education.

Attendance has emerged as a “problem” for some programmes at our institution (a university in the North West of the UK) with a preliminary investigation showing that attendance rates at teaching sessions (lectures, seminars and tutorials) have dropped dramatically over recent academic years. Institutional responses involving different strategies were put in place, but without consultation or consideration of the view of the relevant actors and without a clear plan for evaluation. Some of these strategies include new electronic systems to monitor attendance, introduction of pedagogical innovations such as small group teaching or more blended learning, a new logic in the way of organising taught sessions that include a combination of “short and fat” modules with “large and thin” modules and presenting learning material via a virtual learning environment. Langan and Whitton (2016) have recently studied learners’ disengagement within the context of this institution in the areas of psychology and business, but not in education. Their findings, which are aligned with previous literature, recognise some core areas of the student

experience that are associated with non- attendance and suggest that explanations should be negotiated at local levels.

We planned this research project inspired by the idea that developing a local understanding of the topic would allow us (as Education Studies students and lecturers) to include multiple voices on the implementation and evaluation of initiatives that aim to improve attendance.

From previous discussion and the exploration of the literature three main question emerged to focus the study:

1. How is attendance conceptualised by students and lecturers?
2. Do current strategies, at pedagogical, organisational and institutional levels have an impact on attendance?
3. How might the notion of ‘being there’ for students be made relevant?

2. Methodology

This research takes a Collaborative Action Research (CAR) approach that involves conducting research from inside and with *others*, focusing on improving practices and generating knowledge through reflection, collaboration and transformation (McNiff, 2016). This form of research ‘integrates the development of practice with the construction of research knowledge in a cyclical process’ (Noffke & Somekh, 2005: 89). There is a significant tradition of CAR research in the area of education that supports its implementation and promotion for a study of this kind (e.g.Kember, 2000; Hollingsworth, 2001; Baumfield, Hall & Wall, 2008). An examples of the use of AR on the topic of attendance is presented by Gbadamosi (2015) who uses this approach to understand why students were not attending seminars, at the same time as he implements new teaching practices to improve attendance.

Our CAR project included 3 lecturers and 12 students that participate as co-researchers, to embed a student-lecturer perspective throughout the study. They are distributed in three research teams of 1 lecturer and 4 students. Each research group is in charge of one specific elements related to the topic of attendance (individual or personal aspects, pedagogical aspects and organisational or institutional aspects). Three main meetings were used to discuss (and generate) data, emerging issues and further steps. More details about the structure of this research can be found in *figure 1*:

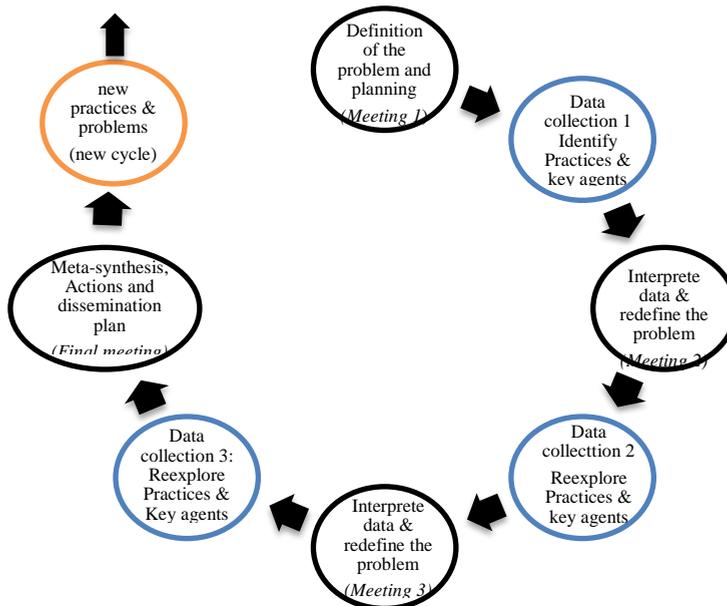


Figure 1. Action Research cycle adapted from the classic action-reflection cycle developed by Lewin (1946)

In addition to attending the 4 main meetings, the groups meet regularly to carry out research activities. These groups work independently, collecting and reflecting on different forms of data that include: data from interviews with different agents (students, academic and non-academic staff and representatives from the student union or student services), secondary data (university policies and data from the Student Engagement office), notes from meetings, and reflective activities in the form of reflective diaries, logs and/or personal journals. A final all-day meeting is dedicated to meta-synthesis (analysis of data across groups), discussion of findings and the production of dissemination material. Diverse techniques and strategies to analyse data were employed (e.g. descriptive statistics, thematic analysis, discourse analysis).

Underpinning this study is the presupposition that equality is not a goal, but a point of departure. We are inspired by Rancière's understanding (1991) of the *equality of intelligences* that makes us conscious of the necessity of believing in the possibilities of what can be done with equality. This involves a continuous interrogation and verification of the principle of equality as part of the research process. In other words, students as researchers are considered as fully capable beings that have the possibility to act and respond, bringing into the world original and valuable ideas, points of views and make tensions manifest.

3. Preliminary findings and discussion

Although this study is still in progress, we can advance some relevant findings. Some of the changes evaluated by the research teams include the introduction of new electronic monitoring system in which students register their attendance to lecture and seminars using a card-reader system. Changes to the timetable, teaching methods, distribution of assessment dates and forms of taught session, are also all discussed within the research teams.

Our findings suggest that attendance is conceptualised in different ways by lecturers, students and other agents (e.g. senior managers and student engagement officers). All of them understand that the level of attendance have some implications for academic performance. However, there is evidence that shows disagreement in the way that they perceive attendance as a “problem” and the implementation of new initiatives at university level to improve attendance. For example, there are some tensions in the way that the new electronic monitoring systems are introduced. This system is praised by senior managers and students engagement officers whereas for some students it is a form of “depersonalization”. Although students recognize the benefits of an electronic system, they also see what is missed with electronic initiatives to record attendance:

I think the lecturers should interact with the students so they know who is in...so they can actually draw into them and maybe it's more time consuming...(Year 1 student, Focus group 1, Group D).

Lecturers can see some of the advantages of the electronic system, but for some of them it comes with implications for their identity as educators:

There are ways of checking, I'm looking for patterns of all of the people who come in late because this new tech allows us to do this. On the other hand, I don't want to be doing this...I'm not the police, so I understand that the people are coming in late (Lecturer, Focus group 2, Group D).

For others there is an ambivalence,

I don't care what the university does in terms of swiping or the other methods. I will always, always, always, always take a paper register, so that if something goes wrong electronically I'm very aware of whether students have been in or not...it seems quite old fashioned to have a paper register but I like the security of it. (Lecturer S, interview, Group J)

Staff also feel the lack of consultation over the system keenly, as this means (for example) that when registering students their previous attendance record, and hence patterns, are not readily available.

Students value the efforts made by lecturers and the institutions to improve their student experience although they think it is still insufficient. They see on the type/structure of the teaching session a powerful motivator to attend/miss lectures:

Erm... for enrichment I make sure I attend because it's all activity based but like the other ones you know when they are just talking and your like ahhh...you are like I can just see it on Moodle...(Student, Focus group 2, Group S)

They agree with lectures that absenteeism to lectures and seminar have a negative impact on their learning experience. Neither students and lecturers like the experience of “*an empty room*”, specially if it is a lecture theatre. For lecturers it has implications for the way that they plan activities. For one lecturer, the planning was all around the social nature of learning, and hence attendance was key;

... I won't read out what's on the slides it's all ...really about talking about the particular issues and making those connections and trying to keep it kind of lively and going in that way. (Lecturer E, interview, group J)

Students also consider that physical attendance is not always essential, as materials are available via the virtual learning environment (VLE); they suggested that often they learn better by studying lecture notes when they are on their own, and that in fact good quality materials on the VLE can discourage physical attendance;

If you go to a session but the tutor will [upload] good quality material and you didn't have to make that 2 hour drive and you could just look at the material on Moodle. (Student, focus group 2, group J).

However, they did value the collaborative learning experiences planned by staff.

We found that a key theme in understanding attendance and engagement was that students' identities are multi-layered and complex, and that their identities as students are often interwoven with those of (say) parent, and/or employee. There are tensions involved in the lived realities of students' lives, for example in paying substantial fees as well as completing assignments; those tensions are reflected in the multiple identities that students experience and exhibit. For example, in order to pay fees and for accommodation, students often need to work, and their employment contracts may limit their ability to attend lectures. In addition, the interaction between the multiplicity and variety of factors that impact on physical attendance (such as session timing, closeness to assignment submission dates, childcare and travel arrangements and the use of technology in learning) plays a fundamental role in the understanding of practices and the ways that attendance and engagement are conceptualised.

4. Conclusion

This CAR project contributes to enhance the student experience, improve the research capability of lecturers and provide guidance for the University. The research design required participants to operate at personal, professional and political levels (Noffke 2009), providing opportunities to reshape their world and identity. The project presents opportunities for students to participate as researchers and contributes to reshaping the ways that Education Studies students, lecturers and other university agents understand the topic of attendance. Therefore, the project has a direct impact on the students who participate but also influence teaching practices and inform university policies more broadly. On a theoretical level, the project provides comprehensive insight into the ways that attendance is problematized and conceptualised from different perspectives. At policy level, this study offers recommendations to key agents by examining current attendance policies from different perspectives and proposing alternatives. Finally, this project also provides support for teaching practices by providing guidance for lecturers (e.g. the co-constructed dissemination materials are shared as part of departmental professional development days, seminars and short reports) and as materials that could be used to discuss attendance with students. The evaluation of strategies at a local level are used to inform key agents about their current strategies and alternatives.

References

- Allen, D. & Webber, D.J. (2010). Attendance and exam performance at university: a case study. *Journal of Research in Post-Compulsory Education*, 15 (1), 33-47.
- Arulampalam, W., Naylor, R. and Smith, J. (2012). Am I Missing Something? The Effects of Absence from Class on Student Performance. *Economics of Education*, 31 (4), 363-375
- Barlow, J and Fletcher, S. (2011). Student absenteeism: whose responsibility?. *Innovations in Education & Teaching International*, 48 (3), 227-237.
- Baumfield, V., Hall, E. and Wall, K. (2008). *Action research in the classroom*. London: SAGE.
- Bowen, E. Price, T. Lloyd, S. and Thomas, S. (2005). Improving the quantity and quality of attendance data to enhance student retention. *Journal of Further and Higher Education*, 29 (4), 375-385.
- Brown, W. (2015). *Undoing the Demos: Neoliberalism's stealth revolution*. New York: Zone books.
- Burke, P. (2002). Towards a collaborative methodology: an ethnography of widening educational participation. *The Australian Educational Researcher*, 29(1), 115–136.
- Chamberlain, J. M. (2012). Grades and Attendance: Is There a Link between Them with Respect to First Year Undergraduate Criminology Students? *Educational Research and Reviews*, 7 (1), 5-9.

- Gbadamosi, G. (2015). Should we bother improving students' attendance at seminars? *Innovations in Education & Teaching International*, 52 (2), 196-206.
- Hollingsworth, S. (ed) (2001). *International Action Research: a casebook for educational reform*. Washington: Falmer Press.
- Kelly, G. (2012). Lecture attendance rates at university and related factors. *Journal of Further and Higher Education*, 36 (1), 17-40.
- Kember, D. (2000). *Action learning and action research: improving the quality of teaching and learning*. London: Kogan Page.
- Langan, M. and Witton, N. (2016). Understanding Learner Disengagement: Why do students pay £9,000 a year not to attend lectures? *Learning and Teaching in Action*, 12(1), 56-70.
- Lewin, K. (1946). Action research and minority problems. *Journal of social issues*, 2 (4), 34-46.
- Locke, T., Alcorn, N. and O'Neill, J. (2013). Ethical issues in collaborative action research. *Educational Action Research*, 21 (1), 107-123.
- Mason, J. (2002). *The discipline of noticing*. Oxon: Routledge.
- Massingham, P. and Herrington, T. (2006). Does attendance matter? An examination of student attitudes, participation, performance and attendance. *Journal of University Teaching and Learning Practice*, 3 (2), 82-103.
- McNiff, J. (2016). *You and your action research project*. London: Routledge.
- Molesworth, M., Scullion, R. and Nixon, E. (eds) (2011). *The Marketisation of Higher Education and the Student as Consumer*. London: Routledge.
- Moore, S., Armstrong, C., Pearson, J., (2008). Lecture absenteeism among students in higher education: a valuable route to understanding student motivation. *Journal of Higher Education Policy and Management*, 30 (1), 15-24.
- Noffke, S. (2009). 'Revisiting the professional, personal and political dimensions of action research', in S.Noffke and B. Somekh (eds) *The Sage Handbook of Educational Action Research*. (pp. 6-23) London: Sage.
- Ranci re, J. (1991). *The ignorant schoolmaster: five lessons in intellectual emancipation*. Stanford: Stanford university press.
- Somekh, B. and Lewin, C. (2003). 'Action Research', in B.Someck and Lewin, C. (eds) *Research Methods in the social sciences* (pp. 89-96). London: Sage.
- Turkle, S (2011). *Alone Together: Why we expect more from technology and less from each other.* , New York: Basic Books.
- Zeni, J. (2009). 'Ethics and the personal in Action Research', in S.Noffke and B. Somekh (eds) *The Sage Handbook of Educational Action Research* (pp. 254-267). London: Sage.

Participation in International Telecommunication Projects for Intercultural Communication and Creating an English Authentic Environment Development

Kalizhanova, Anna^a; Ibrayeva, Bayan^b and Ishmuratova, Margarita^c

^aForeign Languages and Intercultural Communication Department, Bolashak Academy, Kazakhstan, ^bForeign Languages and Intercultural Communication Department, Bolashak Academy, Kazakhstan, ^cBotany Department, Karaganda State University named after academician Ye.A. Buke

Abstract

This article describes the experience of participation in one international telecommunication project My City and Me, conducted by the U.S. International Education and Resource Network (iEARN) that united 26,000 teachers, around 2,000,000 students from 140 countries for working on 3,000 projects in 30 different languages. The described project aimed to foster ESL learner' awareness of intercultural communication. Moreover, the Project participants learned how to choose the right technologies and software and create an authentic English environment.

Keywords: *IEARN, information and communication technologies, communicative skills, authentic environment.*

1. Introduction

Nowadays, the Kazakhstani government sets such objectives as upbringing and creating a communicative and competent specialist that will manage to represent the country in the world arena with all dignity and respect (“UNDP in Kazakhstan” 2004). A national educational project “The Trinity of Languages” aims for the increasing the role of Kazakh language as a state one, accepting the high significance of Russian language and developing favorable conditions to master English language (Seitzhanova 1970). However, Kazakhstan still faces many issues connected with the lack of English native speakers due to the latter unwillingness to work in the far and unknown place, the impression about which is full of stereotypes and prejudices (“Teach English in Kazakhstan”).

Another issue regarding the contemporary educational process involves the demand for teachers to use a lot of software equipment, which does not mean a high quality of performance and assimilation of the material. The choice of any software should be justified and appropriate, so that information and communication technologies help in solving specific problems. In other words, techniques should not dominate in the educational process. According to Varshuer and Hailey (1998), the goal of any software should involve learning experience in the development of authentic and communicative environment with the help of multimedia tools by a thorough evaluation of any programs to meet personal and professional needs of students.

In this regard, the ESL teachers of the Private Institution Bolashak Academy decided to participate in the international, telecommunication project *My City and Me*, held by the International Education and Resource Network (iEARN). This organization unites 26,000 teachers and around 2,000,000 students from 140 countries for working on 3,000 projects in 30 different languages (IEARN Collaboration Centre). Since 1998, the slogan of iEARN is “Linking Communities to Make a Difference in the World” (IEARN Collaboration Centre). iEARN involves students from different corners of the Earth in network project work and provides a platform for publishing their projects’ results and sharing experiences. iEARN grants students an opportunity to organize a variety of conferences or projects individually within the sphere of suggested topics with the help of information and communication technologies.

The choice of the project *My City and Me* was justified by the students’ desire to promote their hometown Karaganda in Kazakhstan, familiar for the most only thanks to the song by pop-band *Dune*. The Project aimed at creating vitally crucial for Kazakhstani ESL students an authentic English-speaking environment as well as building necessary for safe and peaceful coexistence in the modern world awareness of the intercultural communication skills. Additionally, the 1st-year ESL students were supposed to learn to choose the right

software and information and communication technologies for successful implementation of the Project.

2. Objectives and Methods

The experiment involved four 1st grade students of the specialty “*Foreign Language: Two Foreign Languages*” of the Department of Foreign Language and Intercultural Communication and lasted from December to April 2017.

The quantitative and qualitative research methods, as well as data analysis and processing, were defined to complete the Project.

3. The Flow of the Experiment

3.1. Stage 1

The project was subdivided into several phases. The first step included brainstorming, choosing appropriate informative and communicative technologies, identifying the scope of workflow, and delegating tasks. The Bolashak Academy students decided to use Trello Board – a free online platform that was highly popular among IT engineers in their projects implementation.

Additionally, with the help of Google forms, the students surveyed Karaganda 11th-grade graduates’ opinions about all pros and cons of living in Karaganda as well as either staying or leaving the city based on the town’s potential for personal and professional development.

3.1.1. Survey Data Processing

The six-question survey allowed to receive the answers of one hundred and twenty 11th-grade students of different schools in Karaganda.

52.5% of respondents answered positively on the first question “Do you think Karaganda is a good place for living?”, whereas 45% of respondents answered negatively, but 2.5% ones chose the option “it is hard to answer.”

The second question “How do you think are there more advantages or disadvantages of living in Karaganda?” indicated 60% of surveyed who could see only disadvantages whereas the rest 40% voted for advantages.

The third question revealed Karaganda teens’ favorite places: Central Park (29.1%), shopping centers (4.1%), some cafés and fast-food restaurants (35.7%), cultural sites (21.6%), theatres, cinemas (6.5%), and no favorite place (16.6%).

76.6% of respondents showed their willingness to leave Karaganda when answering the fourth question “Are you planning to stay in Karaganda or leave in another city/country after graduating?” Only 23.3% of future graduates thought to stay in their hometown.

The fifth question “Could you advice foreign residents or citizen of our country, who live in other cities to visit Karaganda city?” showed that 53.3% of youngsters would approve the arrival of foreigners in Karaganda, while 44.16% of surveyed would not recommend visiting this city.

The last sixth question asked the future school graduates to estimate the level of lifestyle in Karaganda from 1-10 and resulted in 57.5% of surveyed, who gave lower than 5 points. Also, 16.6% of future graduating students gave Karaganda 5 points, whereas, surprisingly, 25.8% of respondents rated Karaganda higher than 5.

3.1.2. Survey Results

On the whole, more than 50% of young people dreamed of leaving Karaganda after graduating because they could see no perspectives for a future career path and professional development. Moreover, the surveyed teenagers named such favorite places as Central Park, City Mall, and some cafés but not museums or theatres for leisure-time and cultural activities in the city. Thus, the conducted survey results defined the second stage of the project that included the presentation of Karaganda in the form of a virtual tour around Karaganda’s universities with the help of *Windows Image Composite* software to reflect the high academic and creative potential.

3.2. Stage 2

Instead of ordinary presentations made in PowerPoint by the majority of the iEARN participants from different countries, the students of the Private Institution Bolashak Academy decided to create English comics, where they would show the most beautiful places of Karaganda in the image of the comics’ characters (see figure 1).



Figure 1 demonstrates some slides from the cartoons made by the students of Bolashak Academy to present the universities of Karaganda City.

For that purpose, Bolashak students chose the program *StoryboardThat* (The World's Best Free Online Storyboard Creator). Such a fresh solution on Karaganda City presentation met the approval of the participants from different countries and was recognized as the most unusual and exciting.

3.3. Stage 3

The next phase involved the students of Bolashak Academy in collaboration with other countries' participants for the joint international project creation and required to choose one of the proposed by the organizer's topics and become rated by the age. In the pursuit of the friendship with the native English speakers and exchange of intercultural values, the students of Bolashak Academy joined the USA team. At the same time, the students of Bolashak Academy extensively commented and supported participants from Russia, China, Egypt, Turkey and many other countries, which got less attention compared to the participants from Canada, England, or the USA. The students from Karaganda could successfully create an authentic English-speaking environment and established a friendly connection with age mates from different countries via Skype and Facebook.

4. iEARN Project Participation Analysis

The iEARN project *My City and Me* allowed its participants from Karaganda to contribute equally and proportionately to their possibilities and interests. In particular, skilled in photography student was responsible for taking panoramic pictures and creating a virtual tour around Karaganda. Another student, interested in poetry, wrote small poems about Karaganda for the comics. The students with the dominant interpersonal intelligence (Gardner 1983) was in charge of timely contacting and responding to the participants from other countries via Skype or Facebook. The 4th student was responsible for attaching all Project products to Trello Board. In all, such a mutual collaboration made such participation rewarding and fruitful. Furthermore, the students limited and combined the number of technologies for achieving the project goals.

Bolashak Academy students highly estimated the experience of participation in the Project *My City and Me*, held by iEARN, and pointed out the tremendous benefit of the further use of technologies, active communication with non and English speaking participants, and the development of virtual tour and comics. The Project demonstrated that the appropriate goal setting outlined right strategies and techniques to develop useful products and contacts for students in further personal and professional development.

4.1. Advantages

Analyzing strengths and weaknesses of participation in international telecommunication project iEARN, the advantages entirely are:

1. the rise of the social significance of students by participating in international telecommunication projects;
2. getting to know the process of the global project from planning all stages and setting goals to the successful realization of the plan;
3. extension of the students' intercultural awareness and leadership skills, such as initiatives, synthesis, analysis, collaboration;
4. an additional English-speaking environment's creation by establishing the connection with native speakers that increased the participants' English proficiency level;
5. the reasonable choice of technologies, appropriately adjusted to the project's each stage's need;
6. maintaining the level of motivation for learning English through the realization of its importance for intercultural communication and further development in the professional and personal life;
7. education of patriotism and love to the hometown and the motherland

4.2 Disadvantages of the Project

It is necessary to mention following disadvantages, typical for such projects:

1. dependence on external factors, such as a timeless response to comments and messages by other project participants;
2. biased attitude to the students from not English-speaking countries, such as Egypt or Bangladesh, caused by too extensive attention to English native speakers;
3. lack of the possibility to establish a full connection with other participants within the only iEARN platform; further communication with other participants can switch to the social networks or Skype upon an initiative of participants;
4. irrational time-management, assigned to different stages of the project;
5. short life-cycle of such projects due to lack of confidence in further joint work during the whole project workflow;
6. lack of consistent and regular engagement of participants from different countries in the project: English speaking countries' participants rarely and weakly connected to the developing countries, dominated by the substantial quantitative overbalance.

5. Conclusion

Summing up, positive impressions from the participation in iEARN Project *My City and Me* outweighed the drawbacks and allowed concluding that involvement in similar projects develops intercultural communication skills and improves English language knowledge. Moreover, such projects form cultural and social, linguistic, and communicative competences, removes the linguistic barrier, creates an authentic English environment, and develops research, organizational, and leadership skills. Finally, taking part in international telecommunication projects raises social significance and helps fulfill the creative potential of each project participant. In conclusion, the participation in the global scheme on the iEARN platform sufficiently changes the script “education-learning,” broadens the scientific and intercultural horizons and goes beyond the bounds of a particular city and even the country.

References

- Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. New York: Basic Books.
- iEARN Collaboration Centre. (n.d.). Retrieved January 24, 2018, from <https://iearn.org/>
- Seitzhanova, A. et al. (1970). New Trend of Education in Kazakhstan: English as the Medium of Instruction. Retrieved from <https://econpapers.repec.org/RePEc:pdj:rpieb:v:15:y:2015:i:3:p:113-116>
- Teach English in Kazakhstan | Information for English teachers. (n.d.). Retrieved from <http://www.eslbase.com/countries/teach-english-in-kazakhstan>
- The World's Best Free Online Storyboard Creator. (n.d.). Retrieved January 24, 2018, from <http://www.storyboardthat.com/>
- UNDP in Kazakhstan. (2004). Retrieved from <http://www.kz.undp.org/>
- Warschauer, M., & Healey, D. (1998). Computers and Language Learning: An Overview. *Language Teaching*, 31(02), 57. doi:10.1017/s0261444800012970

Introducing Geosciences in a blended Education Master degree

Huguet, Carme ^a; Francisco Blanco-Quintero, Idael^b; Henao Mejía, Martha Cecilia ^c;
Moreno Vela, Francy Julieth^c; Chimbí Sanchez, Lizeth Andrea^c

^aGeoscience department, Universidad de los Andes, Colombia, ^b Departamento de Ciencias de la Tierra y del Medio Ambiente, Universidad de Alicante, Spain ^cConecta-TE Center on education innovation, Universidad de los Andes, Colombia.

Abstract

We aimed to introduce geoscience to a group of primary and secondary teachers without previous knowledge of the subject, since this branch of science has only recently been included in the science basic program. While all students had completed university education, none had any geoscience background, thus the course was designed at a basic level. Contents and activities were carefully selected to provide a good introduction to geosciences giving the students the basic concepts and letting them apply new knowledge within a problem based strategy. Since the students of the module work full time, the master was designed in a blended format providing flexibility of work hours. The blended model also helped students from the wide geographical region interact and form long lasting collaborations. Students reported that collaborative learning was necessary and key to their learning process. They also stated that the contents of the course were sufficient, clear, organized and interesting. We view the module as a success since all students reported enjoying the module and building novel knowledge in the field of geosciences. Additionally since the students are in turn teachers we were very happy to learn some of them will implement geosciences in their activities in the future.

Keywords: *Blended education; problem based learning; active pedagogy; collaborative learning; master; geoscience*

1. Introduction

We present the implementation of a geoscience module within a Physics and Geoscience course, for a blended Master in Education, imparted by the Andes University, Bogotá, Colombia. The Geoscience module had 18 students who are school and high school teachers in full time employment in the Tolima Department (Fig. 1). The students present a range of educational backgrounds (Fig. 1a) and teach a variety of subjects at their institutions Fig. 1b).

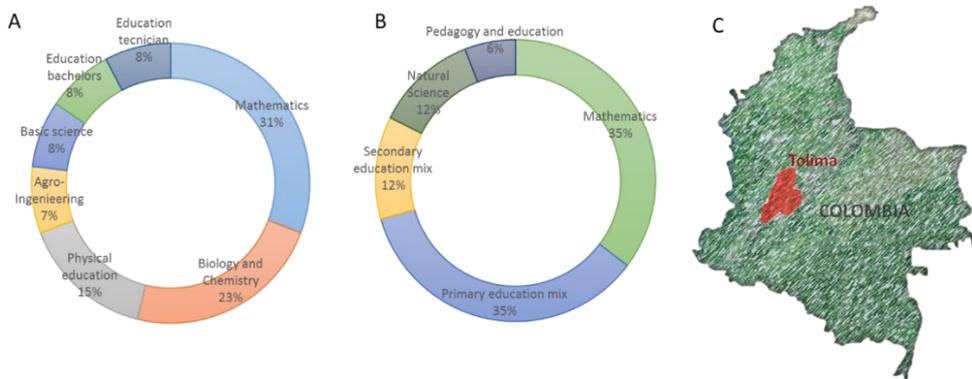


Figure 1. Description of student population taking the blended Master on Education imparted by the Universidad de Los Andes in Ibagué, Tolima; A) Education that the students had when starting the master; B) Classes the students impart on their own institutions; C) Map of Colombia, the Tolima region has been highlighted in red.

While geoscience is part of the basic science knowledge it has only recently been included in the education guidelines from the Colombian government (Ministerio de Educación de Colombia 2006). Therefore the students of the blended Education master had no previous knowledge of earth sciences.

The geoscience **module contents** follow the guidelines of the Ministry of Education of Colombia about the application of geoscience concepts in the different courses at school and high school level (Ministerio de Educación Nacional de Colombia, 2006). The idea was to make the content challenging for professionals that already completed university degree (Fig. 1a) but at the same time accessible and interesting to none specialist (e.g. Yuretich, 2001). We also had the challenge to introduce a completely new subject to the students since geosciences is not included in the basic education in Colombia.

The main challenges of the blended module in geosciences were 1) offer the means for the students to combine their daily workload with studying a master; 2) promote collaborative learning; 3) deliver in 8 weeks a basic education in earth sciences to a very heterogeneous

student base; 4) use a range of activities that aided effective learning. The first and second challenges was addressed through **blended learning** strategies (Graham 2006).

While many definitions have been suggested, blended learning could be defined as an approach that integrates web-based teaching and learning mode with face-to-face interaction (see Maarop and Embi, 2016 for review). Blended learning is supposed to improve student participation, but issues like poor time management or lag of interaction with peers and teachers have been reported in some instances (Graham, 2006; Maarop and Embi, 2016 and references therein). This was the reason the module was designed to promote **collaborative learning** within a blended format.

The concept of collaborative learning, though student pairing to achieve an academic goal has been widely researched and advocated (e.g. Dillenbourg, 1999). The term "collaborative learning" can be defined as a method in which students work together in small groups toward a common learning goal (e.g. Dillenbourg, 1999). Even though online activities can be collaborative, the in site classes are considered key in developing synergies between the students (Graham, 2006; Maarop and Embi, 2016).

Finally we wanted students to engage in **active learning**, as it provides greater appropriation of knowledge and deeper understanding based on synthesising, critically assessing and transforming basic knowledge, which can be seen as 'learning better' (e.g. Yuretich 2001; Freeman et al. 2014). For that professor IFBQ selected a range of activities that required applying the knowledge acquired to solve problems. **Problem-based learning** has been proven to increase learning and improve retention (e.g. Yuretich, 2001). In the present case the project on Rocks from the Tolima region (where the students came from; Fig. 1c) is a great example of problem based learning.

2. Methods

2.1. Structure of the module

The Geoscience module took place between the 1st of October and the 26th of November 2017, starting on week 9 of the master's second semester (Table 1). Three in site sections were included (shown by stars in Table 1) on Saturdays from 7 to 10 am. The module was divided in 3 content sections, 1) Earth origin, structure and plate tectonics; 2) Volcanos, earthquakes, minerals and rocks; and 3) Life origin, fossils and geological time (Table 1).

Table 1. Timeline of the course with the contents covered during the week period of the Geoscience module. Stars indicate on-site lectures by CH.

Content Covered	W-9	W-10	W-11	W-12	W-13	W-14	W-15	W-16
Earth Origin, Structure and plate tectonics	★							
Volcanoes, Earthquakes, Minerals and Rocks					★			
Life origin, Fossils and Geological scale								★

2.2. Tools for evaluation

Students undertook an online survey in order to evaluate a range of qualitative aspects related to the learning environments of the module. The team at Conecta-te (Center on education innovation), Los Andes University, Colombia, developed a survey to measure the key conditions of learning blended environments using the **Likert scale** (Likert, 1932). The Likert scale was developed in 1932 as the familiar five-point bipolar response that most people are familiar with today (Likert, 1932). The scale assigns a numerical value of (1) totally disagree; (2) disagree; (3) nor agree or disagree; (4) agree and (5) totally agree.

3. Results and discussion

While many aspects of were evaluated, in line with our objectives for the module, we will focus on 1) collaborative learning and interaction; 2) the quality of the geoscience module contents and 3) the contribution of the proposed activities to the learning process.

3.1. Collaborative learning and interaction:

Collaborative work is essential to improve knowledge acquisition and student motivation (e.g. Dillenbourg, 1999; Attard et al. 2010). In fact, collaborative learning has been shown to enhance many transversal skills such as critical thinking or teamwork. However, this type of learning is challenging when working on a blended context (e.g. Maarop and Embi, 2016). Many of the e-activities were selected to foster interaction with peers and the teacher.

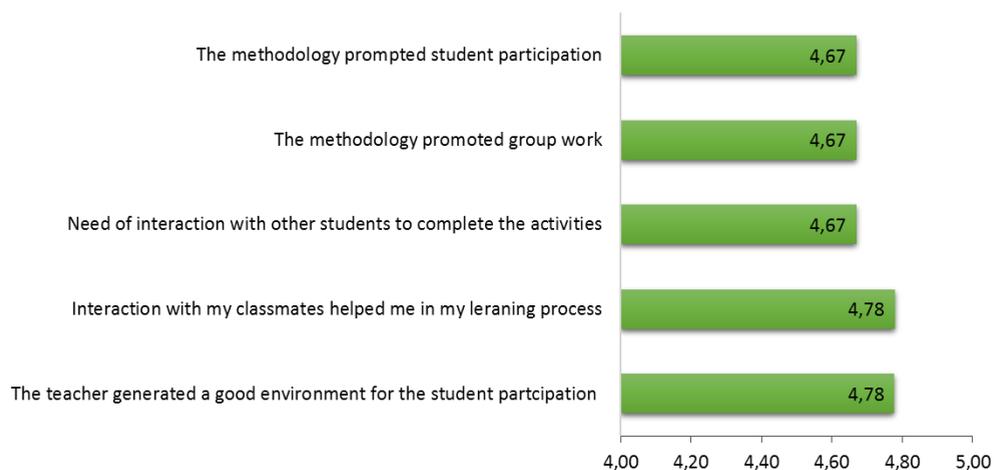


Figure 2. Perceptions of collaboration and interaction within the Geoscience module. Likert scale of evaluation is from 1 to 5 but has been enhanced to start from 4 since all values are above that.

Students rated how the methodology prompted student participation and group work with a 4.67 (Fig. 2). It was found in previous projects that group homework assignments were less effective in promoting teamwork, since group homework was usually undertaken by one enthusiastic student or divided among team members to undertake individually (CH personal observation). Therefore, the activities in the master module were designed so they would require interaction between group members to be completed and were successful in that respect with a 4.67 mark allocated by the students (Fig. 2).

A key component of collaborative learning is that students are responsible for their peers' learning as well as their own and the success of one student helps the others to be successful (Dillenbourg, 1999). The interaction with their peers was rated in 4.78 as helping them with their learning (Fig. 2), thus confirming the importance of teaching between pairs and the adequacy of the module design to achieve that goal.

3.2. *Quality of Geoscience Module contents*

Since the introductory geosciences course at Andes University is all face-to-face and additionally has a much higher credit load, designing the contents and activities of the module in the education master was challenging. Professor IFBQ together with Conecta-te, course developer MCHM designed the course to cover three main areas of the geosciences according to the Ministerio de Educación de Colombia (2006) published guidelines (Table 1). They selected activities that would help integrate the novel concepts acquired by the

students to the construction of knowledge in geosciences and that would require active learning.

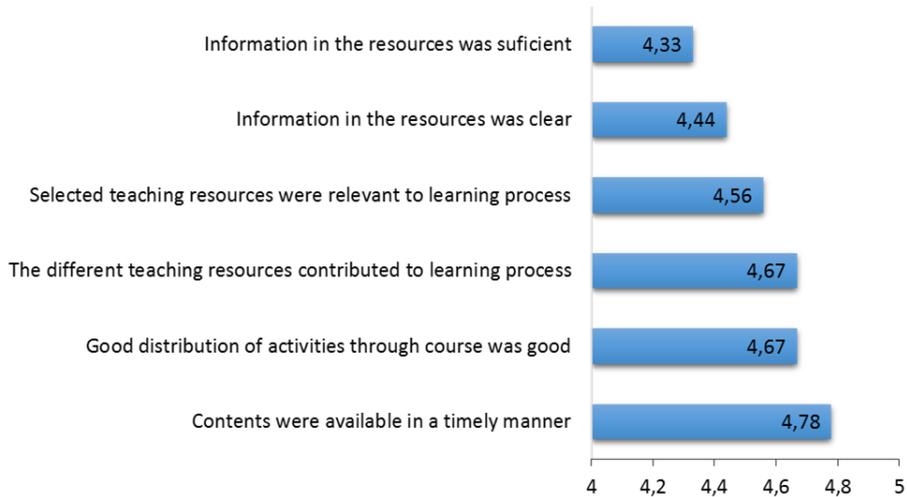


Figure 3. Student evaluation of course contents based on clarity, variety and quality. Likert scale of evaluation is from 1 to 5 but has been enhanced to start from 4 since all values are above that.

The information provided was considered sufficient (4.33; Fig. 3) and clear (4.44; Fig. 3) which was one of the challenges faced by the module designers in teaching geoscience to that particular student base (Fig. 1a). The resources included a range of videos and an introduction to geoscience book (Tarbuck et al. 2005), the students were encouraged to find other materials independently. The students agreed that the selected resources were relevant (4.56; Fig. 3) and contributed to their learning process (4.67; Fig. 3). Additionally the contents were readily available (4.87; Fig. 3) and well distributed through the course (4.67; Fig. 3). Thus, in general the contents were very highly rated and viewed to be conducive significantly to the learning process.

3.3. Contribution of the proposed activities to the learning process

In terms of aiding the learning process the proposed activities were rated between 4.22 and 4.89 (Fig. 4). While the participation on an online forum was rated the lowest (4.22, Fig. 4) it is still highly rated as conducive to their learning. That is even more positive when we consider that some of the students had limited access to internet during the week, which has been shown to hamper blended strategies (Maarop and Embi, 2016).

Even though two different tools, Wiki pages and Paddlet, were used by the students to produce online material, students rated them equally with a 4.56 (Fig. 4) for their

contribution to their learning process. Groups were picked randomly and were different for the two activities and the contribution of all members of the group was assessed.

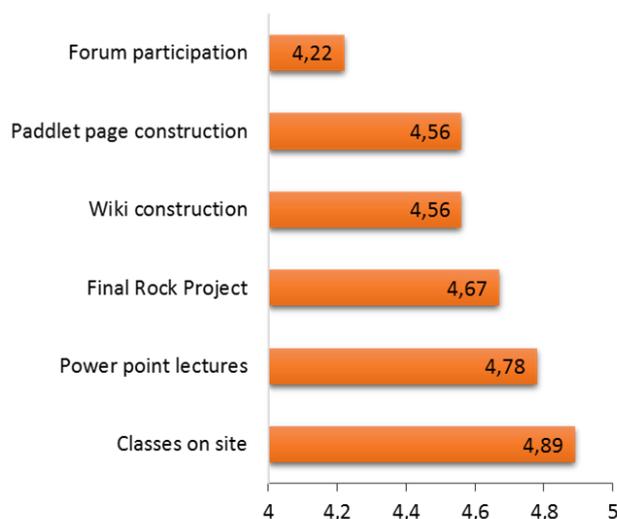


Figure 4. Contribution of activities proposed during the geoscience module to students' learning process. Likert scale of evaluation is from 1 to 5 but has been enhanced to start from 4 since all values are above that.

The final project to study Rocks from the Tolima area was introduced as a departure from the traditional 'spoon-feeding' teaching, promoting student's active work through realistic and challenging project. It has been shown that applying knowledge to complete a project results in better learning and higher motivation (e.g. Sodupe-Ortega et al. 2017). In the present case we were tapping into the intrinsic motivation, which is related to the "human propensity to learn and assimilate" (Ryan and Deci, 2000) to provide a more fulfilling and meaningful learning. The fact that the project was based on the area of residence and work of the students made it even more relevant to them with a 4.67 evaluation (Fig. 4) on the contribution it made to their learning process. Some of the students involved their pupils in the sample collection thus resulting on a trickle down strategy not anticipated by the course designers.

Still the highest rated activities were those done in class with the power point lectures attaining a 4.78 and the teacher performance a 4.89 (Fig. 4). Thus, the direct interaction with the teacher was crucial to the success of the Geoscience module and the learning process of the students. Justifying the need for a blended strategy rather than a fully online one.

Additionally the articulation between in class and online activities was considered good by 89.9% of the students with a mark of 4.44 on the Liker scale.

4. Conclusions

The Geoscience module received very good ratings from the students with no evaluation below 4.22. This is specially fulfilling since the students are education professionals themselves.

The design of the course was successful in making accessible the novel geoscience subject to all the students in the master, as demonstrated by the fact that all of them passed the module (data not shown).

The choice of activities both online and in class achieved our goal to foster collaborative work and interaction both among students and between students and teacher.

The proposed activities were considered pertinent and conducive to learning by all students in the class.

Additionally since the students are in turn teachers we were very happy to learn some of them will implement geosciences in their activities in the future. Making this experience a success also in disseminating that subject on the country.

References

- Attard, A., Di Iorio, E., Geven, K., & Santa, R. (2010). Student-Centred Learning: Toolkit for Students, *Staff and Higher Education Institutions*. European Students' Union (NJ1).
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410-8415.
- Graham, C. R. (2006). Blended learning systems. *The handbook of blended learning*, 3-21.
- Likert, R., (1932). A Technique for the Measurement of Attitudes, *Archives of Psychology*, 140, 5.
- Maarop, A. H., & Embi, M. A. (2016). Implementation of blended learning in higher learning institutions: A review of literature. *International Education Studies*, 9(3), 41.
- Ministerio de Educación de Colombia (2006). Estándares Básicos de Competencias en Lenguaje, Matemáticas, Ciencias y ciudadanías: guía sobre lo que los

estudiantes deben saber y saber hacer con lo que aprenden. Bogotá, D.C: MEN.
Recuperado de: http://www.mineducacion.gov.co/1621/340021_recurso_1.pdf

Dillenbourg, P. (1999). What do you mean by collaborative learning? 1-19pp.

Ryan, R.M. & Deci, E.L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology* 25: 54–67. doi:10.1006/ceps.1999.1020.

Sodupe-Ortega, E., Martínez-de-Pison-Ascacibar, F. J., Urraca, V., Antonanzas-Torres, J., & Sanz García, A. (2017). Assessment of microproject-based teaching/learning (MicroPBL) experience in industrial engineering degrees. In *HEAd' 17 proceedings of the 3rd international conference on higher education advances*.

Tarback, E. J., & Lutgens, F. K. (2005). *Ciencias de la Tierra: Una introducción a la geología física*, 8^{va}. Edición.

Yuretich, R. F., Khan, S. A., Leckie, R. M., & Clement, J. J. (2001). Active-learning methods to improve student performance and scientific interest in a large introductory oceanography course. *Journal of Geoscience Education*, 49(2), 111-119.

In search of health evidence. Proposal for self-learning

Blasco-Igual, Jose María^a; Sanchis-Sánchez, Enrique^a; García-Molina, Pablo^b; Balaguer-López, Evelyn^b; Georgieva, Sylvia^c and Sánchez-Lorente, María Montserrat^d

^aDepartment of Physiotherapy, University of Valencia, Spain. ^bDepartment of Nursing, University of Valencia, Spain. ^cDepartment of Methodology and Behavioral Sciences, University of Valencia, Spain and ^dConselleria de Sanitat, Generalitat Valenciana. Spain.

Abstract

Information sources are a key tool in the current social and technological evolution. While it is true that not all are benefits. In the same way the over information is evident, and can lead to the extraction of conclusions that, in many cases, becomes confusing, diffuse, or even erroneous. In this context, the use of the 6S pyramid can help you find the best research evidence with the least amount of time and effort. This work proposal exposes the methods and development of a support and training program to search for evidence in health. To do so, the learning resources will be taught through a specific seminar and the option of using self-directed online resources, freely accessible, from the “National Collaborating Center for Methods and Tools” (NCCMT) of McMaster University. Later, the assessment of competences will be undertaken. The expected results for the students is to be able to perform the analysis of their searches based on elements that can later include in their final work, with the benefits that this implies in the education.

Keywords: *Self-learning; Quality-Assessed; Evidence-Informed; Preappraised Resources; 6S Pyramid.*

1. Introduction

Information sources are a key tool in the current social and technological evolution. However, it is true that not all are benefits. In the same way the over information is evident, and can lead to the extraction of conclusions that, in many cases, becomes confusing, diffuse, or even erroneous. Therefore, it is necessary to know how to discern and contrast the evidence that students use (in many cases) indiscriminately to complete the large number of jobs that new teaching methodologies and education plans require for the attainment of competences.

In past years, accessing the evidence meant having knowledge of literature search and the ability to apply of critical appraisal skills to separate lower-from higher-quality clinical studies. The databases and other sources that should be searched to identify evidence of clinical effectiveness depend on the review question (National Institute for Health and Care Excellence, 2012). However, over the last decade, many practical resources have been created to facilitate ready access to high-quality research. Currently, new sources of information are available to help us recover the best updated evidence quickly. These are called "Preappraised Resources" because they are the result of a filtering process and only include high quality studies and also because they are updated regularly (DiCenso, Bayley, & Haynes, 2009).

In 2001, R. Brian Haynes (one of the natural leaders of the Evidence-Based Medicine Working Group) synthesized, in a pyramidal model of four strata, the information resources according to their usefulness and properties in the decision making in health care. This hierarchical structure was called the "4S" pyramid, by the initials in English of the four resources that comprise it: Systems, Synopses, Syntheses and Studies. The same author added, in 2006, one stratum more to the pyramid (Summaries), known, therefore, as the pyramid of the «5S». Finally, in 2011 the Synopses were divided into two groups (Synopses of Studies and Synopses of Syntheses). In this final pyramid of the «6S», the ascending levels involve a smaller volume of information, but a greater degree of processing of it.

The use of the 6S pyramid can help you find the best research evidence with the least amount of time and effort.

Each level of the 6S pyramid (Figure 1) is based on research evidence from the lower layers, so starting a search at the top (or the highest possible layer of the 6S pyramid model) yields the most synthesized research evidence and of the highest quality (DiCenso et al., 2009).

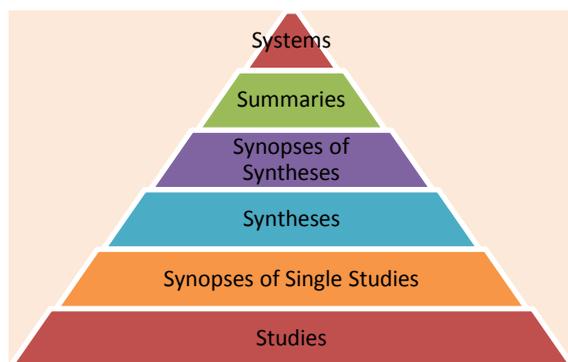


Figure 1. 6S pyramid.

Most health sciences students initiate the search by the lowest level, this means that the original studies are used. However, it is necessary to understand how to use the search engines to find the study that interests and then finally to interpret and apply the individual study without an expert opinion. This search strategy as well as being a tedious and slow process does not guarantee that the best available information is actually used.

It is essential to modify this erroneous practice progressively. For all these reasons, this educational innovation activity is suggested with two objectives; to know the use of different sources of information or resources according to the needs of each research question and to classify the different types of source and resources according to the Haynes pyramid.

Evidence-based practice is an integral component of the health professionals' curriculum in undergraduate, postgraduate and clinical practice training. The concepts of levels of evidence and degrees of recommendations are fundamental for the definition of evidence-based practice, as they attempt to standardize and provide professionals with convincing rules to evaluate published research, determine its validity and summarize its usefulness in clinical practice (Upshur, 2003).

McMaster University is one of the institutions that leads internationally the harmonization of evidence hierarchies and the understanding of what is an evidence-based recommendation. This understanding allows for more consistent patterns of practice in order to benefit the patient.

The central focus of open learning is commonly placed on the "needs of the student as perceived by the student" learning as an innovation both within and across academic disciplines, institutions of higher education, collaborative initiatives between institutions and education for young learners (D'Antoni, 2009).

Generally, through open learning, activities that enhance learning opportunities within formal education systems or expand learning opportunities beyond formal education systems are carried out. It is not limited to classroom teaching methods or learning interactive approaches (D'Antoni, 2009).

2. Proposal

All undergraduate students have to perform works in which they must know and assess the scientific evidence of the subject on which they have to carry out the required activity in the teaching guides of the different subjects

In order to perform an effective literature search, students have to know how to clearly define the question or problem to be studied and to know which is the most appropriate research design to answer the question asked. The next issue that students have to deal with is the one that is undertaken in this activity: knowing where to look for information with the best available evidence to address the problem and also to establish a search strategy that allows to find the most solid quality and most relevant evidence.

Development of a support and training program to search for evidence in health, based on learning resources through a specific seminar and the option of using self-directed online resources, freely accessible, from the “National Collaborating Center for Methods and Tools” (NCCMT) of McMaster University.

These online learning resources have been developed to support the process of evidence-informed public health. Each module relates to at least one step in the process as indicated by Dobbins (Dobbins, 2017): 1) define, 2) search, 3) appraise, 4) synthesize, 5) adapt, 6) implement, 7) evaluate. Our proposal is related to the search module. Registration is free and simple.

2.1. Aims

The proposal has the following objectives:

- To know the use of different sources of information or resources according to the needs of each clinical question.
- To classify the different types of sources and resources according to the Haynes pyramid.

2.2. Methodology

The planned methodology contains the following steps: To groups

A. Conducting an initial training seminar, which will consist of two parts.

1. Theoretical-practical session in which the "Search for evidence" program will be exposed, in which the evidence will be defined and how to search and discern the level of evidence. The objectives will also be exposed, as well as the sequencing, methodology, and knowledge to be achieved.

A document will be provided as a guide or roadmap that will guide students on the following steps in order to achieve the aims. One hour is expected.

2. Presentation, for those students who choose to complete knowledge and skills, online tools and resources and access to the learning center NCCMT Learning Center to perform the module "Searching for Research Evidence in Public Health".

- The module can be completed at home or on the computers of the faculty.

- Term of completion: Period of achievement of the Program.

- Duration of online training: 3-4 hours.

- Explanation about obtaining certification of competencies of the NCCMT of the McMaster University of those students who complete the module and achieve at least 75% in the final test.

- Requirements for the use of the tool and resource: average comprehension level of English or French.

- Other features: you can work on the modules individually or as part of a group. Each participant in a group must have an individual NCCMT account. You can choose to complete the NCCMT learning module as an individual or as part of a group.

B. Evaluation of the experience session:

1. Evaluation of the knowledge acquired.

2. Assessment of the difficulties encountered and the degree of satisfaction.

A self-administered questionnaire based on questions with answers with a Likert scale will be used.

The evaluation will be subjective on the part of the students, and objective on the part of the professors, who will base their criterion not only on the perception but on the evaluation of the papers presented in the subjects.

2.3. Results

A total of 58 students from the Faculty of Nursing (2 year) participated, of which 47 were women and 11 were men, with mean age of 20.2 (2.6).

Fifty participants completed the training and the forms that were fulfilled before and after the training seminar. The participants shown a slight but significant increase in the knowledge right after the training sessions with $p < 0.05$, as shown in Table 1.

Table 1. Results on knowledge evaluation right after the training

	Pre	Post	P-Value
n	58	50	0.096
Fails	6,07 (1,98)	5,29 (1,67)	0.093
Range	[2-11]	[3-10]	
Score	6,21 (1.14)	6,69 (1,05)	

The level of satisfaction as appraised in terms of utility, method, organization and teaching team was good with a mean value of 7.83 (1.41) as shown in Table 2.

	Utility	Method	Organization and Resources	Teaching team	Overall assessment
Mean	7.59	7.45	7.99	8.58	7.56
Std	1.43	1.31	1.28	1.11	1.61
Min	3.00	4.50	4.50	5.00	2.00
Max	10.00	10.00	10.00	10.00	10.00

Results in the use of resources used in the group works performed during the course and complying with higher levels of evidence will be available by the end of May 2018.

2.4. Conclusion

These types of activities are of interest because they motivate students and provide a continuous added value that allow students to acquire and strengthen competencies for their future reality in the workplace.

References

- D'Antoni, S. (2009). Open Educational Resources: reviewing initiatives and issues. *Open Learning: The Journal of Open and Distance Learning*, 24(1), 3–10. <http://doi.org/10.1080/02680510802625443>
- DiCenso, A., Bayley, L., & Haynes, R. (2009). ACP Journal Club. Editorial: Accessing preappraised evidence: fine-tuning the 5S model into a 6S model. *Ann Intern Med*, 151(6).
- Dobbins, M. (2017). *Rapid Review Guidebook Steps for conducting a rapid review*. Retrieved from: <http://www.nccmt.ca/uploads/media/media/0001/01/a816af720e4d587e13da6bb307df8c907a5dff9a.pdf>
- National Institute for Health and Care Excellence. (2012). The guidelines manual: Process and methods [PMG6]. Retrieved from: <https://www.nice.org.uk/guidance/pmg6/resources/the-guidelines-manual-pdf-2007970804933%0Ahttps://www.nice.org.uk/process/pmg6/chapter/reviewing-the-evidence>
- Upshur, R. E. G. (2003). Are all evidence-based practices alike? Problems in the ranking of evidence, 169(7), 672–673.

Attitudes towards English in Cuban Higher Education. Recent Developments and Challenges

Van Splunder, Frank^a and Dávila Pérez, Geisa^b

^aLinguapolis, University of Antwerp, Belgium, ^bLanguage Department, Universidad de Oriente, Cuba.

Abstract

English is used as a lingua franca in an increasing number of domains. In higher education, English has become prominent as the language of course materials, scientific publications, research as well as teaching, a trend which is particularly noticeable in Europe. In Latin America, however, the surge of English is relatively recent, and within Latin America, Cuba is an interesting case. Whereas learning English was not encouraged in the 1980s, in today's Cuba English has gained importance, and learning and teaching English has become a priority.

The current research explores how Cuban students and lecturers of two different fields (English and Engineering) perceive the growing importance of English in today's higher education in Cuba. Data were collected by means of a questionnaire conducted at Universidad de Oriente, Santiago de Cuba. The results reveal a positive attitude towards English, which most participants perceive as very important for their career prospects. On the other hand, it was found that most respondents overrate their ability to communicate in English. Moreover, they are not acquainted with the Common European Framework of Reference for Languages (CEFR), even though the Cuban Ministry of Higher Education has accepted the CEFR as its official standard.

Keywords: attitudes; English language; higher education; Cuba; CEFR

1. Introduction

English is the language of globalization (Crystal, 2003; Dewey, 2007; Pennycook, 2010). This is mainly due to the worldwide dominance of the United States since World War II and the resulting use of English as a lingua franca in an increasing number of domains, including the economy, politics, and culture (Fishman, 2006). In higher education, English has become prominent as the language of manuals and course materials, scientific publications, research, as well as teaching, a trend which is particularly noticeable in Europe (Wächter, 2014). In Latin America, however, the surge of English is relatively recent, and the level of English tends to be generally low (English Proficiency Index, 2017). Within Latin America, Cuba takes a mid-position on the 2017 English Proficiency Index with a score of 50.83; i.e. ‘low proficiency’.

Cuba is a very interesting case as its relations with the United States have been strained since the 1959 Revolution. It was not until 2015 that diplomatic relations between both countries were resumed officially. In a groundbreaking move after more than half a century of estrangement, President Obama aimed to normalize relations between both countries, and Secretary of State Kerry presided over the official reopening of the US Embassy in Cuba on 24 August 2015. While Cuba was awash with hope that relations between both countries were eventually back to normal, the new administration appears to have dashed this hope as President Trump tightened the economic embargo on Cuba and released new, restrictive travel rules in 2017 (Alzugaray, 2017; Pope & Finn, 2017; Dembiczy, 2017; Grabendorff, 2017).

Consequently, learning and teaching English in Cuba should be understood in the context of this fraught relationship with its dominant neighbour. Whereas in the 1980s, learning English was not encouraged in Cuba and it was even seen as ‘supporting the Americans’ (Pignatelli, 2017), in today’s Cuba English has been gaining importance, and the learning, teaching and testing of English has become a priority. Thus, the Cuban Ministry of Higher Education (*Ministerio de Educación Superior*, henceforth MES) stresses the importance of foreign languages – English in particular – to be able to fully participate in a globalizing world (MES, 2013).

Following this new policy, the Ministry adopted the B1+ level; i.e. ‘Independent User’ according to the CEFR (Council of Europe, 2001) as a requirement for graduation, and students have up to four years to acquire the necessary language skills, both written and orally. In order to acquire these skills, students can attend English language courses, make use of academic services in English, or manage their learning independently. Language centres (Centros de Idiomas) as well as self-access centres (Centros de Auto-acceso) are set up to meet the needs of training in English.

The underlying assumption is that globalization necessitates English, and therefore the Cuban Ministry introduced a paradigmatic shift in the teaching and learning of English. Whereas during the period 1960-1982 the focus was on reading skills in a broad sense, and then, between 1983 and 1990, on reading skills for academic and professional purposes (Rivera *et al.*, 2017), at present the focus has shifted towards oral skills in the academic and professional contexts. Yet, Cuban universities still fail to achieve the desired level in the domain of communicative competence, and the level of proficiency in English of Cuban students entering higher education remains low and heterogeneous (Rivera *et al.*, 2016; MES, 2013). In addition, the level of motivation towards language learning tends to be low, and the students lack awareness of the need for English as a study and work tool.

2. Research objectives and methodology

The current research explores how Cuban language learners and teachers perceive the growing importance of English in today's higher education in Cuba. Data were collected by means of a questionnaire conducted at Universidad de Oriente in Santiago de Cuba in December 2017. The rationale to choose Universidad de Oriente is that this institution is the leading university in the eastern part of Cuba, and one of the main universities nationwide.

This study intends to answer the following research question: *How do language learners and language teachers in Cuba perceive the growing importance of English in their higher education?* In order to explore this question, two different areas of research were selected: English language students and their lecturers on the one hand, and Engineering students and their lecturers on the other hand. Whereas the former group was expected to take a more positive attitude towards English, the latter group was expected to take a less positive attitude or to have a lower level of motivation to learn English as their perceived need of English might be lower. That is, English may not be perceived as a top priority for many Cubans in their daily work context. Another hypothesis referred to age. Younger learners or users of English were expected to have more positive attitudes than the older generation as the latter had grown up in a different context in which English was not needed. Besides, many of these experienced lecturers had learned Russian instead of English, a language they are less acquainted with, while younger people might be more convinced of the need to learn English.

The data were obtained by means of a questionnaire, which was set up in Spanish. Since it was not feasible to pilot the questionnaire at Universidad de Oriente, it was conducted at the University of Antwerp with a group of Spanish-speaking students from various countries in Latin America, who also provided useful feedback. Both universities are involved in a transversal project set up by the Flemish Interuniversity Council VLIR-UOS (<http://www.vlir-uos.be>) with the aim to enhance capacity building in Cuba. The focus of

the present programme is on English language learning, teaching and testing in Cuban higher education.

Due to persistent problems related to the internet in Cuba and the fact that Cubans are generally not familiar with completing online forms, the questionnaire was paper-based (see Appendix). This also explains why the questionnaire was completed by a relatively small sample of respondents: 20 students and 10 lecturers from the English Department and 20 students and 10 lecturers from the Engineering Department. A larger sample would not have proven to be feasible in the given circumstances.

The questionnaire consisted of multiple choice questions relating to the respondents' personal profile (1), their perceived need of English (2), English courses taken (3), the place where these courses were taken (4), the participants' perceived level of English (5), standardized exams taken in English (6), and their familiarity with the CEFR (7). The final question was an open-ended question in which respondents were asked to make associations with English (8). The intended purpose of this item was to elicit personal and creative responses instead of restraining responses to fixed alternatives.

3. Discussion

The questionnaire revealed that the respondents' attitudes towards English are overwhelmingly positive. While 90% of the Engineering students considered English as **very important** and the remaining 10% considered it as **important**, all Language students, their lecturers and the Engineering lecturers perceived English as **very important** for educational and professional prospects. The hypothesis was therefore rejected in that no relevant differences could be observed between the English language students and their lecturers on the one hand, and the Engineering students and their lecturers on the other hand. Age did not appear to be significant either. Language and Engineering students from all academic years as well as young lecturers (with 10-15 years of experience at the university) and experienced lecturers (with more than 20 years of experience at the university) agreed on the relevance of English language in this new context of Cuban higher education.

In spite of these positive attitudes towards English language learning, 70% of the Language students and 60% of the Engineering students admitted that they had never enrolled in English language courses. In addition, 50% of the students from both areas stated to have learnt English without having attended any formal courses. This may be due to limited availability of language courses, high costs of private language tutors or lack of time. On the other hand, 40% of the Language lecturers and 50% of the Engineering lecturers, regardless of age, had taken English courses during and after university studies. Therefore,

it might be assumed that although students recognize the importance of English, they do not take steps towards formal English training unless they are certain they will need the language after university graduation.

Regarding the perceived level of English, respondents tended to overrate their ability to communicate in English. Based on the CEFR descriptors, most Language students and lecturers rated their level of English as C1 or C2, whereas their actual level is more likely to be within the B1-B2 range, particularly in the case of the students. Besides, many language lecturers may not be 'proficient users' (C1-C2) of English either, in spite of the fact that many of them have taken the Teaching Knowledge Test certified by the British Council (Radio Cadena Agramonte, 2017). The Engineering students and lecturers overrated themselves as well, as most of them (lecturers as well as students) rated their proficiency as B2, whereas their actual level is generally lower. Yet, it may be difficult to establish an accurate range, as most respondents have never taken a standardized language proficiency test that certifies their level of English. Moreover, a very low percentage of the participants is actually familiar with the CEFR, even though the Cuban Ministry of Higher Education has adopted the CEFR as its official standard. Concerning the final question, English is most commonly associated with communication, scientific research, bibliography, academic mobility, professionalism, traveling and free-time activities. Links to the United States or its policy towards Cuba are strikingly absent in the respondents' associations.

The findings are in line with results from a large-scale study carried out at the University of Antwerp, which revealed that lecturer and student attitudes towards English are largely positive (van Splunder, 2014). It should be noted that the participants in Antwerp were more acquainted with English than their counterparts in Santiago. Moreover, their level of English was considerably higher (B2 is required for incoming students, C1 for teaching purposes).

4. Conclusion

Whereas in the previous decades, English was commonly associated with the United States or with US imperialism, this is hardly the case in today's Cuba, in which learning English has become a top priority. Although the sample was relatively small, this research demonstrates that attitudes towards English are largely positive as the language is associated with globalization and educational and professional prospects in Cuban higher education. In other words, English means access to the world, not just to the United States.

In contrast to earlier observations, the level of motivation towards learning English did not appear to be low, and the students did not appear to lack awareness of the need for English as a study and work tool. However, the level of English remains generally low, a fact which

most respondents did not appear to be aware of. Moreover, from a more general perspective, it should be noted that access to English remains limited in Cuba.

As a follow up to this research, a larger-scale online questionnaire should be administered, on condition that improved internet facilities are available. Moreover, it would be relevant to conduct interviews or focus groups to analyse the attitudes in more detail to find out why they are so positive. At the same time, it could be significant to find out why negative attitudes are strikingly absent, even with the older generation. It should be considered to broaden the scope of research, and to focus on other stakeholders, such as the Ministry of Higher Education. Finally, it may be relevant to study English language attitudes in areas other than higher education, such as tourism or business, and areas in which English is not commonly used. English may mean access to the world, but it remains an open question what this implies for groups of people such as farmers whose life and work is limited to a Cuban context, and who apparently do not participate in globalization.

References

- Crystal, D. (2003). *English as a Global Language*. Second edition. Cambridge: Cambridge University Press.
- Council of Europe. (2001). *Common European framework of reference for languages: learning, teaching, assessment*. Cambridge: Cambridge University Press.
- Dembicz, K. (2017). Cubans: a Vulnerable Society? *Journal of American Studies*, 17, 109-118.
- Dewey, M. (2007). English as a Lingua Franca and Globalization: An Interconnected Perspective. *International Journal of Applied Linguistics*, 17(3), 332-354.
- English Proficiency Index. (n.d.). Retrieved December 22, 2017, from Education First, www.ef.com/epi.
- Fishman, J.A. (2006). Language Policy and Language Shift. In T. Ricento (ed.) *An Introduction to Language Policy. Theory and Method*. London: Blackwell, 311-328.
- Grabendorff, W. (2017). Cuba: The Challenges of Change. *Pensamiento Propio. Edición especial a cargo de Andrés Serbin*, 22, 33-56.
- Ministerio de Educación Superior. (2013). Documento base sobre el perfeccionamiento de la enseñanza del idioma inglés en las universidades cubanas. Aprobado por el Consejo de Dirección del Ministerio de Educación Superior, diciembre.
- Pennycook, A. (2010). English and Globalization. In J. Maybin and J. Swann (eds.) *The Routledge Companion to English Language Studies*. London: Routledge.
- Pignatelli, B. (2016, February 27). English Language learning in Cuba. *Havana Times*. Retrieved from <http://www.havanatimes.org/?p=117059>.
- Pope, C. & Finn, J. C. (2017). Editors' Introduction: Geographies of Contemporary Cuba. *Human Geography*, 10(3), 1-6.

Radio Cadena Agramonte (2017, June 22). Cuba da prioridad a superación de docentes en idioma inglés. Retrieved from <http://www.cadenagramonte.cu/articulos/ver/71090>.

Rivera Pérez, S., Torres García, M., & Estrada Rodríguez, P. (2017). Instrumentación de la estrategia de perfeccionamiento del inglés en las universidades del Ministerio de Educación Superior (MES). Congreso Universidad, 6(6), 73-89. Retrieved from <http://www.congresouniversidad.cu/revista/index.php/rcu/article/view/976>.

van Splunder, F. (2014). Negotiating Multilingualism in Flemish Higher Education. In J.W. Unger, M. Krzyżanowski and R. Wodak (eds.) Multilingual Encounters in Europe's Institutional Spaces. London: Bloomsbury, 221-242.

Wächter, B. (2014). The European map of English-taught programmes in 2014: Results of a new ACA study. Paper presented at the ACA, Brussels, 4 December 2014.

Appendix: Questionnaire

Cuestionario

El siguiente cuestionario se enfoca en las actitudes hacia el aprendizaje del idioma inglés en la enseñanza superior en Cuba, particularmente en la Universidad de Oriente. Agradecemos su colaboración.

1. Actualmente, usted es
 - Estudiante (Facultad.....; Año académico.....)
 - Profesor (Facultad.....; Años de experiencia como profesor en la universidad.....)

2. ¿Cómo califica la importancia del idioma inglés para su carrera profesional?
 - Muy importante
 - Importante
 - Poco importante
 - Nada importante

3. ¿Ha tomado cursos de inglés? (Es posible marcar más de una opción)
 - Sí, antes de entrar a la universidad
 - Sí, durante la universidad
 - Sí, después de terminar la universidad
 - No, nunca he tomado cursos de inglés

4. ¿Dónde ha tomado los cursos de inglés? (Es posible marcar más de una opción)
 - En instituciones estatales
 - En instituciones no estatales
 - Autodidacta
 - Ninguna de estas alternativas

5. ¿Cuál considera que es su nivel de comunicación en inglés?
- No me puedo comunicar en inglés
 - Básico.** Puedo relacionarme de forma elemental, siempre que la otra persona hable despacio, con claridad y esté dispuesta a cooperar.
 - Intermedio Bajo.** Puedo comunicarme de manera sencilla sobre temas de mi interés personal o que me son familiares, y a la hora de realizar tareas simples y diarias, que requieran solo información sobre cuestiones que son conocidas o habituales para mí.
 - Intermedio Alto.** Puedo comunicarme con un grado suficiente de fluidez y naturalidad, de modo que la conversación se realice sin esfuerzo por parte de ninguno de los interlocutores.
 - Avanzado.** Puedo usar el idioma de forma flexible y efectiva para fines sociales, académicos y profesionales.
6. ¿Ha hecho un examen de idioma para saber su nivel de inglés?
- Sí, TOEFL
 - Sí, IELTS
 - Sí, otro examen (Indique cuál.....)
 - No, nunca
7. ¿Está familiarizado con la escala de dominio de la lengua del Marco Común Europeo de Referencia (en inglés *Common European Framework of Reference*)?
- Sí
 - No
8. ¿Cón que asocia el idioma inglés? Escriba solo cinco palabras.

Traditional learning approach versus gamification: an example from psychology

Limniou, Maria ^a and Mansfield, Rosie ^b

^a School of Psychology, University of Liverpool, UK, ^b Manchester Institute of Education, University of Manchester, UK.

Abstract

Teaching research methods and statistics in Psychology is a known pedagogic challenge due to students' varied mathematical aptitude, prior knowledge and attitudes towards modules. The aim of this investigation was to study student perspectives of an interactive learning approach for the first year practical class of a "Research Methods and Statistics" psychology module based on problems and games. The approach was developed by integrating problem-based learning and games supported by Kahoot and PollEverWhere (Web 2.0 applications). Two groups of first year psychology students (20 persons per group) attended practical classes based on an interactive and a traditional approach but following a different attending order (1. interactive and 2. traditional approach or vice versa) and completed two online surveys. Overall, the interactive approach was perceived to significantly improve student learning experience by promoting active and collaborative learning through the use of real research study applications and formative feedback.

Keywords: *research methods; problem-based; game-based; active learning; Web 2.0; formative feedback*

1. Introduction

Researchers have studied the importance of the research methods and statistics integration into a psychology module, as students are not eager to follow relevant modules (Rajecki *et al.*, 2005). The willingness of Psychology students to follow these modules is related to three broad perspectives: mathematical aptitude and prior knowledge of students, affective and attitudinal factors and pedagogic approaches (Mulhern & Wylie, 2006). Many Psychology students experience 'statistics anxiety' (Wilson, 2013) and it is widely acknowledged that teaching statistics in Psychology is a pedagogic challenge due to heterogeneous cohorts with varied mathematical ability (Lalonde & Gardner, 1993; Mulhern & Wylie, 2004). Tishkovskaya and Lancaster (2012) reviewed the challenges of statistical education and provided an overview of suggested strategies and techniques for developing research-based statistics courses. For example, they proposed the use of active and collaborative problem solving, technology and online resources to promote statistical reasoning, interactive activities with feedback and the use of real world examples. Wilson (2013) reported that a flipped classroom approach could enhance the learning of statistics allowing students to "do statistics" and solve problems in an environment where they can get immediate feedback (p. 197).

Wiggins, Chiriac, Abbad, Pauli and Worrell (2016) highlighted the lack of the extent integration of problem-based learning approach into Psychology modules, although it could allow students to apply knowledge across contexts and to real world problems and to understand a topic through the collaboration with their peers enhancing their problem solving skills (Hmelo-Silver, 2004). Despite the difference in problem-based activities, class size and evaluation, a problem-based approach in research methods and statistics modules can increase students' motivation, engagement (Elder, 2016) and student performance (Karpiak, 2011). Boyle, Connolly and Hainey (2011) suggested that the integration of games into education can provide contextualised, problem-based and interactive learning activities allowing students to learn through entertainment (Henderson, 2005). According to de Marcos *et al.*, (2014) "gamification is the use of game elements and game-design techniques in non-game contexts, to engage people and solve problems" (p.82). It has been reviewed as an effective learning method, as it enhances student motivation, team work and collaboration (McLafferty *et al.*, 2010) promoting learning in a nonthreatening and stress-reduced environment (Henderson, 2005).

McLoughlin and Lee (2007) have presented how the introduction of Web 2.0 technology could enhance learning by using a wide variety of tools in education to support student interaction, learning approaches and self-directions. Wang, Elvemo and Gamnes (2014)

have advocated that the way of Web 2.0 applications are integrated into teaching and learning process has an impact on student engagement, learning, attention and contribution. The aim of this investigation was to compare student views following an interactive teaching approach based on (game-based) student response systems (Kahoot and PollEveryWhere) with a traditional way of teaching for first year research methods and statistics practical classes in a Psychology course. The hypothesis of this study was to investigate whether the interactive approach will significantly improve student learning experience compared with the traditional way of teaching.

2. Method: Experimental conditions and participants

Forty first year Psychology students participated in this investigation. The students were split into two groups. The first group (Group A) had firstly participated in the interactive learning approach and then attended the traditional approach, while the second group (Group B) had attended the practical classes with the opposite order. Two online questionnaires were distributed to them, one per learning approach. 32 students completed both questionnaires (Group A: N = 14, Group B: N= 18) which consisted of quantitative questions (0-10 agreement scale) and an open-ended question. The items of the questionnaire were inspired by the UK National Student Survey (NSS) (<http://www.thestudentsurvey.com>).

3. Procedure: Description of the two learning approaches

3.1. Traditional learning approach

Students were expected to attend a 90-minute practical class for a “Research Methods and Statistics” module each week in order to revise and apply knowledge from the relevant lecture on statistics. In the practical class, students were firstly presented with a brief introduction to the assumptions of the test and were given a simple hypothetical study example. They were asked to complete a few questions relating to the design, data level and statistical distribution. Also, they were asked to calculate descriptive and inferential statistics by hand using step-by-step instructions from a workbook. An example of how to write up the result in a report was provided and they completed summative weekly tasks in their own time by using SPSS. The design of this approach was aimed to support an independent learning process in a small scale learning environment (20 students per class).

3.2. Interactive learning approach based on (game) student response systems

The teacher initially presented the theory behind the statistical analysis (e.g. independent samples t-test) and introduced the class to a real research problem, recently studied by

researchers within the School. The whole class was split into smaller groups and they were encouraged to consider the rationale of the study and form an experimental hypothesis. They were given time to work together through questions relating to the presented research study.

Kahoot! was used as game-based student response system (Wang, 2015) allowing the groups of students to compete against one another while testing their knowledge. The groups could add a team name and compete against each other by answering the multiple choice questions as quickly as they could. Between each question the scoreboard was updated; the pause between questions gave the teacher a chance to discuss the correct answer with the class and to provide formative feedback (Figure 1).

Following the first activity, students were given an example set of data for the given research question and asked to fill in the blanks for hand calculations. The main focus of this activity was to get students to understand the mathematical underpinnings of the statistical analysis. Groups were then given screenshots of SPSS output to consider, based on different data for the same study example, and were instructed to work together to answer several questions regarding data handling and SPSS interpretation. PollEveryWhere was used as student response system (Shon & Smith, 2011). Each student was encouraged to submit their responses on research design, hypotheses, data handling and SPSS output interpretation questions (Figure 2). The design of this approach was aimed to support an collaborative problem-based learning process in a small scale learning environment (20 students per class).

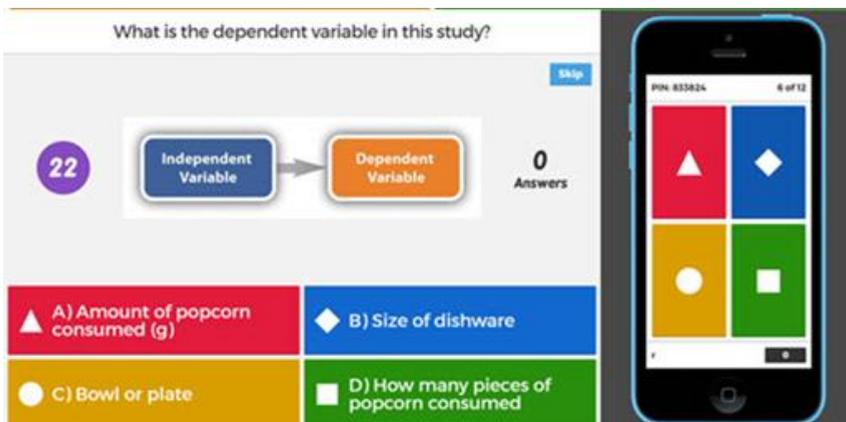


Figure 1: Screen shot from the Kahoot game

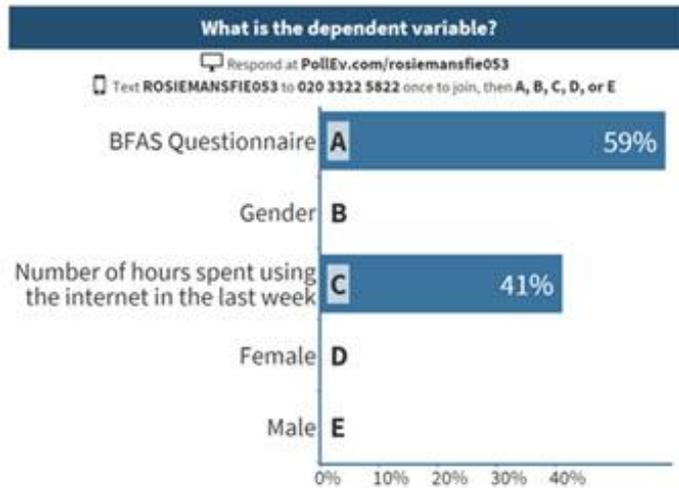


Figure 2. Example screenshot from the Poll Everywhere questions

4. Results

Table 1 shows the mean and the standard deviation values (\pm SD) for the traditional and interactive learning approaches on items relating to the learning experience. A repeated measures MANOVA revealed a significant main effect of approach on learning experience $F(1, 30) = 30.61, p < .001, \eta^2 = .51$, such that students reported a significantly better learning experience for the interactive approach (8.13 ± 1.45) when compared with the traditional approach (6.04 ± 1.56). There was a significant item by approach interaction $F(5, 160) = 10.00, p < .001, \eta^2 = .25$, caused by students reporting that the interactive approach was significantly more interesting, intellectually stimulating, enjoyable and active and engaging ($p < .001$).

Table 1. Means(\pm SD) for the traditional and interactive learning approaches on items relating to the learning experience

To what extent would you say the traditional approach of teaching year 1 practical classes/interactive approach achieves the following	Traditional Approach	Interactive Approach
Q1. Explaining research methods and statistics concepts	7.00(\pm 1.81)	7.44(\pm 1.83)
Q2. Making practical class interesting	5.16(\pm 2.17)	8.41(\pm 1.70)
Q3. Making the practical class content intellectually stimulating	5.63(\pm 2.00)	8.19(\pm 1.67)
Q4. Enjoyability in the first year practical class	6.06(\pm 2.18)	8.28(\pm 1.69)
Q5. Opportunities for a active and engaged learning approach	5.56(\pm 2.03)	8.41(\pm 2.08)
Q6. Being organised and run smoothly	7.72(\pm 1.53)	8.59(\pm 1.50)
Q7. Providing constructive comments on student contributions in the traditional/interactive practical class	5.13(\pm 2.60)	7.56(\pm 1.93)
Q8. Preparing students for their exams	6.56 (\pm 1.97)	7.53 (\pm 1.44)

Q1, Q2 & Q3 (0 = very poor, 10 = very good), Q4. (0 = no enjoyment, 10 = extremely enjoyable), Q5. (0 = not at all, 10 = very engaging), Q6. (0 = not at all, 10 = very smooth and well organised), Q7. (0 = not at all, 10 = very often), Q8. (0 = not at all, 10 = very good preparation).

Furthermore, the interactive approach was perceived to be significantly more organised ($p=.024$) and provided more constructive feedback ($p<.001$). However, there was no significant difference between approaches in the extent to which research methods and statistics concepts were explained ($p>.05$). Finally, there was no significant approach by class interaction $F(1, 30) = .13, p=.719, \eta^2 = .00$, indicating that the effect of approach was not dependent on the class attending order (1. interactive and 2. traditional approach or vice versa). A related samples t-test also revealed that students perceived the interactive approach to better prepare them for examinations, when compared with the traditional learning approach, $t(31) = -2.14, p=.040$. Finally, they had the opportunity to leave any comments they might have about their first year practical classes (Table 2).

Table 2. A sample of the student comments relating to the learning experience

'I really enjoyed participating as a group and talking with the group to come to a joint decision and discussing ideas etc., I also really enjoyed the Poll Everywhere quiz at the end to test individual knowledge- this seems a really good way to allow you to engage on an individual level without having to put hands up etc. therefore making it more accessible for everyone. I felt that it was really engaging and put stats and methods into a very practical and memorable format where the relevance for future research and studies could be clearly seen and therefore the willingness to participate was higher.'

'The new collaborative approach is a significantly refreshing and exciting approach in teaching statistics and methodology....I developed a better understanding of the research being taken in the departmentI honestly enjoyed being presented with different types of tools and being able to make a decision on what would be best for this experiment.....I did feel there was a lot more participation than in my normal seminar which was nice..... Poll Everywhere, Kahoot.it will absolutely increase participation in seminar groups. I was more likely to contribute answers since it was anonymous - this could have profound influence in allowing students with anxiety or shyness to add their answers'

'I really enjoyed the new approach as it encouraged me [to] ask for help with the people on my table if I was struggling to understand something, I also felt that we were more engaged with our instructor as she was able to spread her time between four different tables instead of several smaller tables'

'I thought the Poll Everywhere aspect was very good - to actually test yourself and no one was embarrassed to answer'

5. Discussion and conclusions

The aim of this investigation was to study what impact an alternative learning approach based on (game) student response systems had on student experience compared with the traditional way of teaching for psychology research methods and statistics practical classes. Overall, students reported the interactive learning approach to be significantly more interesting, intellectually stimulating, enjoyable, engaging and organized. It provided students with more constructive feedback allowing themselves to express their views through a collaborative environment. The students stated they felt better prepared for their final examinations upon following the interactive approach, as they felt that they better understood the research methods and statistics topics through the interaction with technology, problems and games. Another interesting point is related to the relationships between students and teachers. It seems that by supporting a teaching approach based on problem-based and game-based learning with the appropriate use of technology, the gap between teachers and students decreased allowing students to be more engaged and motivated with the learning process by expressing their thoughts. By solving problems and

playing games to produce a research methodology rationale, students critically reflected on the statistical results process and they better understood the “repulsive” subject topic of research methods and statistics. Results suggested that by incorporating research-based, problem-solving and game-based learning approaches with technology students were not only active learners, but they enjoyed their learning time. The student views were not influenced by the order that they followed the two approaches.

The way that the interactive approach was designed was based on student difficulties within the domain of research methods and statistics rather than being technology-driven. For that purpose, a pedagogical approach based on research-led activities along with a model of the pedagogical use of the tools were firstly designed. The choice of technology was in alignment with the design of the activities. For example, the choice of the Web 2.0 social media applications was made to support an approach which would be conducted in a relaxing and problem-based learning environment, allowing students to learn through entertainment and anonymous feedback. The learning activities were not designed to replace the traditional tasks or to integrate technology into a part the traditional learning approach, but they were designed to allow students to learn research methods and statistics through interactions with content, their peers, teachers and technology by using real research study examples. This learning approach could be determined as authentic, because it supported a combination of research methods and statistics domain subject with the “real world” scenarios in a problem- and game-based learning environment promoting active and collaborative learning process. Future research will be conducted on student research skill development and students’ performance.

References

- Boyle, E., Connolly, T.M., & Hainey, T. (2011). The role of psychology in understanding the impact of computer games. *Entertainment Computing*, 2(2), 69-74.
- de-Marcos, L., Domínguez, A., Saenz-de-Navarrete, J., & Pagés, C. (2014). An empirical study comparing gamification and social networking on e-learning, *Computers & Education*, 75(1), 82-91.
- Elder, A D. (2015). Using a brief form of problem-based learning in a research methods class: perspectives of instructor and students. *Journal of University Teaching and Learning Practice*, 12(1), 8.
- Henderson, D. (2005). Games: making learning fun. *Annual Review of Nursing Education*, 3, 165.
- Hmelo-Silver, C.E. (2004). Problem-based learning: what and how do students learn? *Educational Psychology Review*, 16(3), 235-266.
- Karpiak, C.P. (2011). Assessment of problem-based learning in the undergraduate statistics course. *Teaching of Psychology*, 38(4), 251-254.

- Lalonde, R.N., & Gardner, R.C. (1993). Statistics as a second language? A model for predicting the performance in psychology students. *Canadian Journal of Behavioural Science*, 25(1), 108-125.
- McLafferty, E., Dingwall, L., & Halkett, A. (2010). Using gaming workshops to prepare nursing students for caring for older people in clinical practice. *International Journal of Older People Nursing*, 5(1), 51-60.
- McLoughlin, C. and Lee, M.J.W. 2007. Social software and participatory learning: pedagogical choices with technology affordances in the Web 2.0 era. In *ICT: Providing Choices for Learners and Learning: Proceedings Ascilite Singapore 2007*, pp. 664-675. Retrieved from www.ascilite.org.au/conferences/singapore07/procs/mcloughlin.pdf at 19 January 2018.
- Mulhern, G. & Wylie, J. (2004). Changing levels of numeracy and other core mathematical skills among psychology undergraduates between 1992 and 2002. *British Journal of Psychology*, 95, 355-370.
- Mulhern, G., & Wylie, J. (2006). Mathematical prerequisites for learning statistics in psychology: assessing core skills of numeracy and mathematical reasoning among undergraduates. *Psychology Learning & Teaching*, 5(2), 119-132.
- Rajecki, D. W., Appleby, D., Williams, C. C., Johnson, K., & Jeschke, M. P. (2005). Statistics can wait: career plans activity and course preferences of American psychology undergraduates. *Psychology Learning & Teaching*, 4(2), 83-89.
- Shon, H., & Smith, L. (2011). A review of Poll Everywhere audience response system. *Journal of Technology in Human Services*, 29(3), 236-245.
- Tishkovskaya, S., & Lancaster, G.A. (2012). Statistical education in the 21st century: a review of challenges, teaching innovations and strategies for reform. *Journal of Statistics Education*, 20(2), 1-24.
- Wang, A. I., Elvemo, A. A., & Gammes, V. (2014). Three social classrooms applications to improve student attitudes. *Educational Research International*, 259128, 14.
- Wilson, S.G. (2013). The flipped class: a method to address the challenges of an undergraduate statistics course. *Teaching of Psychology*, 40(3), 193-199.
- Wiggins, S., Chiriac, E.H., Abbad, G.L., Pauli, R., & Worrell, M. (2016). Ask not only 'what can problem-based learning do for psychology?' but 'what can psychology do for problem-based learning?' A review of the relevance of problem-based learning for psychology teaching and research. *Psychology Learning & Teaching*, 15(2), 136-154.

Case Study: Use of Open Education Resources in Business Capstone

Mathien, Lorena D.

Business Department, State University of New York Buffalo State, United States

Abstract

Recent studies on textbook costs in the United States have indicated that there is a direct relationship between textbook costs and student success. With textbook costs increasing at a rate higher than the cost of living, many students have cited the textbook cost as an important factor when obtaining (or not obtaining) a textbook. Open educational resources (OER) are tools that educators can use to supplement or build a course. OER are free for anyone to reuse, revise, remix, and redistribute and are a low-cost, tailored solution for faculty and students. There have been calls for research that demonstrates how OER are being put into practice. This case study examines the responses of users to a voluntary survey in a capstone business course that implemented OER in lieu of traditional textbooks. The study suggests that, for teachers and students, as well as self-directed learners, OER provide a valuable resource to eliminate the pay wall, improve learning design, and support the power of the community through sharing and collaboration.

Keywords: *OER; Open Education Resources; Business; Education, Case Study.*

1. Introduction

The growth of the open education resources (OER) movement has steadily gained global momentum since 2000 (Wiley & Gurrell, 2009). OER offer opportunities to students who may be economically, or otherwise, excluded from formal education due the increasing cost of traditional learning materials. There are several studies and initiatives worldwide, and some of the claims indicate that OER and technology may be able to bridge the gap between formal and informal education (Ehlers, 2011; Meiszner, 2011). OER adoption may also lead to the inclusion of excluded groups of students via access to a wider range of little or no cost learning content (Lane, 2008).

The theory of OER was initially defined at the 2002 UNESCO Forum on the Impact of Open Courseware for Higher Education in Developing Countries (Armellini & Nie, 2013). OER are teaching, learning, and research resources that reside in the public domain or have been released under a Creative Commons license that permit reuse or repurposing. These resources may include textbooks, course materials, modules, podcasts, experiments, demonstrations, teacher guides, lesson plans, videos, tests, images, supporting materials and resources, government documents, open datasets, programs, or full courses (Atkins, *et al.*, 2007). Creative Commons licenses allow for the sharing of resources via the changing of copyright terms to best fit users' needs (Sharma, 2013). OER are free to use and remix, thus enabling instructors to customize and differentiate materials for students (Ash, 2012).

There have been several calls for research on the real-world effects of OER on instructors and learners (Schmidt-Jones, 2012). There is a “dearth of systematic empirical data to help answer the following questions: Who uses OER and for what purpose? What is the impact of OER? To what extent have OER engendered changes in teachers’ professional practices? Have OER led to improvements in the quality of learning and outcomes?” (Kanwar, *et al.*, 2010). This case study is the beginning of an empirical study on the impact of OER on business students.

2. OER in SUNY Buffalo State Business Capstone

2.1. Purpose of Study

According to the College Board 2011 study, the average postsecondary student at a four-year college in the United States paid \$1,137 for textbooks during the 2010-2011 academic year. Since 1994, the cost of textbooks has risen nearly four times the rate of inflation (Student PIRGs, n.d.). Projected annual textbook costs in 2013 at the State University of New York (SUNY) two-year and four-year colleges was almost \$417,000,000, and textbook costs at SUNY Buffalo State were just over \$11,000,000 (IPEDS, n.d.). The need to understand the impact of these costs led to various studies, including the 2012 Florida

Student Textbook Survey (Florida Virtual Campus, 2012) and the unpublished replicated study at SUNY Buffalo State. The purpose of these studies was to assess textbook choices, reasoning, and attitudes of students and faculty, including dollars spent, usage, impact of cost, formats preferred, functionality, and perceptions.

After implementing OER in the business capstone course, these studies were replicated and expanded to students across six sections of the course. Students were provided with free, modular-based learning materials via the campus learning management system from day one of the class. Previous and other sections of the course utilized traditional publisher materials. OER materials were all Creative Commons licensed, including readings, videos, images, and case studies, and offered free of charge to students.

Traditionally, the availability of OER materials has lagged in the business discipline. While offerings are being added regularly, lower-level introductory courses are more readily available. Upper-level courses have limited materials in comparison. This capstone course was adapted from a Saylor Academy course, and refined with the inclusion and exclusion of various OER, as well as instructor-developed assessments and assignments.

Those who actively use OER may be in the best position to judge its value. This is the first study done on this campus to assess OER satisfaction, and the first in the United States to assess satisfaction in an upper-level business course. This is an important first step in determining the quality and acceptability of OER in place of traditional textbook materials. SUNY has initiated a concerted effort, backed by state government, to engage and train faculty across New York State in the adoption and creation of OER. This study is in direct support of that initiative.

2.2. Methodology

At the end of each semester, undergraduate business capstone students were offered an anonymous, voluntary survey via Qualtrics® software. Students could opt in to the survey and the survey was not connected to final grades. Survey questions were adapted from the previous studies mentioned above. All questions were optional. Additional questions were added to assess the impact of OER on student learning outcomes. Ordinal Likert scales were used to measure perception of OER in the course, with open-ended questions used to probe deeper into responses. Data was then analyzed using descriptive statistics. The preliminary sample was 200 senior students. Table 1 outlines the respondent demographics.

Table 1. Respondent Demographics

Demographic	Response Category	Percent
Age	< 18	0
	18-22	58
	> 22	48
Gender	Male	49
	Female	51
Receive financial aid for texts	Yes	31
	No	66
Total text cost covered by financial aid	Yes	19
	No	81

Source: Mathien (2017).

2.3. Results

In terms of textbook format, previous research showed that students prefer a hard copy of their textbooks to digital; however, this study indicated that 93% of students consider cost to be the major factor when choosing a textbook (table 2). This was a key finding since many OER materials are offered digitally. While printing of materials is an option with OER, it does increase cost to the student.

Table 2. Student Textbook Preferences

Demographic	Response Category	Percent
Factors for student choice of textbook	Cost	93
	Format	2
	Length of access	5
	New vs. used	0
Textbook format preferred by students	Digital	7
	Print	29
	Cheapest available	62
	No preference	2
Methods used to obtain textbooks	Bookstore – new/used	69/76
	Outside source	78
	Rent – print/digital	65/56
	Share with classmate	44
	Library – borrow/reserves	22/11

Source: Mathien (2017).

If the textbook was considered too expensive, 96% of students reported they have gone without a textbook for at least one course during their time at the college. Students responded that, at some time during their program of study, they have used various methods to obtain textbooks at a lower cost, including buying used, renting, sharing, or borrowing from the library (table 2). Other implications of textbook costs can be seen in figure 1.

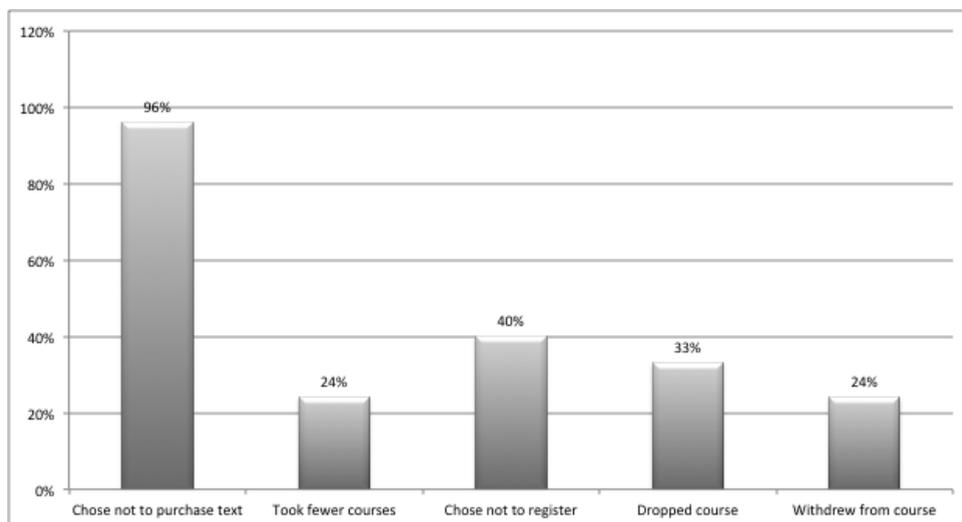


Figure 1. Impact of high textbook cost on student purchase behavior. Source: Mathien (2017).

Students were also asked about the effect of OER materials on their learning and engagement in the capstone course. While they reported positive outcomes in most categories, some of the most impactful results include increased participation in class, improved grades, increased engagement, increased experience with new ways of learning, and increased likeliness of completing readings and assignments (figure 2). Other positive findings include an increase in the interest of the subject being taught, increased student confidence, increased independence and self-reliance, increased collaboration with peers, increased enthusiasm for future study, increased interest in a wider range of subjects than before the OER, and better understanding of the content than use of a traditional textbook.

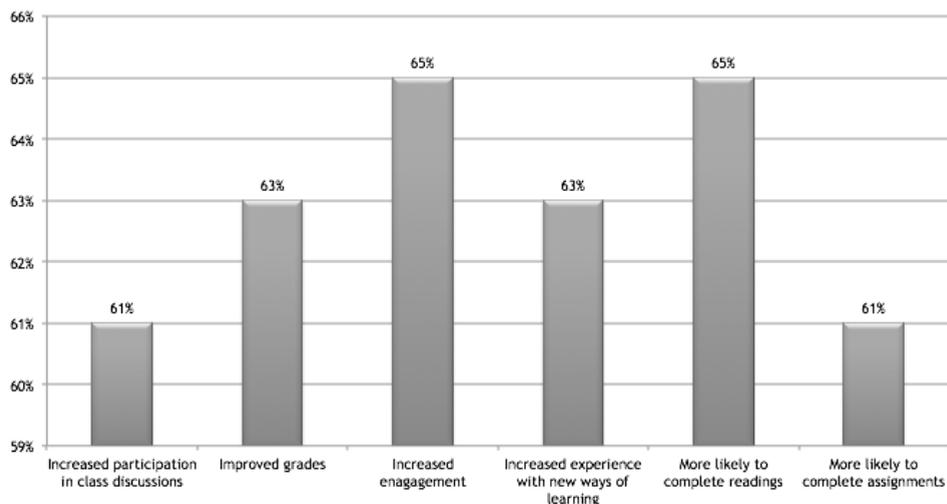


Figure 2. Impact of OER on student success. Source: Mathien (2017).

When students were asked if they saved money, 82% felt they had, while only 6% felt they had not. No reason was indicated as to why they did not save money, although course materials were free. When asked if they would take more OER courses, 79% indicated they definitively would take more and 18% said they might take more OER courses.

3. Conclusion and Recommendations

Studies have shown that the cost of textbooks is leading to reduced textbook purchases and decreased performance in courses. Students are foregoing the text or even dropping the course due to the increasing cost of course materials. While faculty are using various methods to try to control costs, OER are an effective way to cut expenses and add value to a course. Benefits of OER for the student may include day-one access to course materials, lower cost, and improved learning. Benefits for faculty may include better-prepared students, as well as control over and increased engagement with learning materials. Benefits may also extend to the institution, including potential increased enrollment and greater persistence and retention.

This study investigated the impact of OER on students in various sections of a capstone course at SUNY Buffalo State. Results strongly indicate increased satisfaction with the course materials, as well as several measures of improved performance. With day-one access to course materials, and flexibility to adjust materials as needed, the materials are more current than traditional publisher materials that typically see a lag from time of development to time of publication. The business discipline is in constant change, and OER

allow for easy and quick customization of content to remain current. Students in this capstone course indicated a preference for use of OER for several reasons, and most were highly satisfied with the course materials.

This study measured the student perceptions of OER by understanding how students perceive the quality of OER compared to traditional materials. Further research could expand this study to other business courses and institutions, and include faculty perception of OER as well. Additional analyses could be done by comparing groups of students statistically to assess differences between groups. In addition, further quantitative analyses could be conducted to measure the impact of OER adoption on cost. The data for this analysis was collected, but proceeding data before adoption would need to be assessed. While saving money is important, concern for education outcomes is critical. Further research may be conducted on grades, course throughout rates (combination of drop rates, withdraw rates, and final grades), and enrollment intensity and persistence (credit attempts and completions).

References

- Armellini, A., & Nie, M. (2013). Open educational practices for curriculum advancement. *Open Learning: The Journal of Open, Distance and e-Learning*, 28(1), 7-20.
- Ash, K. (2012). Open educational resources surge. *Education Week's Digital Directions*, 6, 42-45.
- Atkins, D., Seely Brown, J., & Hammond, A. (2007). *A review of the open educational resources (OER) movement: Achievements, challenges, and new opportunities*. San Francisco, CA: William and Flora Hewlett Foundation.
- Ehlers, U. (2011). Extending the territory: From open education resources to open educational practices. *Journal of Open, Flexible and Distance Learning*, 15(2), 1-10.
- Florida Virtual Campus. (2012). *2012 Florida student textbook survey*. Tallahassee, FL: Author.
- IPEDS: <https://nces.ed.gov/ipeds/Home/UseTheData>
- Kanwar, A., Kodhandaraman, B., Umar, A. (2010). Toward sustainable open education resources: A perspective from the global south. *The American Journal of Distance Education*, 24(2), 65-80.
- Lane, A. (2008). Widening participation in education through open education resources. In T. Iiyoshi & M.S. Vijay Kumar (Eds.), *Opening up education: The collective advancement of education through open technology, open content, and open knowledge* (pp. 149-163). Cambridge, MA: MIT Press.

- Meiszner, A. (2011). *The why and how of open education – With lessons from the openSE and openED projects (1st ed.)*. Maastricht: UNU-MERIT & CCG.
- Schmidt-Jones, C. (2012). An open educational resource supports a diversity of inquiry-based learning. *The International Review of Research in Open and Distance Learning*, 13(1), 1-16.
- Sharma, Y. (2013). Open access and creative commons – A new platform for open educational resources and scientific research. *Current Science*, 105(11), 1461.
- Student PIRGS: <https://studentpirgs.org/>
- Wiley, D., & Gurrell, S. (2009). A decade of development. *Open Learning: The Journal of Open, Distance and e-Learning*, 24, 11-21.

The Exercise Science Toolkit: a web application for exercise and health science students

Norton, Kevin^a and Norton, Lynda^b

^aSchool of Health Sciences, University of South Australia, Australia, ^bDiscipline of Health and Exercise Sciences, Flinders University, Australia.

Abstract

The Exercise Science Toolkit is a web-based educational software program for exercise and health science tertiary students and professionals. The software was developed to facilitate student engagement with essential knowledge, skills and protocols in these disciplines, provide opportunities to conduct analyses on empirical data or simulations on an unlimited supply of virtual clients including difficult or rare cases, encourage overlearning opportunities at their own pace and in their own time, and shift the emphasis from passive knowledge delivery to creative acquisition and application of knowledge. The toolkit is evidence-based with numerous databases on age- and sex-specific population norms built from systematic searches. It uses established internationally accepted protocols for the analytical tools and test procedures. The toolkit has over 40 screens or tools to engage users in a variety of pedagogical modes including pre-class preparation, laboratories in real time, individual and group problem-based learning, online and distance education.

Keywords: *analytic tool; body composition; fitness testing; health profiles; exercise physiology; virtual people*

1. Introduction

Online delivery and e-learning are growing rapidly as part of multimodal pedagogies, including disciplines such as health and clinical sciences (Ellman & Schwartz, 2016). Acquisition and application of knowledge involves challenges in educating students and professionals in methodological issues and protocols, data analytics, knowledge integration, and communication skills. Our goal, therefore, was to develop a comprehensive online analytical and exploratory software program called the *Exercise Science Toolkit* (EST) to help students in exercise- and health-related disciplines develop proficiencies in these areas. The tools within the program cover key content including pre-exercise screening procedures, health risk factor assessment, physiological responses to exercise, performance testing across the three energy systems, body composition analysis and basic statistical/analytical calculators. Numerous approaches are used to reinforce knowledge and its context using population norms and variations, and novel ‘what-if’ functionality. Simulation strategies have also been created to supply an unlimited number of virtual clients offering unique learning opportunities with a vast array of individuals, and in a range of delivery modes. The URL for free access to the toolkit is: www.exercisesciencetoolkit.com (Norton & Norton, 2018).

2. Rationale for the Exercise Science Toolkit

Understanding foundation elements of exercise, sport and health sciences courses takes time and rehearsal, especially practical skills that are applied as professionals. Students need frequent exposure to laboratory experiences to process the: (1) physiological/biochemical or performance variable being measured, (2) units of measurement, and (3) knowledge integration with contextual references such as what is ‘normal’, ‘extreme’, ‘plausible’, ‘a risk factor’, ‘world class’, ‘low’ for a specific type of athlete or diseased patient etc. Putting their own measures into perspective is almost invariably how students associate previous knowledge with new information to better understand the meaning, including the units of measurement (Mishra & Koehler, 2006). For example, after collecting physiological or performance data for a variable students will often ask ‘am I normal?’ or ‘what is normal?’ or ‘what is a good value?’ or ‘what does that value mean?’ The EST allows students to engage with the tool and add contextual layers to measured data in an inquiry-based learning framework (Magnusson *et al.*, 1999). Showing students how their own ‘score’ relates to other reference scores or benchmark populations helps them to assimilate information while reinforcing other elements such as probability and statistics.

The EST is a series of tools or calculators that compute results and integrates these with other information, for example, generating training zones based on the results of anaerobic

threshold tests. It also allows comparisons with reference norms across a range of sports, age- and sex-groups, and other clinical sub-populations based on lifestyle behaviours. It uses data from published databases on population and sports-specific norms and is therefore credible and reliable. The laboratory results *per se* are important but mean relatively little without interpretation and exploring how they fit with reference values of populations (eg., male versus female; trained versus untrained; across various sports, with ageing and chronic health conditions, within the range of human capacities etc). This capacity encourages interactivity, particularly when combined with the ‘what-if’ functionality on each tool. The tools create opportunities to introduce explanations about *why* values are like they are and how results can be applied in sports and health science roles. The EST has been developed for multiple modes of delivery including flipped classes, face-to-face classroom activities and within online courses. It is designed to be visually appealing, modifiable and interactive. Moreover, international standards are adopted throughout such as in anthropometry assessment (Norton et al., 1996) and protocols for measuring physical power, aerobic fitness and anaerobic threshold testing (Tanner & Gore 2013). Currently, six different national biometric datasets are embedded in the EST.

3. Exercise Science Toolkit structure and functionality

The EST has multiple analytical tools on approximately 40 screens. These are grouped within six modules covering (1) screening and risk factor assessment, (2) fitness testing across all energy systems, (3) body composition analysis, (4) analyzing blood biomarkers, (5) finding sports that match body size and shape, and (6) generating virtual profiles for population analytics. The EST has two ‘layers’, or ways of using the program: (1) for analysis of laboratory-obtained raw data that students might collect in class, or professionals in their practice, and (2) to create a virtual person (VP) to further investigate.

Each VP is created in real time and there are unlimited numbers of profiles that can be generated. This is because each VP is produced using realistic algorithms linking age, sex, and lifestyle behaviours such as physical activity habits, sedentary patterns and smoking, to outcome variables in areas including health risk factors, medical conditions, body composition and fitness parameters across the energy systems. Each VP profile generated results in ~ 200 random normal variables created for physical, physiological, biochemical and behavioural characteristics that are based on published mathematical models of physiological responses to exercise and correlations between variables to guarantee plausible combinations. Large comparative databases were compiled following systematic reviews of normative data for fitness and physical attributes of elite athletes in over 100 sports, and results from national health surveys for age- and sex-comparisons. Generating a VP is particularly useful in situations where real data have not been collected, where access

to testing equipment is not possible, or where it is problematic for students to gain access to clients that are difficult to practice on in real life (elite athletes, elderly, with chronic conditions or multiple health risk factors etc).

4. Why simulate?

In their professional lives exercise/health science specialists administer a wide variety of physiological tests to a broad range of clients using sophisticated and expensive equipment. Difficulties are encountered when exposing students to sub-populations, for example, to athletes in real life. Elite athletes are rare and are reluctant to interrupt training. Other sub-groups, such as cardiac rehabilitation patients involve additional risks when testing and so are seldom entrusted to students without direct supervision. Simulation using virtual people overcomes these obstacles allowing students to create world champions or people with chronic illnesses and then explore relationships among lifestyle behaviours, demographic information, physiological and fitness parameters. They can explore these contexts multiple times and at their own pace, as well as offering extensive opportunities for application of knowledge and skills.

Simulation facilitates overlearning where students can gain a high volume of training in data interpretation and knowledge integration across the spectrum of human capabilities. Additionally, professionals in real life need to work with absolute confidence and certainty because serious errors are unacceptable. Simulation supports safe, accelerated testing and the EST maintains interest by constantly varying the human material.

The simulation strategy of the EST promotes problem-based learning. It has embedded capacity for trial-and-error approaches. For example, many tools have ‘what-if’ functionality where users can monitor the effect of changing input parameters on response variables such as health status, blood biomarkers, body composition and fitness characteristics. Simulation also brings with it open-ended analytical capabilities allowing free play to trial novel solutions and explore relationships among variables. The EST allows students to generate virtual populations (up to 5000 per iteration), export the database files and then investigate correlations and probability patterns among variables.

5. Exercise Science Toolkit content

An overview of some of the screens in the six modules is presented below. The opening screen in figure 1 shows there is an initial option for either empirical data entry or to generate a VP profile. To narrow the sub-population generated, users can select specific age, sex or physical activity groups.

5.1. Screening and Risk Factor Assessment module

Pre-exercise screening is part of the duty of care for those involved in exercise prescription. The screening module in the EST is based on the Australian model (Norton & Norton, 2011) and can be used for real clients to assist in managing medical conditions and in constructing appropriate programs for people beginning exercise. It also allows students to investigate a range of VP that would otherwise be rare for students to see, for example, the elderly, and those in poorer health and fitness states etc, but yet graduates may be expected to handle immediately upon graduation. This facilitates decision-making and cross-checking of these decisions in the safety of dealing with a VP rather than real clients. Comprehensive ‘what-if’ functionality is embedded in the module to facilitate exploration of health risk factors, absolute risk of cardiovascular disease and life expectancy as behaviours and biomarkers are altered.

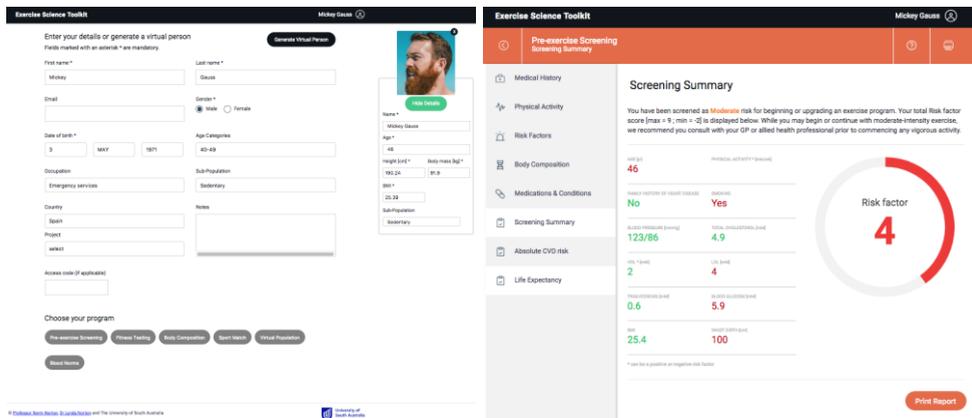


Figure 1. The opening screen in the EST showing a generated virtual person (sedentary male, 46 y, BMI 25.4)(left); The Pre-exercise Screening and Risk Factor Assessment module summary screen (right).

5.2. Fitness Testing module

The Fitness testing module is structured to reflect a range of tests associated with each of the energy systems. On most of these screens there are both population-based norms (5-year age- and sex-specific groups) as well as a contemporary database of elite athletes reported in the scientific literature. There are printout options for each screen and numerous graphing and comparison functions.

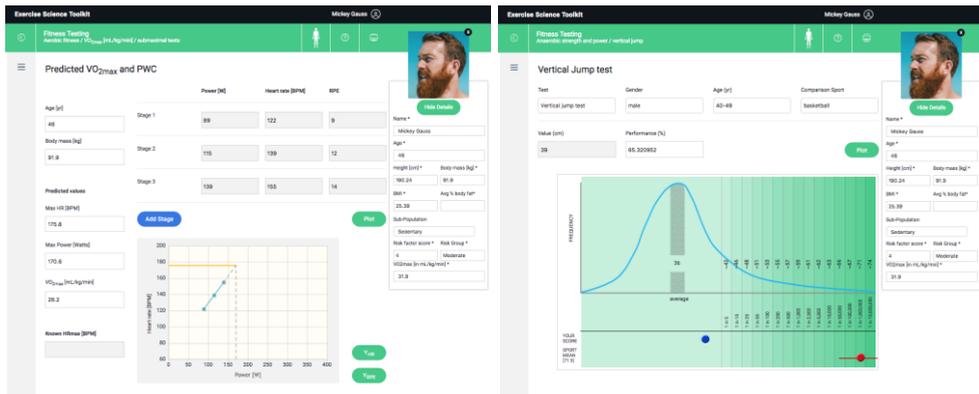


Figure 2. Example screens for the Fitness Testing module; (left) aerobic fitness test results including heart rate and workloads for a submaximal exercise test to predict maximal oxygen uptake, and (right) probability plot for the vertical jump test results and an elite sport comparison (elite basketballers).

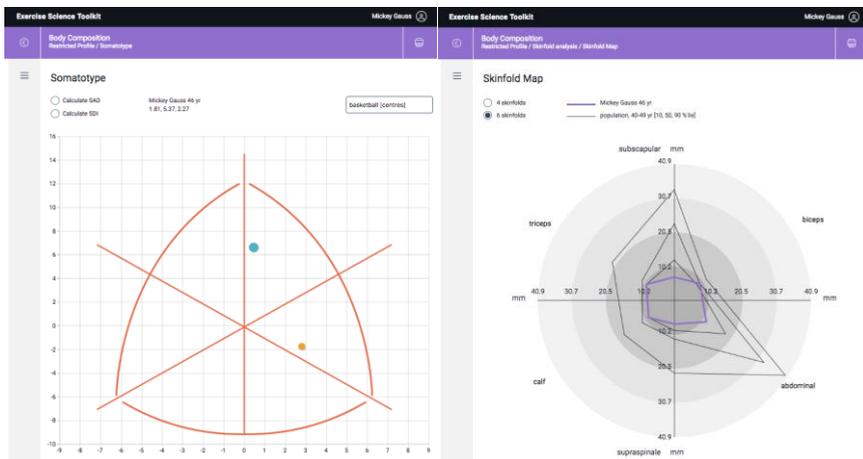


Figure 3. Example Body Composition module screens for the VP. The left panel shows the calculated somatotype of the VP and a comparison plot for elite-level basketballers. The right panel shows a skinfold map for 6 skinfolds relative to age- and sex-specific population norms.

5.3. Body Composition and Sport Match modules

The Body Composition module allows the user to input anthropometry data and then explore outputs such as: comparisons against population norms, % body fat prediction, skinfold plots, somatotype, fractionation of body mass, and various types of reliability analyses for students to check their skill competencies. The Sport Match module uses the inputs of a range of body measurements (size, shape and composition) and a bivariate probability function to determine the profile's best fit among about 100 sports (Norton &

Olds, 2001). The normative data are from published information of the highest quality athletes available and the degree of ‘best fit’ is represented by an ‘overlap score’ out of 100. Students can perform ‘what-if’ scenarios to modify inputs and explore the sports rankings thereby linking body proportions and composition with sport functionality and athletic performance (biomechanics, fitness etc).

5.4. Blood Biomarker module

Users can enter data to determine percentile ranks for up to nine biomarkers and to reinforce units of measurement and risk factor threshold levels for key health indicators. Databases were constructed from published national health surveys and large epidemiological studies across six countries and cover ages 18-75 yr.

5.5. Virtual Population module

To facilitate investigation among the ~200 VP variables a ‘Virtual population’ function has been developed. This allows thousands of VP profiles to be generated and explored for patterns such as correlations or ageing trends, differences across sexes or, for example, when analysing different disease conditions, sedentariness and activity levels.

Figure 4. The Virtual Population module can generate up to 5000 VP profiles per iteration. Specific sub-populations can be chosen and laboratory exercise tailored for particular curriculum focus areas.

6. Conclusion

The EST has been developed to (1) reinforce applications of correct measurement units and ranges, (2) understand the breadth of human capabilities and limitations, (3) explore

relationships among behaviours, health and fitness for both individuals and in populations, (4) calculate, compare, integrate, graph and print data, either real or virtual, (5) conduct interactive analyses on health and fitness parameters, including unusual and difficult cases to experience in real life, (6) instruct protocols and laboratory procedures, and (7) apply simple statistical methods to calculate reliability of skills and methods.

The EST facilitates dynamic, interactive learning sessions where students can use empirical or simulated data in a variety of pedagogical contexts such as problem-based learning, team-based learning, ‘what-if’ scenarios, clinical simulation exercises, and patient decision-making. Teachers can also develop and share laboratory ideas and supporting resources such as quizzes, video clips and project designs that utilize the EST functionality.

References

- Ellman, M.S., & Schwartz, M.L. (2016). Online Learning Tools as Supplements for Basic and Clinical Science Education. *Journal of Medical Education and Curricular Development*, 3 109–114 doi:10.4137/JMECD.S18933.
- Magnusson, S, Krajcik, J. & Borko, H. (1999). Examining Pedagogical Content Knowledge, Chapter 4 in Volume 6 of the series *Science & Technology Education Library* pp 95-132. Nature, Sources, and Development of Pedagogical Content Knowledge for Science Teaching.
- Mishra, P. & Koehler, M. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record* Volume 108 Number 6, p. 1017-1054. <http://www.tcrecord.org> ID Number: 12516, Date Accessed: 28/01/2018.
- Norton, K. & Norton, L. (2011). *Pre-exercise screening. Guide to the Australian adult pre-exercise screening system*. Published jointly by Exercise & Sports Science Australia, Fitness Australia and Sports Medicine Australia.
- Norton, K. & Norton, L. (2018). Exercise Science Toolkit [Computer software]. Retrieved from <http://exercisesciencetoolkit.com>.
- Norton, K. & Olds, T. (2001). Morphological evolution of athletes over the 20th century: causes and consequences. *Sports Medicine*, 31, 763-783.
- Norton, K.I., Whittingham, N., Carter, J.E.L., Kerr, D., Gore, C.J. & Marfell-Jones, M. (1996). *Measurement techniques in anthropometry*. In K. Norton and T.S. Olds (Eds.) *Anthropometrica*, 25 - 75, Sydney: UNSW Press.
- Tanner, R.K. & Gore, C.J. (2013). *Physiological tests for elite athletes 2nd ed.* Illinois: Human Kinetics.

Improving the quality of learning in a blended learning environment for first-year biology

Kritzinger, Angelique^a; Lemmens, Juanclaude^b and Potgieter, Marietjie^c

^aDepartment of Plant and Soil Sciences, University of Pretoria, South Africa, ^bDepartment of Education Innovation, University of Pretoria, South Africa, ^cDepartment of Chemistry, University of Pretoria, South Africa.

Abstract

Increased class sizes and rapid advancement of information technology has prompted institutions to move toward blended learning. The effectiveness of the instructional design of the blended learning courses has not been studied extensively in large classes. This study aims to interrogate the effectiveness of the instructional design of a large first year biology class with the aim of providing the most effective blend for all students but focusing on the at-risk and murky middle students. This was done by firstly investigating which of the different learning opportunities contributed most to the success of the students and secondly by investigating student engagement with the learning opportunities provided to them. The results show that small, face-to-face tutorial classes and online formative assessments contributed the most to student success. The results also show that at-risk and murky middle students tend to make use of learning opportunities less after the first summative assessment, possibly putting them at risk of failing.

Keywords: *Learning analytics, blended learning, first year biology, course design.*

1. Introduction

It is widely acknowledged that higher education worldwide faces the challenge of growing student numbers, increased diversity of students and reduced resources (Cash, Letargo, Graether, & Jacobs, 2017). This is particularly acute in South Africa where students numbers have almost doubled since 1994 but the per capita funding has decreased (Badat, 2014). The increase in class size and the rapid advancement of information technology have prompted institutions to move to blended learning. Although blended learning has been investigated (Gleadow, Macfarlan, & Honeydew, 2015) the effectiveness of the blend, especially in large classes, has not been studied extensively. In order to study the effectiveness of the blend one should investigate student engagement with the learning opportunities provided to them and the impact that the different activities have on student performance. Thus, student engagement can be used as a theoretical lens to study the instructional design of the course.

2. Theoretical framework

In the early 1980's student engagement was defined as a student's "time-on-task" with educational activities. The current definition highlights the obligation of both the institution and students to take responsibility for engagement. Zepke & Leach (2010) suggest that engagement can act as a proxy for quality in education. Thus facilitating student learning is an institutional responsibility which is acted out by the lecturers involved in instructional design of the courses they present.

Siemens and Long (2011) defined learning analytics (LA) as the use of learner produced intelligent data and analysis models to uncover information and to predict and advise on learning. With LA, student learning, academic progress and teaching practice can be analyzed which, in turn, can be used to inform instructional design.

In principle each cohort of students can be divided into three groups; students that are likely to pass with relative ease, students that are likely to fail the course in the absence of substantial interventions (termed at-risk) and students for whom the prediction of outcomes is difficult. The Student Success Collaborative in the USA (Student Success Collaborative, 2014) coined the term the "murky middle" (MM) for these students for whom the academic outcome is difficult to predict. It was demonstrated that a lot of resources are allocated to the at-risk group and comparatively little to the MM students, while an investment of resources to support this group of students will deliver a high return on investment (Student Success Collaborative, 2014). In this study we want to analyse the engagement patterns of each of the three groups in anticipation that each group could potentially benefit from a different combination of learning opportunities. We are also particularly interested in the engagement patterns of the MM and the blend of learning opportunities that could promote their chances of success.

3. Rationale

Many higher education institutions have moved toward a blended learning approach for teaching and learning, providing learning opportunities both in and outside of the classroom. Given the cost of higher education it is important to monitor the effectiveness and uptake of learning opportunities provided to the students for two reasons; firstly the human resource implications of its setup and maintenance and secondly, the cost involved for students to access online resources. The effectiveness of the instructional design of the course is seldom investigated. One would ideally like to provide the most students with the best possible interventions given limited resources. Thus using the premise of the MM, the study will investigate which learning opportunities are used most by the at-risk and MM students and which of these have the biggest impact on success for these two groups of students.

4. Aim of the research

The aim of this research is to interrogate the design of the blended learning environment to ensure that it is optimal to advance student success. Thus, the research questions that we would like to explore are:

RQ 1. Which of the activities in the blended learning environment are associated most strongly with success for each of the three groups?

RQ 2. What is the difference in the uptake of learning opportunities by the three different groups of students?

5. Methodology

For this study students were categorized based on their performance in the Grade 12 final examination for the subject physical sciences. The at-risk group were classified as students with a physical sciences mark below 72%, the MM as students with a mark between 72% and 81% and the LTP students had a mark of 81% or more (Kritzinger, Lemmens and Potgieter, under review). The first objective of this study was to determine if there was a difference in engagement patterns between the at-risk, MM and likely-to-pass (LTP) students. Previously it was shown that the summative assessments (semester tests 1 and 2) were the best predictors of success for the course (Kritzinger, Lemmens and Potgieter, under review). The summative assessments were spaced at regular intervals in the timeline of the course, which allowed for the data to be analysed to detect a shift in the use of learning opportunities over time. Chi-square Automatic Interaction Detector (CHAID) was chosen as the method of analysis to determine which activity contributed the most to success overall. This analysis was performed for the total student population as well as the

three subgroups with the first and second summative assessment and the exam mark as outcome variables, respectively. Success is defined as either a fail or pass mark for the respective summative assessments. Analysis of Variance (ANOVA) and Tukey *post hoc* tests were chosen as the methods of analysis to determine if there was any difference in use of the learning opportunities by the subgroups.

6. Context of the module

Molecular and Cell Biology (MLB 111) is a first year module in the Faculty of Natural and Agricultural Sciences at the University of Pretoria, South Africa. A large number of students annually enroll for this course (ca. 1500 students). The module is a blended learning course with both face-to-face and online components. Data for this study were obtained from the students enrolled during the first semester of 2015 for MLB 111. A total of 1084 student records were used for the study. The sample comprised 730 females (67%) and 354 males. The engagement data for the study were obtained from the Grade Centre of the Learning Management System (LMS).

The instructional design for the course is summarised in the activities described below. The description below indicates how activity engagement were recorded and provides a motivation for inclusion of these activities in the instructional design.

6.1 Compulsory activities

There were three compulsory activities that students had to participate in to be granted access to the examination at the end of the semester; namely class participation, tutorials and Connect quizzes.

- A. Class attendance and participation in class have been shown to correlate well with achievement as reported in the meta-analysis by Credé, Roch, and Kieszczynka (2010) and were thus included as a compulsory activity for this module. Students had to attend four theory classes a week during which at least one peer learning activity was conducted and recorded. Responses were logged using clickers.
- B. Face-to-face tutorials in small classes have been part of the course design for a number of years and are considered essential for the success of the students. Tutorials are presented every week and are led by senior post-graduate students that were trained beforehand by the lecturers. The tutorials are structured around peer learning activities (Lasry, Mazur, & Watkins, 2008) and students participated in the tutorials by using clickers.
- C. Online testing has become commonplace in the last few years as part of the blended learning initiative at the university. A review of the literature by Gikandi, Morrow and Davis (2011) shows that it is mostly used for immediate feedback, engagement with critical learning processes and promoting equitable education by addressing diverse

student needs and has a positive effect on student engagement (Angus & Watson, 2009). Online quizzes were used as low stakes tests at the end of each study unit.

6.2 Voluntary activities

Some optional learning opportunities were also provided. Lieu, Wong, Asefirad and Shaffer (2017) showed that students do not read their textbooks unless an incentive is provided, and that pre-reading in first year biology has been correlated with improved exam performance. Learnsmart is an adaptive learning system that is part of the online suite of the prescribed textbook for the course. Learnsmart was introduced as a voluntary activity for the module with the intention to help students prepare for the upcoming lectures and to prompt them to read the textbook. In the case of MLB 111, the student were given time before the relevant section of the work started to complete the Learnsmart assignments in order for them to prepare before the class. Virtual tutorials were conducted outside of class time by senior post-graduate students who also presented face-to-face tutorial classes. Students could participate on a voluntary basis and participation was logged into the LMS.

7. Preliminary findings

The analysis of engagement data generated a rich description of differences between sub-groups as well as shifts in engagement during the course of the semester. These findings are reported in Table 1 and Figure 1 and only the most important aspects are described below.

A CHAID analysis of the complete dataset using the exam as outcome variable showed that the biggest contribution to success for all students was participation and performance in tutorials. The results show that the likelihood of students to pass the exam if they had below 82% for their tutorials was 23% (node 1). These students' chances increased to 37% if they also participated in the online quizzes (labelled Online tests) and scored more than 81% in these tests, but dropped to 17% if they achieved less than 81% average for the online quizzes. The second node showed that if students obtained between 82% and 86% for the tutorials they had a likelihood of 49% to pass the exam, however they increased their likelihood of passing the exam to 65% if they gained above 81% for the online quizzes and decreased their likelihood to a mere 33% if they did not get 81% for the online quizzes. Nodes three and four showed that students who had 86% and more for their tutorial classes had a likelihood of 76% or more of passing the exam. Detailed CHAID analysis (not shown here) for each group of students (at-risk, MM and LTP) using the summative assessments as outcome variables was also performed and confirmed the results of the CHAID showing that tutorials were the most important predictor of success (RQ 1). The analysis of the MM subgroup showed that over the duration of the course different learning opportunities contributed differently to student success.

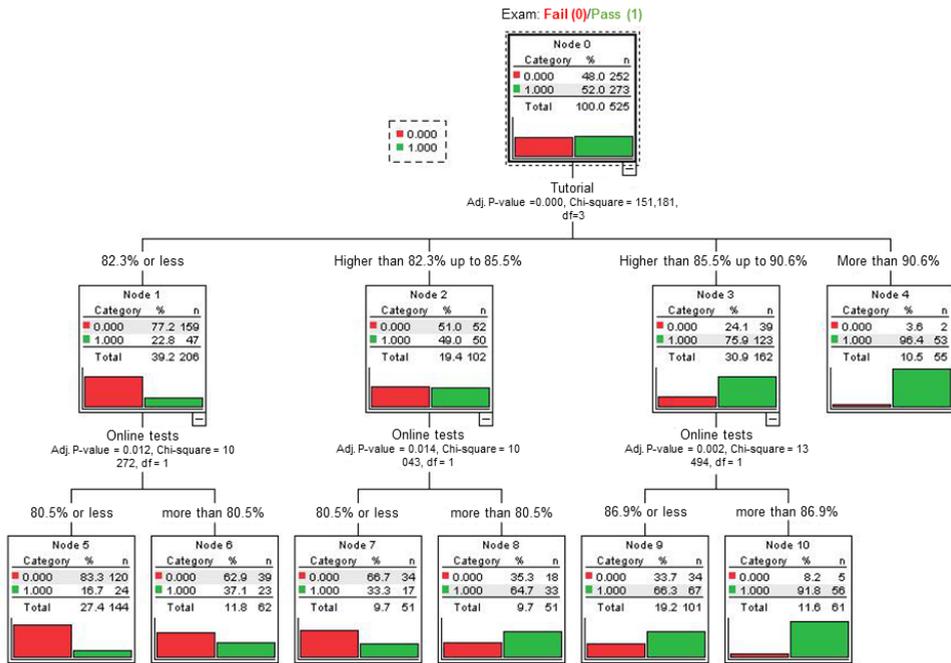


Figure 1: CHAID with exam as outcome variable using the complete data set.

Following the CHAID analysis we investigated the uptake of learning opportunities by the three subgroups before semester test 1 (period 1) and between semester tests 1 and 2 (period 2) (Table 1). Table 1 lists the three compulsory activities with a statistical analysis of the uptake of these activities by the three subgroups for the two time periods (voluntary activities not included).

In pairwise comparisons there were a significant difference between all groups for all three compulsory activities, except for class participation where the MM resembled the LTP group in period one. In period two a shift occurred and all three groups participated less, however two shifts were notable; for the peer led tutorial classes the significant difference present between group one (at-risk) and two (MM), in period one, was not present in period two anymore. For class participation the resemblance between group two (MM) and three (LTP) disappeared. Both shifts are reason for concern. Uptake of the voluntary activities was low overall and was not included in Table 1 due to space constraints.

Table 1: Engagement patterns with the blend of learning opportunities by the at-risk, MM and LTP groups in MLB 111.

Compulsory activities	Activities before semester test 1 (Period 1)				Activities between semester tests 1 and 2 (Period 2)			
	At-risk (Group 1)	MM (Group 2)	LTP (Group 3)	Between group significance	At-risk (Group 1)	MM (Group 2)	LTP (Group 3)	Between group significance
Peer led tutorial classes (Average %)	77% (SD 19%)	81% (SD 15%)	88% (SD 11%)	$p_{(1,2)} < 0.001$ $p_{(1,3)} < 0.001$ $p_{(2,3)} < 0.001$	71% (SD 21%)	74% (SD 18%)	80% (SD 12%)	$p_{(1,2)} = 0.120$ $p_{(1,3)} < 0.001$ $p_{(2,3)} < 0.001$
Online quiz (Average %)	62% (SD 30%)	72% (SD 26%)	82% (SD 20%)	$p_{(1,2)} < 0.001$ $p_{(1,3)} < 0.001$ $p_{(2,3)} < 0.001$	60% (SD 29%)	66% (SD 27%)	79% (SD 20%)	$p_{(1,2)} = 0.015$ $p_{(1,3)} < 0.001$ $p_{(2,3)} < 0.001$
Participation in class (total count)	8.2/10 (SD 2.5)	8.7/10 (SD 2)	9.1/10 (SD 1.7)	$p_{(1,2)} = 0.007$ $p_{(1,3)} < 0.001$ $p_{(2,3)} = 0.072$	6.3/ 8 (SD 2.1)	6.6/8 (SD 1.9)	7.1/8 (SD 1.3)	$p_{(1,2)} = 0.037$ $p_{(1,3)} < 0.001$ $p_{(2,3)} < 0.002$

8. Discussion

Credé, Roch and Kieszczynka (2010) showed in a meta-analysis that class attendance (face-to-face) has a positive correlation with performance in individual courses and that the association is even stronger in science than in non-sciences courses. In this study the CHAID analysis identified engagement in the tutorial classes (face-to-face) as the most important predictor of academic performance when the complete dataset was used in the analysis. The fact that the engagement in tutorial classes and participation in theory classes by the MM declined markedly in period two is a cause for concern (Fig 1). As tutorial and theory classes are face-to-face classes, failure to attend and engage in these classes will have a negative impact on performance. Failure to attend these classes might be due to a lack of effort regulation or time management.

9. Preliminary conclusion

The overall aim of this paper was to interrogate the learning design of the blended learning environment of a first year biology course. In particular we wanted to see which activities contribute most to the success of the at-risk and MM students (RQ1). The most important finding of this study is that small group, face-to-face tutorials were the learning opportunity that contributed most to the success. The use of learning opportunities by all three groups declined during the second period but this was even more pronounced for the MM (RQ2). This is a worrying trend as the first analysis clearly showed that opportunities such as the

online quizzes and tutorial classes contributed to the success of the MM students (Fig 1). The research suggests that the most important element of the course design should be well planned face-to-face interactions in smaller groups with well-trained tutors. Regular, formative assessments also helps students, especially the MM, as it provides real time feedback on their learning throughout the semester. The findings of the study has implications for instructional design of this course. Since voluntary activities did not contribute significantly to the outcomes for any of the subgroups, scarce resources can be directed elsewhere.

References

- Angus, S. D., & Watson, J. (2009). Does regular online testing enhance student learning in the numerical sciences? Robust evidence from a large data set. *British Journal of Educational Technology*, 40(2), 255–272. <https://doi.org/10.1111/j.1467-8535.2008.00916.x>
- Badat, S. (2014). Higher Education Challenges: Presented by Higher Education South Africa (HESA). Parliamentary Monitoring group. Retrieved from <https://pmg.org.za/committee-meeting/17037/>
- Cash, C. B., Letargo, J., Graether, S. P., & Jacobs, S. R. (2017). An Analysis of the Perceptions and Resources of Large University Classes. *CBE Life Sciences Education*, 16(2), ar33. <https://doi.org/10.1187/cbe.16-01-0004>
- Credé, M., Roch, S. G., & Kieszczynka, U. M. (2010). Class Attendance in College: A Meta-Analytic Review of the Relationship of Class Attendance With Grades and Student Characteristics. *Review of Educational Research*, 80(2), 272–295. <https://doi.org/10.3102/0034654310362998>
- Gikandi, J. W., Morrow, D., & Davis, N. E. (2011). Online formative assessment in higher education: A review of the literature. *Computers & Education*, 57, 2333–2351. <https://doi.org/10.1016/j.compedu.2011.06.004>
- Gleadow, R., Macfarlan, B., & Honeydew, M. (2015). Design for learning - a case study of blended learning in a science unit. *F1000Research*, 4, 898. <https://doi.org/10.12688/f1000research.7032.2>
- Lasry, N., Mazur, E., & Watkins, J. (2008). Peer instruction: From Harvard to the two-year college. *American Journal of Physics*, 76(11), 1066–1069. <https://doi.org/10.1119/1.2978182>
- Lieu, R., Wong, A., Asefirad, A., & Shaffer, J. F. (2017). Improving Exam Performance in Introductory Biology through the Use of Preclass Reading Guides. *CBE Life Sciences Education*, 16(3), ar46. <https://doi.org/10.1187/cbe.16-11-0320>
- Siemens, G., & Long, P. (2011). Penetrating the fog: Analytics in learning and education. *EDUCAUSE Review*, 46(4), 30–32. <https://doi.org/10.1145/2330601.2330605>
- Student Success Collaborative. (2014). *The Murky Middle Project*.
- Zepke, N., & Leach, L. (2010). Beyond hard outcomes: “soft” outcomes and engagement as student success. *Teaching in Higher Education*, 15(6), 661–673. <https://doi.org/10.1080/13562517.2010.522084>

“Tug of war” Maths & Sport Project

Magnaghi-Delfino, Paola^a and Norando, Tullia^a

^aDepartment of Mathematics, Politecnico di Milano, Italy,

Abstract

Tug of war is a sport which originated from rituals practiced by ancient populations and now is an organized sport. In this paper we present the project that we proposed to a group of high school students, in order that they analysed the physics of tug of war and produced a model. The project was carried out with the support of the math and physics teachers of the students involved. After some introductory lessons, the students worked independently producing results that were discussed with us. Virtual simulations were carried out in the school laboratory using first Excel and then the open source LÖVE graphics engine. The experiments were done in the school gym. The students asked the collaboration of players of some teams of tug of war to validate the expected tactics of the mathematical model.

Keywords: *Mathematics, Physics, Sport*

1. Introduction

The authors of the present paper are engaged in interdisciplinary research initiatives of the FDS Laboratory of the Politecnico di Milano (Formation, Didactics, Science Communication) and, in particular, they are interested to “contamination” projects between scientific thoughts, artistic insights and sport. It is well known that Mathematics plays a very important role from a cultural point of view in the modern world and the students realize that Mathematics is also a powerful tool, rather than being a closed discipline. Mathematical concepts connect new ideas to other ideas learned previously or in other educational experiences, helping to learn concepts used in other disciplines.

In 2002, the FDS laboratory conceived a program called "Progettiamo con la Matematica" (Planning with Mathematics) to let students and teachers of upper secondary schools know how Mathematics can enter in many aspects of human life, through the modeling of phenomena, situations, forms or allowing predictive studies. The experience aims to develop in the working group the ability to analyze a problem, its adequate formalization, identification of a suitable resolution strategy, and a subsequent verification of the results obtained. The project also allows an unusual collaboration between students, teachers and university tutors; it favors the ability to communicate both by means of information technology and orally. Students can take advantage of the research developed both in the school career and in national / international competitions.

In this article, we present a project that combines Mathematics, Physics and Sport.

We propose the “Tug of War” project to a group of pupils of the last year high school. They already knew the fundamental laws of dynamics and in particular the theoretical point of view of the second law of Newton.

2. Historical hints

The *Oxford English Dictionary* says that the phrase "tug of war" originally meant "the decisive contest; the real struggle or tussle; a severe contest for supremacy". Only in the 19th century it was used as a term for an athletic contest between two teams who haul at the opposite ends of a rope.

The origins of tug of war are uncertain, but this sport was practiced in ancient Egypt, Greece and China, where it was held in legend that the Sun and Moon played Tug of War over the light and darkness. In ancient Greece the sport was called *helkustinda* (Greek: ἑλκυστίνδα), *efelkustinda* (ἐφέλκυστίνδα) and *dielkustinda* (διέλκυστίνδα), which derives from *dielkō* (διέλκω), meaning amongst others "I pull through", all deriving from the verb *helkō* (ἔλκω), "I draw, I pull". *Helkustinda* and *efelkustinda* seem to have been ordinary

versions of tug of war, while *dielkustinda* had no rope, according to Julius Pollux. It is possible that the teams held hands when pulling, which would have increased difficulty, since handgrips are more difficult to sustain than a grip of a rope. Tug of war games in ancient Greece were among the most popular games used for strength and would help build strength needed for battle in full armor. Tug of war stories about heroic champions from Scandinavia and Germany circulate Western Europe where Viking warriors pull on animal skins over open pits of fire in tests of strength and endurance, in preparation for battle and plunder.

In the XVI and XVII century, tug of war is popularized during tournaments in French châteaux gardens and later in Great Britain.

In XIX century, tug of war begins a new tradition among seafaring men who were required to tug on lines to adjust sails while ships were under way and even in battle.

3. Tug of war games

Tug of war was part of the Olympic Games from 1900 until 1920, but has not been included since.



Figure 1. Olympic Games - St.Louis 1904. Source:Public Domain

The sport is part of the World Games. The Tug of War International Federation (TWIF) organizes World Championships for nation teams biannually, for both indoor and outdoor contests, and a similar competition for club teams. In England, the sport was formally governed by the AAA until 1984, now the Tug of War Association (formed in 1958) is the delegate authority. Instead the Scottish Tug of War Association (formed in 1980) organizes the competitions in Scotland. The sport also features in Highland Games there. The sport is played almost in every country in the world. However, a small selection of countries has set up a national body to govern the sport. Most of these national bodies are associated with the

International governing body call TWIF, which stands for The Tug of War International Federation. As of 2008 there are 53 countries associated with TWIF, among which are Scotland, Ireland, England, India, Switzerland, Belgium, Italy, South Africa and United States.

3.1 Fundamental Rules

- 1- Two teams formed of eight players (only women or only men), whose total mass must not exceed a maximum weight as determined for the class, align themselves at the end of a rope approximately 11centimeters in circumference and 33.5meters long. The rope is marked with a "center line" and two markings 4 meters either side of the centerline. The teams start with the rope's centerline directly above a line marked on the ground, and once the contest (the "pull") has commenced, attempt to pull the other team such that the marking on the rope closest to their opponent crosses the centerline, or the opponents commit a foul.
- 2- Lowering ones elbow below the knee during a "pull"- known as "Locking" - is a foul, as is touching the ground for extended periods. The rope must go under the arms; actions such as pulling the rope over the shoulders may be considered a foul. These rules apply in highly organized competitions such as the World Championships. However, in small or informal entertainment competitions, the rules are often arbitrarily interpreted and followed.

4. General analysis

While the sport is practiced both outdoors and indoors, we considered the indoor variant of tug of war only, as the soil and ground conditions would furthermore complicate the study, as for the possibility for the players to sink their heels in the ground.



Figure 2. Indoor and outdoor matches. Source:Public Domain

We can distinguish two player roles:

- The first seven players (pullers)
- The eighth player (anchor man)



Figure 3. Players. Source:Public Domain

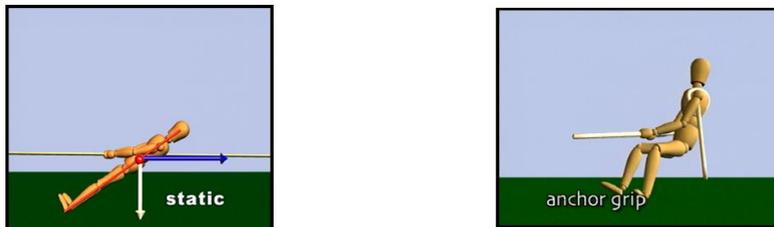


Figure 4. Scheme of Players. Source:Our Creation (2018)

4.1 The first seven players

The elements that characterize these players are:

- the position maintained during the race, characterized by an angle α between the body and the platform
- the force exerted in the shooting action
- the position of the rope always parallel to the platform

4.2 The eighth player

The elements that characterize this player are:

- the position of the rope that is passed diagonally along the body
- this player has an angle β of different inclination respect to the angle of the other players

- the section of rope between him and the seventh player is not parallel to the platform but forms an angle θ with respect to it

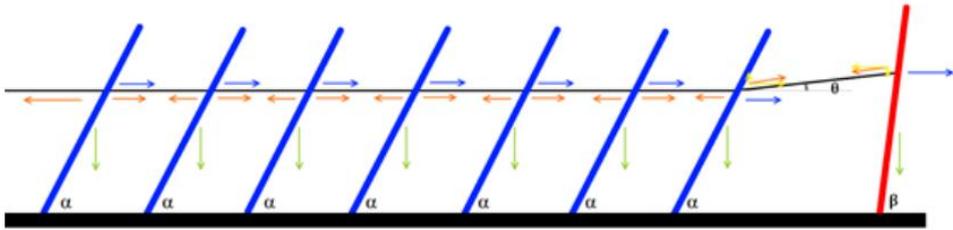


Figure 5. Sport's Diagram. Source:Our Creation (2018).

5. Physical model

Initially, we examine the conditions for static equilibrium of the first six pullers. We assume that the rope is massless, parallel to the ground except for the last two pullers and we approximate the athletes' bodies to rigid bars of the same length.

By applying Newton's second law, we can draw an equation, which ties the tilt angle α of a puller to the force he exerts on the rope. This force is equal to the difference between the tension coming from the front of the athlete and one coming from behind.

Table 1. Variables and Forces

Variable	
T_n	forward tension
T_{n+1}	back tension
F_n	force
F_p	weight
F_a	friction

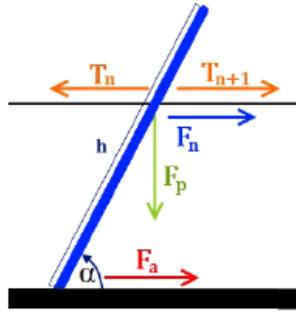


Figure 6. Scheme. Source: Our Creation(2018)

Therefore, we find a minimum tilt angle α_{\min} tied to the coefficient of friction: if the angle α of any puller falls below this value, he falls backwards, due to insufficient friction with the floor. To obtain a measure for the coefficient of friction μ between the athletes' shoes and the floor, we suggest carrying out an experiment in the school gym with dynamometers, some weights and a pair of sports shoes.

The students calculated the static friction force corresponding to an empty shoe and the same shoe with different weights, obtaining the average value of the friction coefficient between the sole of the shoe and the platform.

This mean value is $\mu = 0.71 \pm 0.02$, with R^2 coefficient very near to 1.

As regards the last two athletes, we can draw a similar equation to describe the tension of the rope in front of the seventh puller, which depends on three variables: the tilt angles α and β of the two pullers and the bending angle θ of this section of rope between them.

Thanks to information from Mr. Zoccoli, a professional player, we are able to tie θ to α , and then define β from both, making the equation dependent only on the first angle.

Making a system of the last equation and the equations describing the first six pullers, we are able to write a new equation describing the total force exerted on the team in function of the tilt angle α of the first seven pullers.

The last equation, however, contains a large number of transcendent functions and thus it is impossible to find the value of α by a known tension T . In order to do that, we use a numerical approach that is the bisection method.

We obtain, using the μ value 0.71, $\alpha_{\min} \approx 55^\circ$.

The physical analysis and the simulation developed are limited to modeling pulls into a static equilibrium situation. In a next project, we can carry out modeling pulls in dynamic situation and evaluate the strategic elements that characterize the tug of war.

The program chosen by the students calculates in real time the angle of inclination of each player, using the tension coming from the left and the bisection method.

The tensions of each string sections and the forces applied by each player are calculated. The masses are randomly generated so that their sum is equal to 720kg.

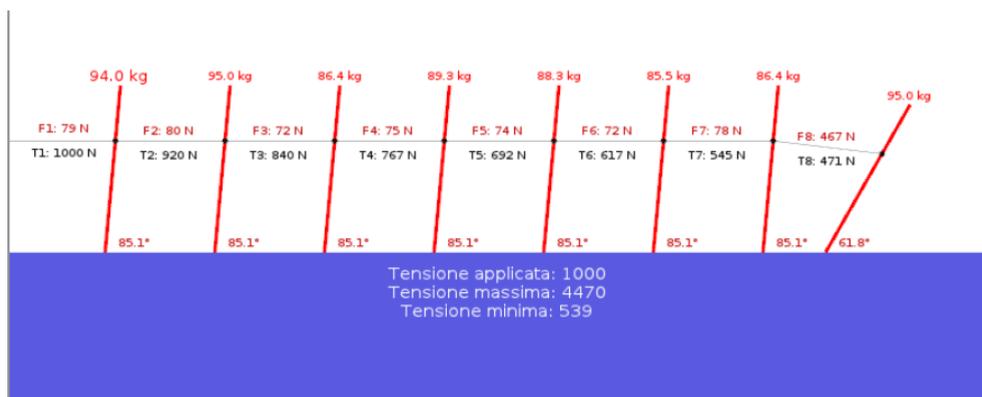


Figure 7. Simulation. Source: Our Creation(2018)

6. Conclusion

The conventional belief has always been that students interested in scientific thought should develop strong math skills. However, it might actually be the other way around. Teachers think that activities in art or in history of science can help students build math skills and make math learning more fun. FDS give both projects to enhance the mathematical knowledge and projects to build a solid math foundation. Here we have presented an example in which students can combine mathematics, physics and sport and the aim is to help students visualize the mathematical abstract concepts and its contributions to the cultural heritage.

References

Brandi, P., & Salvadori, A. (2010). Prima di iniziare, Conoscenze e competenze matematiche di base per l'Università. www.Aquaplano.eu.

- Brandi, P.,& Salvadori, A. (2010). *Matematica&Realtà, Percorso D – Fenomeni e funzioni periodici.*
- Halliday,D.,&Resnick,R. (2011). *Fundamental of Physics.* Cleveland: John Wiley&Sons.
- Sumpter, D. (2017). *Soccermatics: Mathematical Adventures in the Beautiful Game.* Pro Edition (Bloomsbury Sigma) Paperback
- FHSST. (2005). *The free high school science texts: a textbook for high school students studying physics.* Retrieved from <http://www.nongnu.org/fhsst/fhsstphy.pdf>
- www.figest.it
- <http://www.videosports.it/>
- <https://vanessamorello.wordpress.com/2010/11/27/la-matematica-e-lo-sport/>
- <http://utenti.romascuola.net/mediasangallo/SitoArchimede2/GiocoSport.html>
- http://www.logica-matematica.it/sezioni/marina_militare/accademia/fisica.asp
- http://www.liceolocarno.ch/Liceo_di_Locarno/Internetutti/ferrari/PDF/FisI/serie8-I.pdf
- <http://matematica.unibocconi.it/articoli/un-calcio-alla-matematica-ovvero-palanca-chi-era-costui>

Analysis of two Leveling Courses in Chemistry: objectives, methodology, assessments and future prospects

Arroyo-de Dompablo, M. Elena^a and Ibáñez-González, M. José^b

^aDepartamento de Química Inorgánica, Facultad de Ciencias Químicas, Universidad Complutense de Madrid, Spain ^bDepartamento de Ingeniería Química, Escuela Superior de Ingeniería, Universidad de Almería, Spain

Abstract

The purpose of this report is to analyze different aspects of two leveling courses in Chemistry offered to entry-level students in the Degree in Geology (Universidad Complutense de Madrid) and in the Degree in Agricultural Engineering (Universidad de Almería). We comparatively analyze the motivations for offering the course, its aims and objectives, the course design, methodology, assessment and finally the achievements of the course in both universities. The assessment of learning process is done through quizzes at the beginning and at the end of the courses. Voluntary and anonymous surveys show that the students are very satisfied with the courses. In the future, the aim is to improve the learning methodology in order to achieve greater student motivation.

Keywords: *Chemistry; leveling course; e-learning; flipped class*

1. Introduction

Chemistry is commonly seen as a "central science" (Brown, LeMay, Bursten, Murphy, & Woodward, 2009), so that the mastery of its concepts is essential for future university courses in all sciences and in many engineering majors. Unfortunately, the present Spanish educational system does not guarantee that the students accessing the higher education level possess the required mastery of chemistry. Several research studies directly address the issue of high school preparation in connection with college performance in Chemistry (see for instance (Tai, Sadler, & Loehr, 2005)). In this scenario, leveling college courses can be designed to give the students a solid foundation in Chemistry, prior to face the Chemistry courses at the University. Therefore, leveling courses could be defined as the courses taken at the beginning of the first terms by a student before he/she begins their study of Chemistry at the level of the first course taught in the corresponding major. There are diverse formats for these leveling courses, going from traditional in classroom lectures to full *e-learning* courses.

A variety of different entry-level sequences of introductory Chemistry is being offered alongside Spanish universities. Each one is designed for a different target audience, usually differentiated by major. The inter-university framework is a good platform for further development of the leveling courses in Chemistry. In this communication, we analyze the courses of leveling in Chemistry imparted in-classroom in the Degrees in Geology at the Universidad Complutense de Madrid (UCM), and through the *e-learning* platform in the Degree in Agricultural Engineering at the Universidad de Almería (UAL). We will comparatively expose the contents, teaching methodology and evaluation procedures of both courses. The aim of this inter-university collaborative work is to improve the quality of the leveling courses in Chemistry.

The leveling course in Chemistry for the Degree in Geology (UCM) consists of 15 hours of traditional in-classroom lectures, divided in daily sessions of 1.5 h. The entire course is covered in the 10 days before the starting of the regular lectures. The students who accomplish successfully the course are awarded with 1.5 ECTS (European Credit Transfer System). The leveling course in Chemistry for the Degree in Agricultural Engineering (UAL) is encompassed in the subject of Chemistry I (6 ECTS, 1 semester). The leveling course is offered to all the students through the *e-learning* platform. Chemistry I consists of 45 hours, 24 hours in the classroom and 19 hours in the laboratory. The first two hours of each unit comprise a review of basic concepts.

2. Methodology

The design of the leveling courses requires a careful selection of the teaching contents. Our starting point was the program of the subject of Chemistry offered in the last year of high school (Ministerio de Educación, 2015). Figure 1 shows the contents that cover the following topics: periodic table, atomic structure, chemical bonds, chemical reactions, dissolutions, thermodynamics, kinetics and chemical equilibrium. As basic criteria for specific course design we have considered the major, the level of the students and the length of the course. Depending on the major each course is taught at a different level of difficulty for a particular topic, requiring different levels of ability, motivation, and effort, as well as different levels of high school preparation. The length of the leveling course is a limiting factor. In the leveling courses under analysis the lessons have been reorganized according to the majors (Degree in Geology and Degree in Agricultural Engineering), taking into account the entry level of the students, and the course length. The respective programs can be seen in figure 1.

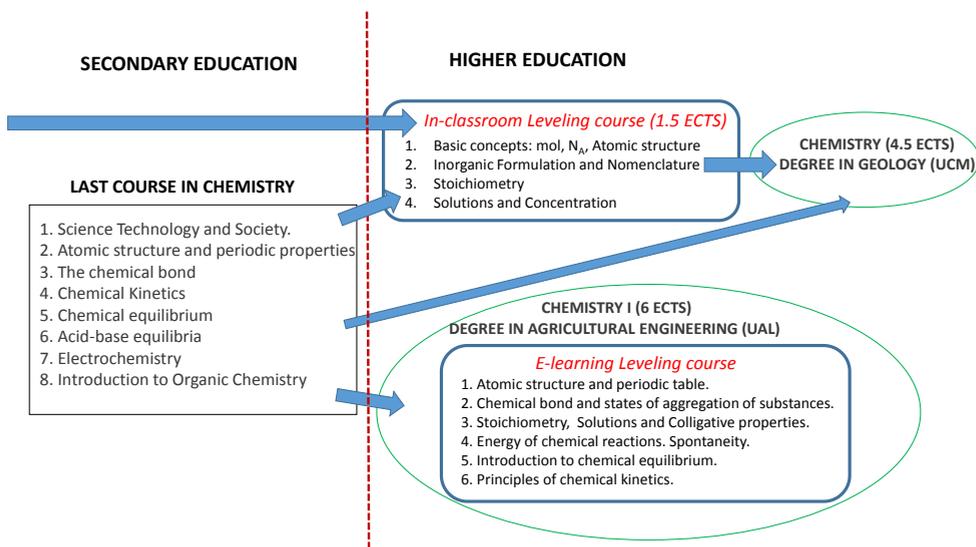


Figure 1. Chart of contents in a high school Chemistry course and in the leveling-courses in Chemistry at the Degree in Geology (UCM) and Degree in Agricultural Engineering (UAL)

A wide range of teaching support and resource materials must be provided to the students. In the two leveling courses under analysis, faculty and teaching assistants have collaborated to prepare such material. Appropriate PowerPoint presentations, some audiovisuals and

self-assessments have been developed for both the in-class or *e*-learning courses at the Department of Inorganic Chemistry (UCM, 2014) and the Department of Engineering (UAL), respectively.

The phases of control and evaluation test the validity of the leveling-courses, throwing results on the attainment of the educational objectives. In the leveling-courses evaluation is mostly done using surveys and multi-choice quizzes. These questionnaires have been designed taking into account the different nature of the courses, in either classroom, or *e*-learning formats. The questionnaires check the level of knowledge in Chemistry acquired by the students but also reflect their opinion about the course.

3. Results

3.1. Traditional in-classroom course. Degree in Geology/Engineering Geology (UCM)

Students can access the major conducting to the Degree in Geology (UCM) with the minimum mark of the university access exam (5 over 14). Most of these students have a poor level in Chemistry. The leveling course in Chemistry is specially designed for students who did not select Chemistry as a subject in the last year of secondary education, although students who desire to reinforce their skills are also accepted. A maximum of 30 students can enroll this course. The leveling course aims providing the very basic concepts of Chemistry, which are introduced in four lessons (see figure 1).The material is delivered to the students as Power Point presentations across the *e*-learning platform the day before the course starts. Along the ten in-class sessions (1.5 hour long), the professor explains the main concepts, ask for individual problem solving and corrects the problems in the backboard. Flipped classroom methodology (Mason, Shuman, & Cook, 2013; Missildine, Fountain, Summers, & Gosselin, 2013) is encouraged, by having students reading selected texts outside of the class, watching supplemental videos, or solving additional problems. However, so far the students show almost no interest in these additional activities.

To measure student subject/matter learning, we used multiple-choice exams. To evaluate the starting level of the students, the first day of class they anonymously solve a quiz (five questions). A second quiz consisting of seven questions, different from those in the first survey, is run at the end of the course. Figure 2 compares the marks obtained for both quizzes, in two consecutive academic years. The percentage of students who correctly answered the questions was significantly higher in the second quiz versus the first.

To measure student perceptions of the classroom, we used a survey (not show for conciseness). The instructor asks the students to communicate anonymously their point of view about the different academic aspects and guidance of the leveling course, through forms filled out in the classroom at the end of the course. In general, the acceptance of the

course is excellent. There are discrepancies regarding the level of the lectures, which is low for some students and high for others (obviously depending on their previous high-school skills). The most valued aspect is the opportunity offered by the course to gradually integrate into the Faculty, and to socialize, in the students' words "make friends".

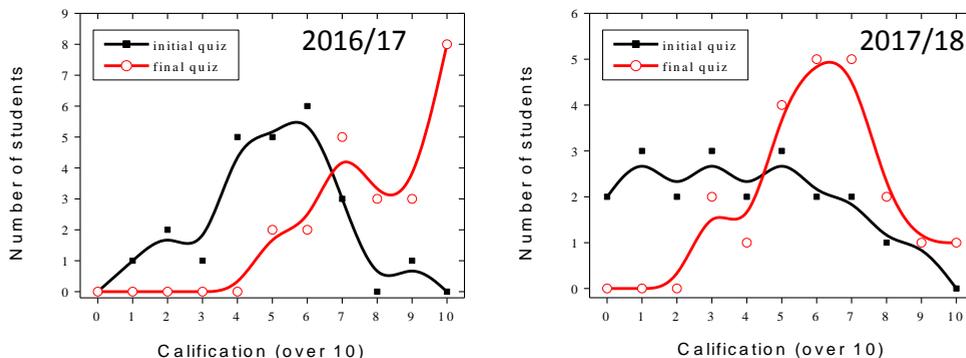


Figure 2. Results of the quizzes in the leveling-courses in Chemistry at the Degree in Geology (UCM). The total number of students taking the course was 24 in 2016/17 and 21 in 2017/2018

3.2. e-learning course. Degree in Agricultural Engineering (UAL)

In general, these are students possessing an acceptable level of Chemistry and Mathematics. Only an underrepresentative minority of students did not take a Chemistry course in the last year of secondary education. Therefore, it has not been considered necessary to design a separate leveling-course, but supplying some introductory material before the beginning of the classes of the subject Chemistry I. Thus, lessons of the leveling-course focus on reviewing the concepts that will be later expanded in the Chemistry I course (see figure 1). Around 95-135 students are enrolled in this subject.

The leveling course is offered in the e-learning platform, applying the flipped learning methodology (Mason, Shuman, & Cook, 2013; Missildine, Fountain, Summers, & Gosselin, 2013), creating a flexible learning environment, empathizing the synergy between group and individual activities and enhancing collaborative learning. The teachers have developed comprehensive, helpful, and interesting chemistry lectures in a series of PowerPoint presentations and audiovisual material, such as YouTube videos or videos made by teachers using Active Presenter software and a Wacom Intuos Pen with a touch small table. In addition, at least 2 hours of classroom sessions are provided for problem-based learning. In the classroom, the professor comments on a PowerPoint reminder and distributes the exercises related to the topic to the students working in informal collaborative groups during their resolution. After resolution, a student from the group is

chosen to resolve the problem on the blackboard. The mark obtained by the student, will be the score of all group. This methodology assured that all students from a group take part in the problem resolution.

Students (approximately 30) voluntarily answer a survey in the Quick test format about their degree of satisfaction with the leveling course. Figure 3 shows a Quick test's answers focused on cooperative learning in the classroom. From the results of the test, it is clear that everyone likes group learning, since it allows them to get to know their classmates. They dislike public speaking. Thus, solving exercises on the blackboard "overwhelms" them. About the audiovisual material (mp4), which has been offered in the course, the opinions were more varied: from "not being useful", to "being useful but not listening well" and to "being useful". The percentage of students passing the Chemistry I subject increased in 30 % after implementing the leveling course.

¿How do you like cooperative learning in the classroom?

+	<ul style="list-style-type: none">+ It gives me the chance to meet classmates+ The experience has been very positive for my personal development. I discovered that discussing with others and solving exercises in the blackboard help me to cope with my shyness+ Being part of a teamwork makes easier solving the exercises.
-	<ul style="list-style-type: none">- I really dislike speaking in public- Solving exercises on the blackboard makes me feel under too much pressure- I find hard assuming the responsibility of contributing to my group's mark. What if I am not good enough?

Figure 3. Summary of the students answers to the anonymous quick test in the leveling-course in Chemistry I at the Degree in Agricultural Engineering (UAL)

4. Discussions

The traditional in-classroom course seems more appropriate for low-level students. During class time, the professor continually observes their students, providing them with feedback relevant in the moment, and assessing their work. This course is scheduled before the official semester starts. The small number of students in the leveling course facilitates the mentoring work of the professor, who has the possibility of helping the students to integrate fully into the university community, stimulating them to approach their studies with

advantage, and inducing an attitude of responsibility over their successes and failures in the forthcoming high education. As disadvantage, this course is quite intensive; limited to a short period of time (10 days) which makes difficult for the students to fully acquire the concepts. Collaborative work is also complicated to conduct in that short period. The flipping class methodology would add dynamism to this course. So far, our attempts in that direction have negligible impact on the students.

The *e*-learning course allows the professor to cover more material, and in accordance, the student must invert a higher level of work. The success of the course is deeply based on the self-learning effort developed by the student. While this is highly positive for motivated students, for the students with poor motivation this methodology is less effective than the traditional in-class lectures. The professor should find the way to get the student to work at home before going to the in-class group activities. The quality of the audiovisual material is essential in the *e*-learning methodology. We are currently working in a better audiovisual material (UAL, 2016), using the Camtasia Studio 8, a software well suited for academicians (Carlson, 2009; Schumacher & Thurkettle, 2007). Learning methodologies applying gamification (Dominguez et al., 2013; Hanus & Fox, 2015) will be included in the future.

The surveys reflect that the students welcome the leveling courses in Chemistry. The students are satisfied with either the in-classroom or the *e*-learning course. They find these courses reinforce their self-confidence, knowledge of the subject, and position them well to succeed in the Chemistry courses in their respective degrees. However, from an academic perspective, there is no solid evidence to sustain that the students who enrolled in the leveling course perform better than their peers do. More investigations should be performed in that direction.

5. Conclusions

We have analyzed two different leveling courses in Chemistry. *E*-learning courses and traditional in-classroom courses have both advantages and disadvantages. The results let us conclude that an effective course design depends critically on the entry-level of the students. A key issue to reinforce in the future is the quality of the audiovisual material provided to the students. We expect that material based on gamification will also influence positively the motivation of the students. In future we will also design strategies to evaluate the impact of the leveling course on performance in the Chemistry subjects. Overall, students who enrolled and follow the leveling-courses are very satisfied with their academic progress and personal assessments.

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References

- Brown, T. E., LeMay, H. E., Bursten, B. E., Murphy, C., & Woodward, P. W. (2009). *Chemistry: The Central Science*.
- Carlson, K. (2009). Delivering Information to Students 24/7 with Camtasia. *Information Technology and Libraries*, 28(3), 154-156. doi:10.6017/ital.v28i3.3223
- Dominguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernandez-Sanz, L., Pages, C., & Martinez-Herraiz, J.-J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, 63, 380-392. doi:10.1016/j.compedu.2012.12.020
- Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, 80, 152-161. doi:10.1016/j.compedu.2014.08.019
- Mason, G. S., Shuman, T. R., & Cook, K. E. (2013). Comparing the Effectiveness of an Inverted Classroom to a Traditional Classroom in an Upper-Division Engineering Course. *Ieee Transactions on Education*, 56(4), 430-435. doi:10.1109/te.2013.2249066
- Ministerio de Educación, C. y. D. (2015). Real Decreto 1105/2014, de 26 de diciembre, por el que se establece el currículo básico de la Educación Secundaria Obligatoria y del Bachillerato. *B.O.E. 13 de enero de 2015*.
- Missildine, K., Fountain, R., Summers, L., & Gosselin, K. (2013). Flipping the Classroom to Improve Student Performance and Satisfaction. *Journal of Nursing Education*, 52(10), 597-599. doi:10.3928/01484834-20130919-03
- Schumacher, G., & Thirkettle, M. A. (2007). Camtasia studio: A teaching tool for academicians and clinicians. *Cin-Computers Informatics Nursing*, 25(3), 130-134. doi:10.1097/01.NCN.0000270038.29788.fl
- Tai, R. H., Sadler, P. M., & Loehr, J. F. (2005). Factors influencing success in introductory college chemistry. *Journal of Research in Science Teaching*, 42(9), 987-1012. doi:10.1002/tea.20082
- UAL. (2016). Universidad Compluense de Almería. Convocatoria de Grupos Docentes para la Creación de Materiales Didácticos en la Universidad de Almería. “Preparación de material audiovisual en química”.
- UCM. (2014). Universidad Compluense de Madrid. Proyectos de Innovación y Mejora de la Calidad Docente *Curso de nivelación de Química para los Grados en Geología e Ingeniería Geológica-PIMCD230*.

Layering Learning for Work-Readiness in a Science Programme

McKay, Marianne.^a; Smith-Tolken, Antoniette^b and Alessandri, Anne^c

^aDepartment of Viticulture and Oenology, Stellenbosch University, South Africa,.

^bDivision for Social Impact, Stellenbosch University, South Africa.

^c Institute for Grape and Wine Sciences, Stellenbosch University, South Africa

Abstract

In order to prepare our students for a challenging workplace, the Department of Viticulture and Oenology at Stellenbosch University in South Africa have implemented Engaged Teaching and Learning (ETL) strategies in the four-year undergraduate degree. In this project, we assessed the effects of service-learning (SL) and a six-month internship on graduate employability by analysing student reflections that had been collected over a number of years. We also asked industry members whether they felt students had improved in key areas after the final year internship. The student submissions for SL showed evidence of personal growth and transformation, and those for the internship reflected industry requirements for practical and other skills in a complex and technically demanding environment. It was found that these innovative and engaged experiences gave students opportunities for self-questioning and personal growth, which is unusual in the 'hard' sciences. Overall, the layered approach (ETL in successive years of the programme) was found to enhance professional attributes advocated by industry professionals, and provide sound preparation for working life. To our knowledge, this alignment of community/industry, academic institution and student in monitoring learning and graduate attributes is a novel approach in science.

Keywords: *Engaged Teaching & Learning; work-readiness; graduate attributes, science.*

1. Introduction

Graduates moving into employment in the agricultural sector in the current South African (SA) context are facing, arguably, some of the most fraught working conditions in the world. A stagnant economy, rampant unemployment, climate change and a history that includes exploitation, racism and deep injustices which still permeate the work context. In addition, Higher Education institutions in SA, and Stellenbosch University (SU) in particular, face complex issues, including calls to decolonise institutions and curricula. With corruption and deep imbalances in SA society seeming to intensify daily, the need to instill ethical, critical citizenship, sensitivity and the ability to cope with the complexity ‘out there’ in our graduates is increasingly important, but challenging within the context of conservative scientific curricula. Fink (2015) notes that a service experience involving significant community issues can be a powerful learning experience will engage students in their own learning will change their lives. An ‘engaged institution’ will be organized to respond to the needs of current and future students (CIC, 2005), through partnering university knowledge and resources with those of the public and private sectors. This strategy will prepare engaged citizens, strengthen democratic values and civic responsibility, address critical societal issues, and contribute to the public good. McNall et al (2009) noted that as HE has engaged with communities, a new form of scholarship – engaged scholarship – has emerged that cuts across teaching, research, and service.

In order to prepare our students for challenges in the workplace, the Department of Viticulture and Oenology at SU in the Western Cape implemented innovative engaged teaching and learning (ETL) strategies in the four-year undergraduate degree which align community/industry, academic institution and student in monitoring learning and graduate attributes. In this project, we assess the effects of these strategies (with a specific focus on the Internship aspects), and whether they help to ‘future-proof’ our students for a the workplace. In order to do this, we also needed to establish what professional attributes were prioritized by our industry, and measure whether these had been affected by our ‘layered learning’ approach.

2. ETL Strategies in Viticulture and Oenology

2.1 Service-learning (SL)

Many universities across the world prefer service-learning as pedagogical framework and practice to integrate community engagement in teaching and learning, but it is less common in the natural sciences. It is a teaching approach that enhances students’ understanding of theoretical content through thoughtfully organized service and real life experience (Lazarus, 2007), where service to the community and learning goals are of

equal weight and benefit (Furco, 2003). Importantly, SL fosters reciprocal relationships with community partners (Lazarus, 2007) while enhancing the academic curriculum through active reflection on learning (Bender, 2006). The focus of service-learning on personal growth, academic learning and social responsibility articulates well with the aims of HE to develop student graduate attributes such as professionalism, critical citizenship and employment competencies..

2.2 Internships

Internships usually require longer regular exposure to workplace learning. In one of the few peer-reviewed studies available on internships in science, Scholz, et al, (2004) investigated the benefits of a compulsory internship in environmental science education. In their study, the authors identified key ‘qualifications’ which transcended the boundaries of a specific discipline, ie: communication skills, organization of work, and provision of information. They suggested that an internship is a good tool to promote these and other skills and abilities and that it should be a compulsory part of the curriculum (Scholz, et al, 2004). King & Schweitzer (2014) argue that internships are more than work-placements, and are a high-impact educational practice, with important consequences for learning as long as the criteria outlined by Kuh (2008) are met. These are: that students invest time and effort, interact with faculty and peers about substantive matters, experience diversity, reflect and integrate learning; and learn through real-world applications.

2.3 Implementation of ETL within the SU Viticulture and Oenology Programme

Engaged strategies are layered throughout the programme, culminating in an extended internship (6 months in industry) in the final (fourth year). These strategies include investigations into social issues in Western Cape, Health & Safety Audits in commercial wineries, and service-learning (SL) at the beginning of the second year. There are normally 30 - 35 students per academic year on the programme. Students are placed in tasting rooms in second year for SL for around a month (a minimum of 25 hours). They will work intermittently during this time, but frequently end up in long term employment at the farm. The internship period is from the end of third year to the middle of fourth year, during which time students do not return to campus, but work continuously at the estate/wine farm carrying out viticultural and cellar duties while experiencing the entire harvest process, from grape ripeness monitoring to the finished wine in bottles. They often live on the farms, and earn a cellar-hand’s wage, and will interact intensively with staff.

McNall, *et al* (2009) stated that an important component of the students’ (as well as staff members) activities is to reflect on their experiences. In our programme, this takes the

form of three reflections on the SL work (before, during and after) in which students analyse intersections (or lack thereof) between their academic work, and their ‘real-life’ experience of wines and consumers. After the internship in fourth year, students submit two reports: a research report based on a small piece of scientific research at the farm, written in the scientific style (third person past perfect), and a routine work report, written in the first person. This contains reflections on daily activities and experiences. Students are mentored by winemakers and viticulturalists on the farm, and by academics at the Department during this time. They are also supported by a full-time internship liaison officer.

3. Project Methodology

In order to analyse how effective our ETL had been in improving student learning, graduate attributes and professional attributes, we analysed three sets of data.

- a) Second year student SL reflections were (~70 reports collected over three years)
- b) Fourth year internship routine work reports, (~80 reports over four years)
- c) Industry members: online questionnaire (one occurrence)

Data was collected on the SU on-line learning platform “SunLearn”, and texts were aggregated and coded using qualitative data analysis software AtlasTI™. Data was coded using strategies as outlined by Saldana (2016). The initial coding cycle in which identified broad themes (Table 1), was followed by second and third coding cycles which extracted subthemes around participants personal and identity development. Ethical clearance for the study was obtained (SU-HSD-002378).

4. Results

4.1. Service-learning

Student submissions for the SL yielded 22 different codes (Table 1) in four broad themes (academic knowledge, work-experience related and personal /perceptions). As was expected in a personal reflection, most content related to their own personal growth. They reflected in depth on their academic content, and the areas in which they had experience which made them feel better prepared for the world of work. The two codes that were highest in frequency were “consumer/marketing interaction” (n=100) and “positive experience” (n= 96).

Table 1. Frequency of codes generated for themes in Service Learning submissions.

Code area	Code	Frequency (n)
ACADEMIC	wine/product knowledge, consumer /marketing interaction knowledge embedded	243
WORK-RELATED	work experience, new knowledge, people skills, communitywine industry, critical thinking/big picture, leadership/responsibility, work-readiness	315
PERSONAL/PERCEPTIONS	Gratitude, life goal, negative experience, personal growth positive experience, self-awareness, agent of change, altered perspective, discomfort and insecurity, confidence	376
Coded items		934

A breakdown of student perception codes can be seen in Figure 1 which shows that there were also negative (uncomfortable) emotions associated with the work experience, and some insecurity (especially at the start of the service-learning period).

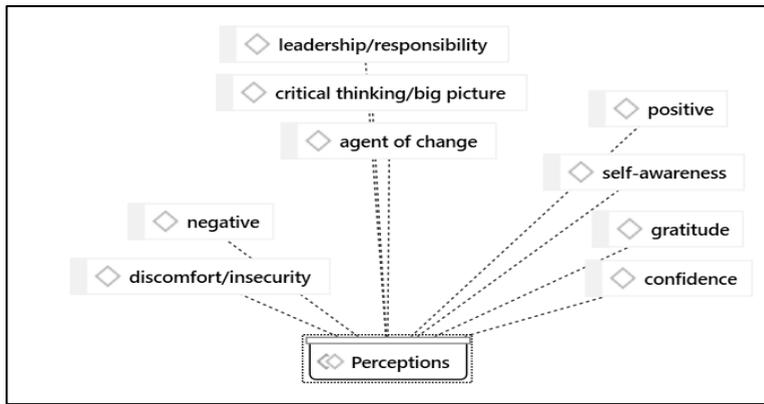


Figure 1. Detailed codes for sub-theme “perceptions” after Service-Learning..

Figure 2 gives some direct quotations from the student reflections, in which it is clear that even though this was a short period in their academic career, it was transformative in nature, leading them to reflect on their career path, industry and even their own personalities.

<p>... I have a much better idea of the wine industry as a whole...</p> <p><i>Being part of a team working in the wine industry has opened my eyes to so much more.</i></p> <p>I'm not exactly sure where I will end up but I know it will never be in a tasting room or any form of marketing!!</p> <p>I've also seen that excellent management is essential for the survival of any business. Service learning is a great method of connecting the theory learnt in class to the practical work actually done in the field of focus. I believe this method should be implemented in all our courses.</p> <p>Before this, I did not know whether to work in the service sector. Regardless of whether this experience is enjoyable, it is valuable and helps one come to a decision.</p>	<p>I learnt how to communicate with people of different ages and nationalities.</p> <p>I have learned that I can be outgoing if I am encouraged or pressured to be in certain situations. I think my anxiety prevents me from experiencing things that could benefit me.</p>	<p>I now look forward to other learning experiences that are outside the classroom.</p> <p>I learnt which language was appropriate to use when describing and explaining wines.</p> <p>This ... has showed me that, if I worry too much about how others work I will never be able to work at my own optimal level.</p> <p><i>I am very shy. I was out of my comfort zone. This pushed me to work hard and to please my employer.</i></p>
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Figure 2. Selected comments from reflections after Service-Learning.

2.2. Internship

The Internship period in the final year takes the work-readiness of the student to the next level. This is evident from their routine work submissions (n=80) in which they reflect on their daily tasks and learning over the six-month period. The total immersion in the work environment is again uncomfortable for them, (particularly at the start of the harvest) and students describe feeling out of their depth, embarrassed, anxious, annoyed or worried by their lack of experience, as they did for their SL. However, by the end of the harvest, levels of confidence are high and accompanied by critical thinking linking a number of aspects of their work experience (Figure 3), and their personal feelings concerning the wine industry in South Africa, and their place in it.

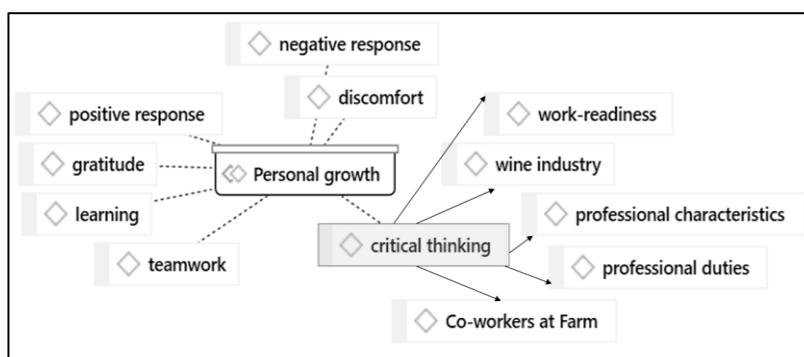


Figure 3. Codes associated with "critical thinking" sub-theme after Internship period in fourth year.

Professional characteristics such as punctuality, being organized and diligent, taking initiative, being proactive and reliable are now discussed by students as important in the working environment, and coincide with those attributes cited by industry as being valuable (Table 2). Awareness of the complexities and social issues within the industry were also highlighted as problems to be solved going forward.

Table 2. Characteristics identified by wine industry members (n=21) impacted by the Internship.

Professional attribute	Chosen by industry members as essential attribute	Improvement after internship?
reliability	18	12
teamwork	16	14
proactive attitude	14	12
problem solving	13	7
organizational skills	12	9
technical skills (vineyard, winery, tasting)	7	11
critical thinker	7	9
Positive impact of Internship overall		19
Employability improved		16

Students worked alongside a varied complement of staff (Figure 4) from all areas of South African society, and recognized the intense value of mentorship not only from their ‘official’ Internship mentors (winemakers and viticultural experts) but also from cellar hands and vineyard workers. Knowledge production worked both ways, with students bringing new scientific findings from the academic environment, and learning key skills from co-workers at the farms, as well as an increased sensitivity for working conditions.

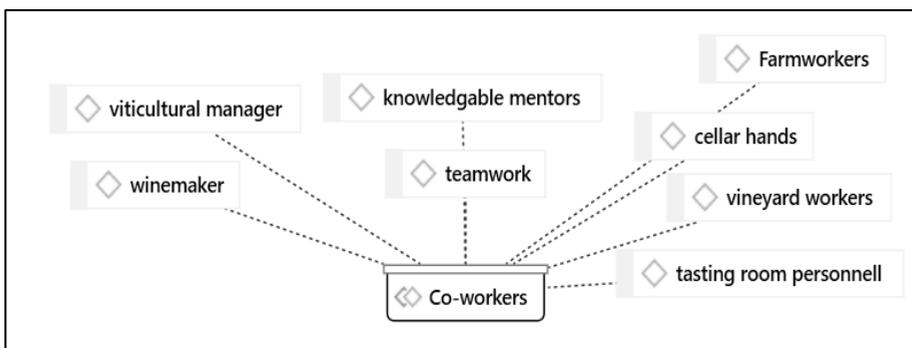


Figure 4. Codes associated with the sub-theme “Co-workers” after the internship.

5. Discussion and Conclusions

Engaged strategies like service-learning and the internship give our students the opportunity to apply academic knowledge in a real-world setting, work and learn alongside a diverse group of people, and reflect on their experiences. We are therefore satisfied that Kuh's (2008) criteria including purposeful tasks, opportunities for reflection, building substantive relationships and engaging across differences, were met in this programme. Engaged experiences are solid preparation for working life, as well as giving students an important (and often humbling) sense of themselves in the broader industry. It was also the case, as asserted by Boler (1996) that the discomfort associated with the workplace provided excellent opportunities for self-questioning and personal growth, which is unusual in the sciences. Our results indicated that ETL enhanced graduate attributes and professional characteristics, with 19 of 21 industry members indicating an overall positive impact, and 76% of these potential employers agreeing that employability had improved. Skills such as organization of work, reliability, and technical abilities seemed enhanced according to industry feedback. Internships also seemed to promote problem solving and teamwork, both important in a South African context. There are clear shifts in focus within the student reflections concerned with learning, interaction with the community, and their own transformation. There is also an interchange of social commodities, which are developed together in the cyclic process, particularly in the internship engagement, which relies heavily on sustainable, reciprocal relationships with excellent mentors. Knowledge is created through the interactions, and meaning-making occurs individually, concurrently and collaboratively. This suggests that engaged teaching and learning strategies within a Higher Education curriculum are of high value to professional education in science.

References

- Bender, G. Daniels, P. Lazarus, J. Naude, L. Sattar, K., (2006). Service-Learning in the Curriculum, A Resource for HE Institutions HE Quality Committee (HEQC), Council for Higher Education, South Africa. http://www.che.ac.za/media_and_publications/research/service-learning-curriculum-resource-higher-education-institutions
- Boler, Megan. (1999) *Feeling Power: Emotions and Education*. New York: Routledge, ISBN-13: 978-0415921046
- Committee on Institutional Cooperation (CIC), Committee on Engagement, (2005). *Engaged Scholarship: A Resource Guide*. http://www.btaa.org/docs/default-source/technology/engaged_scholarship.pdf?sfvrsn=481c09b5_2
- Fink, L.D (2015) *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. Jossey-Basse, Wiley. (Publ) ISBN 978-1-118-41632-7
- King, M & Schweitzer, H. (2014) *A Pedagogy of Internship. Proceedings of the Symposium on Applied Learning in Higher Education*. https://www.academia.edu/6494106/A_Pedagogy_of_Internship

- Kuh, G.D (2008) High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter (eBook Versioniation of American Colleges and Universities: LEAP, Making Excellence Inclusive. ISBN978-0-9796181-4-7
- Furco, A. (2003). Issues of Definition and Program Diversity in the Study of Service-Learning. In Billig, S.H. and Waterman, A.S. (eds.). *Studying Service-Learning: Innovations in Education Research Methodology*. New Jersey: Lawrence Erlbaum Associates
- Lazurus, J. (2007). Embedding Service Learning in South African Higher Education: The Catalytic Role of the CHESP Initiative *Education as Change*, Volume 11 Number 3, Dec 2007, Special Issue: CSL pp91-108
- McNall, M. Sturdevant, C. Reed, R., Brown, A. (2009) Brokering Community–University Engagement, *Innovative Higher Education*, , Volume 33, Issue 5, pp 317–331
- Saldana, J.(2016) *The Coding Manual for Qualitative Researchers*. Sage Publications ISBN 978-1-4739-0248-0
- Scholz, R., Steiner,R., Hansmann, R. (2004) Role of Internship in Higher Education in Environmental Sciences. *J. Res. Sci. Teaching* Vol. 41, No. 1, PP. 24–46

Educational innovation in basic and advanced cardiopulmonary resuscitation in pediatrics and neonatology in a realistic context

García-Molina, Pablo^a; Blasco-Igual, Jose María^b; Balaguer-López, Evelyn^a; Tortajada Alejandro-Lohaces^a; Sanchis-Sánchez, Enrique^b; Georgieva, Sylvia^c and Sánchez-Lorente, María Montserrat^d

^aDepartment of Nursing, University of Valencia, Spain. ^bDepartment of Physiotherapy, University of Valencia, Spain. ^cDepartment of Methodology and Behavioral Sciences, University of Valencia, Spain and ^dConselleria de Sanitat, Generalitat Valenciana, Spain.

Abstract

Introduction: The university professor has to transmit the technical and cognitive skills on Cardiopulmonary Resuscitation (CPR) in Pediatrics with the most effective method.

Methodology: 17 practical classes of Cardiopulmonary Resuscitation of 2 hours for 225 students the 2nd year of the Pediatric Nursing course at the University of Valencia were taught. Each class consisted of 3 clinical cases in which 15 students and 3 monitors participated. The knowledge of the students was evaluated with test-retest of 11 questions and the satisfaction after the simulation (questionnaire of 20 questions).

Results: The satisfaction mean of the students was of 8,62 on 10 points. The evaluation of the monitors was the best (9,56, SD 0,93) and the worst was the time dedicated to the laboratory (7,4 points, SD 2,22). The students improved their knowledge in 7 questions of the 11 questions asked as an average. Being the knowledge about the times of insufflation where more improved. In the remaining 4 the students responded worse, being the knowledge on CPR material the one that worsened (24 erroneous answers).

Conclusions: Students' satisfaction and the knowledge acquired about CPR with the laboratories was remarkable. It is necessary to reduce the ratio of students per laboratory to improve satisfaction.

Keywords: *Cardiopulmonary resuscitation; Pediatrics; Clinical simulation, university teaching, educational innovation.*

1. Introduction

The program of Educational Innovation in basic and advanced cardiopulmonary resuscitation in pediatrics and neonatology is included within the subject "Nursing in Child and Adolescent Health" (NCAH), taught in the 2nd year of the degree in Nursing of the Faculty of Nursing and Podiatry (FNP) of the University of Valencia. It is part of a project of Educational Innovation and Improvement of teaching quality, the Service of Lifelong Learning and Educational Innovation (SLLEI) of the University of Valencia and belongs to the program "Renewal of teaching methodologies" which seeks to experience scenarios where projects are included of innovation of a general nature, aimed at discovering new methodological instruments and new techniques to improve teaching-learning processes (Uv.es, 2017).

In this educational program, taught in the academic year 2016/2017, several clinical situations of the critical pediatric and neonatal context were designed, in which the students of the NCAH had to face different scenarios in which to dynamically implement the knowledge, skills and attitudes acquired throughout the academic year. This type of training is based on the training of students based on competence and for this we must incorporate new methodologies and introduce practices in teaching, thus achieving improvements in the teaching process -learning (Calveras, 2003).

Students must be exposed to clinical situations where they can discuss about possible solutions, to later make decisions. For this reason, the incorporation of clinical simulation in nursing teaching is important, since the professional future will face complex and changing dilemmas to which it must be able to cope (Figuerola, 1999).

The clinical health simulation is defined as a controlled situation of reality and, in the case of nursing, it is considered the experience that mimics a realistic environment and that requires individuals or simulators to demonstrate, practice or learn procedures or techniques, as well as taking of decisions and develop critical thinking in order to provide quality care and insurance for the patient (Guimond, Sole, & Salas, 2011; Urra, Sandoval, & Iribarren, 2017; Jeffries, 2005).

For Gaba, considered in some manuals as the "father of simulation", simulation is a teaching technique and not a technology, which should be used to replace or amplify real experiences, in guided experiences that replicate substantial aspects of the real world, of a Interactive way (Casal, 2016; Gaba, 2004).

This type of teaching methodology is important for training in the proper handling of an emergency situation, since is very difficult to train and evaluate during the actual emergency. When a critical situation occurs, there is no time to stop and think about what the next step will be, for this reason it is essential to control the protocol of action, to know

what actions have to be performed. And the only way to practice an emergency situation (in this case cardiopulmonary resuscitation) without endangering the patient's life is through a simulated environment (De la Horra, 2010).

2. Project

Along the years, 3rd and 4th degree students have attended other subjects where they have continued to carry out activities related to CPR in adults, but not in children or neonates. For this reason, it is essential that these students have direct contact with the practices and instruments of the child and neonate mannequins to consolidate the knowledge they acquired in the 2nd year.

It was decided to design this teaching program in collaboration with other subjects (Medical-surgical Nursing, Practicum III, IV and Emergencies and Extra-Hospital Emergencies), in order to improve knowledge and skills of the framework of urgent assistance in the serious infant and neonate that needs to receive basic and advanced life support.

The expected results are specified in a special way in the acquisition not only of a technical training, but also teamwork with clear objectives, the handling of appropriate and specific material, in an environment of difficulty close to reality and in a environmental simulation with the coordination of the professors of the different subjects and health professionals.

The 3rd and 4th year students who participated in educational innovation project received prior training, in which they had to respond to the clinical cases raised (cases that they subsequently implemented as monitors). And in addition, it is a way to consolidate the knowledge already acquired in the course of the subject by being the ones who teach other classmates.

2.1. Aims

The aims of the project were:

- Increase the ability and autonomy of students in an emergency situation such as CPR in the pediatric population.
- Evaluate the knowledge about pediatric CPR and teamwork after the CPR practice of all the students who were in 2nd year.
- Strengthen the knowledge on CPR of students of 3rd and 4th years who participated as monitors.

- Evaluate the knowledge about pediatric CPR before and after the educational intervention, as well as the satisfaction of the students regarding this teaching methodology.

2.2. Methodology

In order to develop the project, 17 CPR practical lessons of 2 hours duration were carried out, in which 225 students participated in the 2nd year of the studies in the subject of Nursing in Child and Adolescent Health.

Six students of 3rd and 4th years of nursing studies and 13 nurses participated as monitors of the simulation (12 nursing degree teachers from different subjects) participated on the simulation. Previous and acquired knowledges were evaluated by means of two tests (pre-test and post-test). The satisfaction of the students regarding the simulation was also evaluated through a questionnaire passed at the end of the simulation.

The questionnaire to evaluate satisfaction was anonymous. It was intended to know the opinion about the development of the training and thus identify elements of improvement.

The questionnaire consisted of 20 items, scored from 0-10 according to the degree of satisfaction or agreement that the students had in this regard; 0 being the "lowest level of satisfaction or totally disagree" and 10 the "highest satisfaction or totally agree".

In this way, different aspects related to the laboratory were evaluated: laboratory utility, methodology, organization and resources, teachers and general evaluation.

On the other hand, knowledge's evaluation was carried out with two tests: one before starting the laboratory (pre-test) and the other at the end (post-test). Both questionnaires were anonymous, and contained 11 questions. The format was multiple choice questions, only one being correct. The only variation between the post-test and pre-test was the order of the answer.

Prior to the practical lessons, where the clinical simulations were developed, a theoretical class was given to the students of 2nd year, where the recommendations of the 2015 European Resuscitation Council on basic and advance pediatric and neonatal CPR were explained.

Subsequently, between May 2 and 15 of 2017, the simulation laboratories were carried out. Approximately 15 students of 2nd-year participated in each laboratory. In each of them 3 clinical cases were carried out in which the scenario created for this purpose was that of a subway accident where there were multiple victims.

Each case was supervised by a member of the innovation group and the distribution of them was done in the following way:

1. Advanced CPR on a 2-year-old pediatric patient: NCAH teacher.
2. Instrumented CPR in premature RN: student of 3rd or 4th year attached to innovation.
3. Basic CPR in a 2-month-old infant: 3rd or 4th year student assigned to innovation.
4. Evaluation of the tutors: FNP professor assigned to innovation.

The tutor in each case was in charge of evaluating the intervention of the students while one of the collaborating teachers was responsible for assessing (without participating directly) the performance of students during the simulation. After the simulation this teacher directed the debriefing, allowing to evaluate the learning results.

The distribution of time and functions was carried out in the following way:

Table 1. Distribution of time and functions in the laboratory.

	Previous	First part	Second part
Time	10 minutes	60 minutes	50 minutes
Instructors (students and professors)	Deliver pre-test	Tutorize assigned clinical case	Collaborate in the evaluation of the students
Evaluating teachers	-	Fill in check-list	Lead the evaluation of the laboratory (debriefing)
Students NCAH	Fill pre-test	Realisation of clinical cases	Active participation. Fill in post-test and satisfaction survey

Source: Own preparation.

Each group (of 5 students) had 20 minutes per case. After the 20 minutes, each group had to give or receive the change of information about the case to follow where the other group had left it. Each group performed 3 cases in a total of 60 minutes. This meant that the practical laboratory lasted approximately 60 minutes, leaving the remaining time (less than 60 minutes) to perform the debriefing, as reflected in "table 1".

2.3. Results

Figure 1 shows the average score of each of the items of the satisfaction questionnaire:

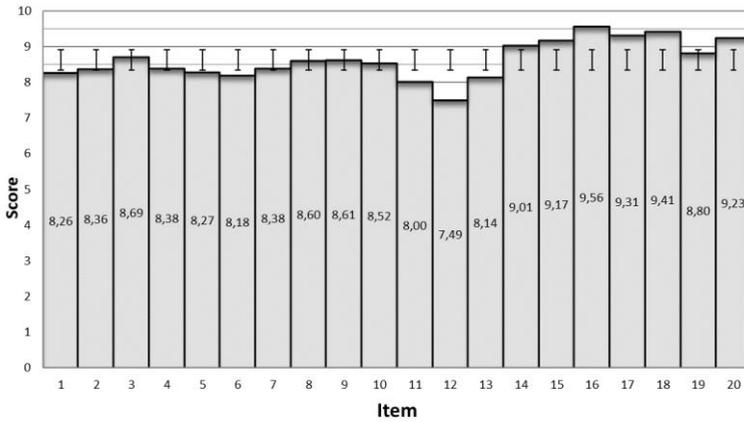


Figure 1. Satisfaction survey results. Source: Own preparation.

The average satisfaction of the students was 8.62 (SD 0.53) out of 10 points. Being the item "proficiency level of teachers" the best valued (9.56). In addition, the students rated the teachers had favored participation (9.41), had maintained interest in the case (9.31) and that they would recommend this laboratory on CPR to other students (9.23). These results showed that the selection of the teaching staff and the training of the 3rd and 4th year students was adequate to the objectives set.

However there are factors that, although it is necessary to improve, are difficult to control. The time it takes a laboratory is 2 hours and it is necessary to assemble the entire laboratory before starting, so that the effective laboratory time is 90 real minutes. This factor was the worst rated of all (7.49).

As for the results of the pre-test and the post-test, the following graph shows in a comparative way the percentage of correct answers, errors and answers in blank in each of the questions.

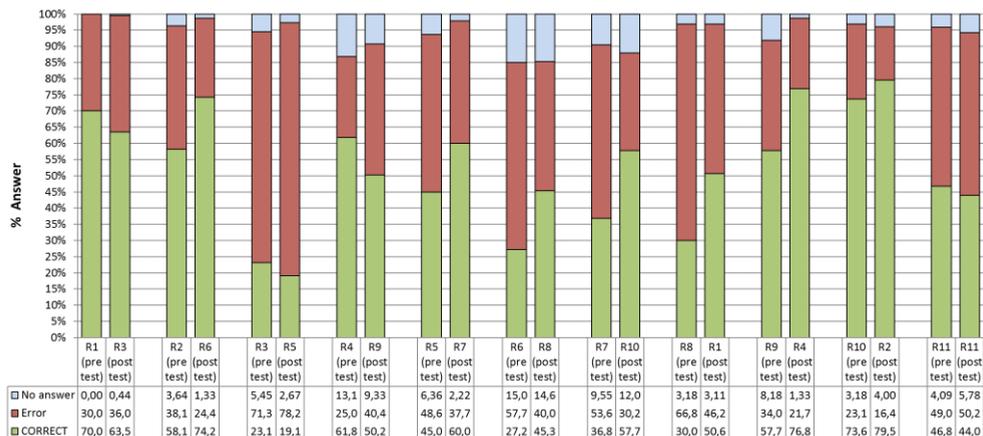


Figure 2. Pretest results vs posttest results. Source: Own preparation.

Regarding the acquired knowledge, the students improved their knowledge in 7 of the 11 questions of the questionnaire.

The question that was answered most correctly in both questionnaires (73.6% were correct in the pre-test and 79.6% in the post-test), was the one about how to act in a foreign body choking situation in a one-month-old infant. The question that showed a greater increase of correct answers (in the post-test, 20.7% of correct answers were increased) was the one about the time a mouth-to-mouth ventilation lasts. Both results may be due to the fact that the training focused on the performance in front of the airway. The students had to perform both techniques in the three clinical cases what reinforced the acquired knowledge.

On the other hand, the question with the most errors (71.40% failed in the pre-test and 78.22% in the post-test) was the one about chest compression in children of 5 years. While the question, which worsened in comparison with the first survey, was related to the material needed to perform an instrumentalized CPR (25% in the pre-test and 40.40% in the post-test.) These results, in turn, they may be due to the fact that in only one of the cases an instrumentalized CPR was performed and that no clinical simulation case exceeded 3 years of age.

The debriefing directed by the collaborating teachers was not recorded in this simulation, this being an important limitation of the study. For the next edition, in the 2017/2018 academic year, a registration process has been designed by means of a video camera with the collaboration of the Department of Audiovisual Communication and Advertising of the University of Valencia. The main ideas of debriefing witnessed by members of the research team and teacher emphasized the impotence felt by the students because they do not know how to act. They reported, in the totality of the simulations, that their biggest competence problem was the lack of knowledge about the preparation of medication and the distribution

of roles in the simulation team. For future research on clinical simulations, we propose that interventions in debriefing should be recorded with a video camera and voice recorder.

References

- Calveras, A. C. (2003). Nuevos planteamientos didácticos : ¿Al innovar en docencia , mejoramos el aprendizaje?, 18–21.
- Casal Angulo, M. (2016). La simulación como metodología para el aprendizaje de habilidades no técnicas en Enfermería. Universidad de Valencia.
- De la Horra Gutiérrez, I. (2010). La simulación clínica como herramienta de evaluación de competencias en la formación enfermera. Reduca. Universidad Complutense de Madrid.
- Durá Ros, M. J. (2013). La simulación clínica como metodología de aprendizaje y adquisición de competencias en Enfermería. Universidad Complutense de Madrid.
- Figuerola, A. A. (1999). La innovación en la educación superior en enfermería y los aportes del diseño de instrucción. *Revista Latino-Americana de Enfermagem*, 7(2), 5–13. <http://doi.org/10.1590/S0104-11691999000200002>
- Gaba, D. (2004). The future vision of simulation in health care. *Quality and Safety in Health Care*, 13(suppl_1), i2–i10. <http://doi.org/10.1136/qshc.2004.009878>
- Guimond, M., Sole, M., & Salas, E. (2011). Getting ready for simulation- based training: A checklist for nurse educators. *Nurs Educ Perspect*, 32(3), 179–185.
- Jeffries, P. R. (2005). A Framework for Designing, Implementing, and Evaluating Simulations Used as Teaching Strategies in Nursing. *Nursing Education Perspectives*, 26(2), 96–103.
- Urra Medina, E., Sandoval Barrientos, S., & Irribarren Navarro, F. (2017). El desafío y futuro de la simulación como estrategia de enseñanza en enfermería. *Investigación En Educación Médica*, 6(22), 119–125. <http://doi.org/10.1016/j.riem.2017.01.147>
- Uv.es. (2017). Convocatoria de proyectos de innovación educativa y mejora de la calidad docente, curso 2017/18. Retrieved January 24, 2018, from <https://www.uv.es/>

The intercultural competence of preservice teachers: An exploratory study

Beutel, Denise and Tangen, Donna

Faculty of Education, Queensland University of Technology, Australia

Abstract

This paper presents the findings of a qualitative study that explored the impact that prior intercultural experiences have in shaping preservice teachers as teachers of diversity. An online qualitative questionnaire was used to collect data from preservice teachers (n=40) enrolled in a one year graduate entry teacher education program in eastern Australia. Hammer's (2009, 2011) Intercultural Development Continuum (IDC) was used as a framework to analyse the data. The IDC is a model of intercultural competence used to explain how people interpret cultural difference (Hammer, Bennett & Wiseman, 2003). Each of the five positions on the continuum has a distinct set of perceptions and experiences around cultural differences. In presenting the results, we draw on several cases that encompass the breadth of prior intercultural experiences of the preservice teachers. Overall, the results indicate that sustained intercultural engagement over time provides opportunity for the development of greater intercultural sensitivity. While it is advocated that teacher education is well-positioned to play a key role in developing the intercultural competences of future teachers, the paper highlights the challenges in providing learning opportunities that allow preservice teachers to practice new ideas, challenge old ideas and reflect on the process of becoming inclusive educators.

Keywords: *intercultural competence; diversity; preservice teacher; teacher education*

1. Introduction

The diversity of students in school classrooms across the globe has increased significantly over the past decade. This broadening of diversity may be attributed in part to globalisation and the increased mobility of populations across the world. Added to this, inclusive education has become a key education agenda internationally. The inclusive education movement emerged from declarations such as 1948 Universal Declaration of Human Rights (United Nations, 1948), the World Declaration on Education for All (UNESCO, 1990) and the Salamanca Statement and Framework for Action (UNESCO, 1994). The principal premise of these core policies is that education is the right of *all* children. In its broadest interpretation, inclusive education encompasses children regardless of race, ethnicity, disability, gender, sexual orientation, language, socio-economic status, and any other aspect that might be perceived as different (Polat, 2011). However, while student populations have become increasingly diverse in areas of ethnicity, culture, languages and disability, the profile of the teaching workforce has remained relatively static (Florian, 2012). In Australia, the teaching workforce has remained largely Anglo-ethnic (Han & Singh, 2007) while student populations have widened in response to increasing numbers of migrants from different cultural and ethnic groups and the implementation of inclusive education policies and practices. It is an expectation that teachers cater for all students in their classrooms. However, concerns have been expressed that beginning teachers are ill-prepared to meet the needs of the diversity of students in their classrooms.

Kumar and Hamer (2013) attribute the lack of preparedness to poor preparation in teacher education programs. Having hands-on experiences such as participation in outbound mobility programs do not guarantee positive intercultural development (Dockrill, Rahatzad, & Phillion, 2015). Indeed, negative stereotypes can be confirmed if preservice teachers feel challenged or threatened in working with different cultures (Tang & Choi, 2004). We argue that because the majority of preservice teachers in Australia lack opportunity to undertake international experiences in their courses, teacher educators need to understand how their backgrounds, prior intercultural learning and experiences can be utilised to better prepare them for teaching diverse learners. This qualitative study (n=40) draws on Hammer's (2009) Intercultural Development Continuum to explore the impact that prior intercultural experiences have on shaping preservice teachers as teachers of diversity. We present several case studies that encompass a range of prior intercultural experiences to posit how teacher education can better prepare preservice teachers for engaging diverse learners.

2. Theoretical framework

A review of the literature has revealed an extant body of research exploring preservice teachers' preparedness for teaching students with disabilities. However, Florian (2012)

identifies that teacher education must also consider the increasing cultural and linguistic diversity presented by students in classrooms. This change in narrative about inclusion means that educators need to think beyond learning difficulties and disabilities and include the notion of intercultural difference. Developing intercultural competence has been widely studied. In a major review researchers for UNESCO (2013) described intercultural competence as having the resources to negotiate cultural boundaries through personal experiences and encounters. Developing intercultural competence 'fees' individuals from their own logic and cultural idioms to engage and interact with cultural 'others'. In doing so, individuals have the opportunity to explore their own identities.

The Intercultural Development Continuum (IDC) (Hammer, 2011) is a model of intercultural competence used to explain how people interpret cultural difference (Hammer, Bennett & Wiseman, 2003). Hammer's IDC considers intercultural competence as falling on a developmental continuum progressing from monocultural (or ethnocentric) mindsets of denial and polarisation through a transitional orientation of minimization towards the more intercultural (or global) mindsets of acceptance and adaptation (Hammer, 2011). Each of the five positions on the continuum has a distinct set of perceptions and experiences around cultural differences (Hammer, 2009). Once advanced to a more global mindset, regression to a more monocultural mindset is unlikely.

Several key factors facilitate the progression along the IDC to more global mindsets. Immersion in a different cultural context from one's own is insufficient to develop a more intercultural mindset (Paige & Vande Berg, 2012). To progress interculturality, individuals must be open to the ideas, beliefs and values of others, critically reflect on their own position about interculturality and actively seek out intercultural experiences, in one's personal life and through educational experiences, and seek out support groups who can both challenge and nourish intercultural sensitivities (Garmon, 2004). Further, these opportunities must be differentiated to align with the level of readiness of individuals.

3. Methods

3.1. Participants

Forty preservice teachers enrolled in a one-year graduate-entry teacher education program in a large Australian university participated in this study. All participants were enrolled in the core subject, Engaging Diverse Learners, generally taken in the first semester of the program. The focus in the subject is on developing preservice teachers' knowledge and understanding of the theories and principles relating to the provision of socially just education, creating supportive learning environments for the diversity of learners in classrooms and the application of these principles to classroom practices.

3.2. Data collection and analysis

Data were collected for this qualitative study using an online questionnaire. A link to the questionnaire was sent out via the subject Blackboard site in the first two weeks of the semester. One reason for the timing of the survey was to better understand the range of intercultural competence the students had; this information allowed the subject coordinator to refine the focus of subsequent lessons about engaging diverse learners. The researchers drew on Hammer's (2009) IDC orientations to develop items for the questionnaire. The first part of the questionnaire comprised questions that collected demographic data including the age range, parental status and gender of the respondents. The remaining questions were open-ended and provided the opportunity for preservice teachers to give extended responses. Questions posed inquired about who provided their inspiration for becoming a teacher and the image they had of themselves as the teacher they aspired to become. Further questions focused on the qualities or strengths that they perceived they had to engage effectively with the diversity. These questions also required the preservice teachers to recall and reflect upon their prior experiences with diversity providing examples of their intercultural engagement.

The data were analysed following release of grades for the subject as per the university ethics requirements. Creswell's (2014) six-stage process of content analysis was used to analyse the data. First, each researcher read and re-read the complete set of data independently. In this process, the complete set of responses for each questionnaire was examined as well as analysing the whole set of responses for each individual question. Following the initial independent analysis, the researchers collaboratively discussed the data in relation to the intercultural orientations of Hammer's (2009) model of IDC.

4. Findings and discussion

Using the lens of Hammer's IDC (2009) this research explored the impact that prior intercultural experiences have in shaping preservice teachers as future teachers of diversity. Table 1 shows the intercultural orientations of the participants in the study. In discussing the findings, we use the responses of three participants, Hannah, Ben and Aaron (pseudonyms), to illustrate the nuances between positions on Hammer's IDC. The first case is Hannah, a female preservice teacher aged between 31 and 40. Hannah was born outside of Australia and was raised in a "country where there are now eleven official languages". Attending primary and high schools that were highly multilingual and multicultural, she commented that "Adapting to other cultures and languages became a necessary way of life, and anyone who did not adapt and tried to live in isolation tended to get left behind" For Hannah, moving to Australia, was "quite a culture shock, not from the differences, but from the monotony. I find it odd that one has to formally be taught how to adapt to a

multicultural group, how to think from another person's cultural perspective". Here Hannah is referring to the need for Australian students to undertake a unit called, Engaging Diverse Learners, as diversity was always a part of her personal history. Since settling in Australia, Hannah indicated that she has actively sought out engagement with diverse cultural groups. However, Hannah acknowledged that she knew little of Australian Indigenous culture but followed up with "It is a learning gap that I will have to fill...quickly". Embedding Australian Indigenous perspectives is a key component of the Australian curriculum. She describes an acceptance of living and working with different cultural groups both in her home country and in Australia. Further, as a preservice teacher, she appeared highly motivated to understand the "culture of learning from which my students come, where they are in life, what their expectations are", indicating a culturally aware approach to teaching consistent with an intercultural mindset. Hannah expressed interest in, and acceptance of, other cultures while also having an awareness that she will need to adapt her pedagogy according to the cultural contexts of her students. Thus, it appears that Hannah's positioning on the IDC would be at the intercultural (or global) end between the *acceptance* and *adaptation* orientations. A shift from *acceptance* to *adaptation*, involves deepening one's own perceptions of other cultures, demonstrating an understanding of different cultural practices (even those that are confronting and opposed to one's own personal values) and an increased capability to make ethical judgements taking into consideration the disparity between different cultural values (Hammer, 2009). An adaptation orientation, involves the capability to shift perspective to another culture and to adapt behaviour according to the cultural context (Hammer, 2009).

We contrast Hannah's case with that of two male preservice teachers, Ben and Aaron. Aaron has no children and is aged between 41 and 50. Unlike Hannah, Aaron was born in Australia. However, similar to Hannah, he describes a variety of intercultural experiences such as "attending school in several different countries including the United Kingdom, Saudi Arabia, Botswana, Papua New Guinea as well as travelling extensively during his school years". Beyond his schooling years, Aaron "went to PNG to work for 6 months in community development then, back in Australia, worked in a company working with Aboriginal communities". Following this, he went to South Korea to teach ESL for 10 years, then worked with Ausaid in Bangladesh and finally returning to Brisbane he has continued teach ESL noting that "Brisbane's ESL students are pretty diverse ethnically". It appears that Aaron has a wide and ongoing engagement with diversity. When asked what qualities he had to teach a diverse group of learners, he focused on the nuances of intercultural interactions "Little things matter - like saying people's names properly, I've had French, Colombian, Venezuelan, Sri Lankan, Indian, Thai and Iranian in one class before - it can be challenging - but if you let your students know you respect them it goes a long way". Further responses from Aaron confirmed respect and tolerance "I'll have to be vigilant that I remain open-minded and tolerant of all". Aaron also described the need for

good communication skills to effectively interact with all his students. From this evidence, we can position Aaron within the intercultural orientation of *acceptance*. Of the 40 participants, 19 (n=6 males and n=13 females) demonstrated an acceptance orientation. People with an acceptance orientation identify how cultural differences operate in situations that involve human interactions. As Bennett (2004) comments, *acceptance* allows a person to “take the perspective of another culture without losing your own perspective” (p. 70). While Aaron appears to have an intercultural mindset, Hannah was the only participant able to imagine how she would negotiate her cultural orientation with being in the classroom with her students, accepting them on their own terms and indeed learning from them.

Table 1: Intercultural orientations of the participants

	Denial	Polarisation	Minimisation	Acceptance	Adaptation
Male	Age 26-30 x 1		Age 21-25 x 2 Age 26-30 x 1 Age 31-40 x 2 Age 41-50 x 1	Age 21-25 x 1 Age 26-30 x 3 Age 41-50 x 1 Age 50+ x 1	Age 26-30 x 1 Age 41-50 x 1
Female			Age 26-30 x 1 Age 31-40 x 3 Age 41-50 x 4 Age 50+ x 1	Age 21-25 x 3 Age 26-30 x 3 Age 31-40 x 2 Age 41-50 x 4 Age 50+ x 1	Age 31-40 x 3
Total	1	0	15	19	5

Ben’s story however is diametrically opposed to that of Aaron and Hannah and the other participants in the study. Ben, described himself as an Anglo-Australian aged between 26 and 30 who is also a parent. Ben described minimal interest and engagement with diversity. When asked to describe his prior experiences with diversity, he responded that “I did an environmental assessment for the Aurukun people that also included recording cultural practices and stories. I have one close friend with Autism (though he has it in a good way)”. He did not describe what having autism ‘in a good way’ meant nor did he reflect on any intercultural impact working for the Aurukun people had on him. Ben, Hannah and Aaron live in a multicultural country (Australia). However, Ben was the only participant who chose not to engage with diversity, preferring instead to stick to his own cultural group thereby limiting his intercultural awareness and sensitivity. He commented that “throughout school/uni I would often make friends with people with different backgrounds. These friendships tended to trail off quickly and now all of my lasting friendships come from similar backgrounds to me”. However, he did identify a need to “Improve my knowledge and understanding of other cultures while reflecting on my own culture, beliefs and prejudice”. While a noble objective, it is not clear if Ben would have made such a

determination for his teaching future if he was not enrolled in a subject named: Engaging Diverse Learners. Of all the participants, Ben was the only participant who exhibited an orientation of denial. His limited experiences with, and apparent distancing from, other cultures confirmed his monocultural orientation and *denial* mindset. His apparent lack of interest in pursuing engagement in intercultural experiences (Garmon, 2004) indicates that Ben's intercultural readiness (Marx & Moss, 2011) might be quite low. While Hannah and Aaron expressed intercultural mindsets, Ben seemed reluctant to engage with diversity or to challenge his prior beliefs about engagement with cultural difference. Previous research (Garmon, 2004) has identified that some individuals resist opportunities to engage with diversity, expressing disinterest in other cultures. This monocultural orientation handicaps preservice teachers' effectiveness to engage diverse learners as fully included members of the classroom. The challenge for teacher education is to provide opportunities for individuals with monocultural orientations, like Ben, that prompt them to reflect deeply on cultural differences and challenge their current intercultural perspectives (Hammer, 2009).

6. Conclusions

The three preservice teachers identified in this paper described opportunities to participate in a range of intercultural activities before entering teacher education. However, previous research (Paige & Vande Berg, 2017) indicates that immersion is insufficient alone to develop more sophisticated levels of intercultural competence. The findings, while only a snapshot of the range of diversity experienced by the group of preservice teachers, revealed that quality opportunities to interact with diversity over extended periods of time have the capacity to increase the development of intercultural sensitivity.

While we agree that teacher education programs must be intentional in their efforts (Bustamante et al., 2016) to develop preservice teachers' intercultural competence, we ponder how rigorous and extended opportunities for developing intercultural capacity can be built into a one-year program, particularly given the pre-existing monocultural mindsets of some individuals entering the program. Further, we posit how to embed meaningful experiences into all teacher education programs to progress preservice teachers towards more intercultural mindsets. We suggest that providing learning opportunities and mentoring in both course work and through professional experience placements that allow preservice teachers to practice new ideas, challenge old ideas and reflect on the process of becoming inclusive educators for the whole range of diverse of learners is a starting point for developing greater intercultural competences with the next generation of teachers.

References

- Bennett, M. J. (2004). Becoming interculturally competent. In J. Wurzel (Ed.) *Toward multiculturalism: A reader in multicultural education* (2nd ed.), (pp. 62-77). Newton, MA: Intercultural Resource Corporation.
- Bustamante, R. M., Skidmore, S. T., Nelson, J. A., & Jones, B. E. (2016). Evaluation of a Cultural Competence Assessment for Preservice Teachers. *The Teacher Educator*, 51(4), 297-313.
- Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th ed.). Boston, MT: Pearson Education Limited.
- Dockrill, H., Rahatzad, J., & Phillion, J. (2015). The benefits and challenges of study abroad in teacher education in a neoliberal context. In J. A. Rhodes & T. M. Milby (Eds.), *Advancing teacher education and curriculum development through study abroad* (pp. 290-305). Hershey, PA: IGI Global.
- Florian, L. (2012). Preparing teachers to work in inclusive classrooms: Key lessons for the professional development of teacher educators from Scotland's inclusive practice project. *Journal of Teacher Education*, 63(4), 275-285.
- Garmon, M. A. (2004). Changing preservice teachers' attitudes/beliefs about diversity. What are the critical factors? *Journal of Teacher Education*, 55(3), 201-213.
- Hammer, M. R. (2009). The Intercultural Development Inventory In: M. A. Moodian (Ed.), *Contemporary Leadership and Intercultural Competence* (pp. 203-217). Thousand Oaks, CA: Sage.
- Hammer, M. R. (2011). Additional cross-cultural validity testing of the Intercultural Development Inventory. *International Journal of Intercultural Relations*, 35(4), 474-487.
- Hammer, M. R., Bennett, M. J., & Wiseman, R. (2003). Measuring intercultural sensitivity: The intercultural development inventory. *International Journal of Intercultural Relations*, 27(4), 421-443.
- Han, J., & Singh, M. (2007). Getting World English Speaking student teachers to the Top of the Class: Making hope for ethno-cultural diversity in teacher education robust. *Asia-Pacific Journal of Teacher Education*, 35(3), 291-309.
- Kumar, R. & Hamer, L. (2013). Preservice teachers' attitudes and beliefs toward student diversity and proposed instructional practices: A sequential design study. *Journal of Teacher Education*, 64(2), 162-177.
- Marx, H., & Moss, D. M. (2011). Please mind the culture gap: Intercultural development during a teacher education study abroad program. *Journal of Teacher Education*, 62(1), 35-47.
- Paige, R. M., & Vande Berg, M. (2012). *Student learning abroad: What our students are learning, what they're not, and what we can do about it*. Hendon, VA: Stylus Publishing.
- Polat, F. (2011). Inclusion in education: A step towards social justice. *International Journal of Educational Development*, 31(1), 50-58.

- Tang, Y. F. S., & Choi, P. L. (2004). The development of personal, intercultural and professional competence in international field experience in initial teacher education. *Asia Pacific Education Review*, 5(1), 50-63.
- United Nations Educational, Scientific and Cultural Organisation (UNESCO). (2013). *Intercultural Competence. Conceptual and Operational Framework*. BSP-2012/WS/9
- UNESCO. 1990. World Declaration on Education for All. Paris: Author.
- UNESCO (1994). *The Salamanca Statement and Framework for Action on Special Needs Education*. Adopted by the World Conference on Special Needs Education, 7-10 June, in Salamanca, Spain.
- United Nations (1948). *Universal declaration of human rights*. Retrieved on February 11 2012 from <http://www.un.org/Overview/rights.html>

Outside the classroom: the participatory design workshop on Healthy City, Mixco, Guatemala

Giofrè, Francesca^a; Ramírez de León, Mario Raúl^b

^aDepartment Planning Design Technology of Architecture, Sapienza University of Rome, Italy, ^bDepartment of Architecture, University of San Carlos of Guatemala, Guatemala.

Abstract

The paper describes an innovative teaching experience held at the Faculty of Architecture at the University of San Carlos of Guatemala as part of the Professional Practice Program (Ejercicio Profesional Supervisado - EPS). 20 students and 9 professors, coordinated by 4 professors, carried out a workshop on the theme of Healthy City in the Municipality of Mixco, with the support of the same. Through active learning, a 'depravity' of the teaching activity and a participatory confrontation activity through interviews and questionnaires with citizens and stakeholders, the students and professors worked in 4 groups for seven days creating a community of practice. The results took the form of project proposals aimed at urban regeneration, in accordance with the principles of the Healthy city, presented to the local community and to the Municipality of Mixco. The experience can be repeated in its methodology and has been positively evaluated by all the participants in terms of acquisition of competences to dialogue with citizens and stakeholders for the identification of needs, increase in design skills and group work, as well as provide a real service in the area. The future urban planners and architects have also played a new role as mediators of participatory processes and facilitators stakeholders to raise needs, increase project skills and group work, as well as of real service on the territory. The future urban planners and architects have also played a new role as mediators of participatory processes and facilitators.

Keywords: *Learning in Higher Education; Architecture; Healthy City; Participatory Design; Urban Regeneration.*

1. Introduction

During the second semester of 2017 between the Faculty of Architecture of Sapienza University of Rome, Italy, and University of San Carlos of Guatemala (USAC), a participatory design workshop on Healthy cities was developed, with the collaboration of the Municipality of Mixco, Guatemala.

The workshop aimed to provide a new project and teaching methodology to students, outside the classroom, based on the collection of the real needs of citizens, and aimed at establishing the perception of the population in mid and small urban areas, as exemplar of the meaning, perception and characteristics of a healthy city. The key categories studied correspond to the state of the art in urban planning and health: public space, transportation, risk, infrastructure, recreation, among others.

A qualitative, participatory research model was employed, with the participation of 20 students of the Ejercicio Profesional Supervisado (EPS). The EPS is a six-month period that students at the Faculty of Architecture develop in the country side of Guatemala, after completing five years of studies. It is part of the social compromise of USAC, with the purpose to link theory with practice in real life situations.

Students were accompanied by nine teachers of the EPS, and four professors acting as coordinators.

In preparation for the workshop, a first questionnaire using google forms was sent to the email of the employees of the Municipality of Mixco, to acquire a general background of the situation in Mixco, regarding the key issues of healthy cities. Also, the Municipality provided a set of maps of the city, with the location of the different neighborhoods, green areas, basic infrastructure, among other urban features.

With this information, the workshop started with a two days general meeting with students and professors, where the key theoretical issues were addressed, as well as the participatory model of the workshop. During this phase, the Urban Planning director of Mixco, was invited to give an overview of the City of Mixco.

The third day, students began field activities, making interviews with stakeholders and local authorities, followed by a survey, to a random sample of 200 citizens of Mixco. Students were divided into four groups, to ensure the maximum coverage of the Historic Center of Mixco (HCM). Each group had to investigate a specific aspect of HC, making different routes through the different barrios (neighborhoods) of Mixco: El Cenicero, El Cementerio, Pansalic, Siguiche, El Cerrito, El Progreso. through the different *barrios* (neighborhoods) of Mixco: El Cenicero, El Cementerio, Pansalic, Siguiche, El Cerrito, El Progreso.

The results have been positively evaluated in terms of didactic innovation and the possibility of repeating the methodology to other contexts of the Country both by students and by teachers. The data analysis shows, also, that there is a polarization in Mixco, where most of the respondents from Pansalic and El Cerrito show a positive correlation between the perception of public space, transportation, risk, and infrastructure, even though there are no green areas of significance in those neighborhoods.

2. Background

The XX century has been dominated by positivist educational theories. Ashraf Salama (1995) has made a profound study on the different approaches in architectural education, while Diana Cheng (2001) has analyzed the transition between a modernist and postmodernist approach in education, identifying Tyler as a representative of positivism in modernity, where education was based in educational objectives.

Moreover, Salama identifies the main trends in architectural education during the XX century, which are, among others: The experimental model of Martin Symes and Alexi Marmot; the energetic conscious model of Raymond Cole; the analogical model, Gordon Simmons; the participative model, Henry Sanoff. The last one, the participatory model, begins at the end of the 1960's. Sanoff states that: "Participatory design is an attitude about a force for change in the creation and management of environments for people. Today participatory design processes are being applied to urban design and planning as well as to the fields of industrial and information technology" (Sanoff, 2007). This social consciousness, therefore, has been growing in design disciplines. Its techniques and methods, usually involve interviews, workshops, questionnaires, and surveys, among others. Sanoff states that: "Architecture in the future should be characterized by an increasing participation of the user in its organizational and formal definition. In order to respond to this situation, professionals will need to do everything possible to make design solutions less the representation of its designers and more the representation of its users." (Sanoff, 1988).

Knowing this, the topic that was chosen to work in the workshop was that of Healthy City, which has evolved over time at the level of world policies that give European importance to the design of the environment in urban settings (Giofrè, Djukanovic, 2017).

The Healthy City (HC) is a set of guides and recommendations, regarding the benefits of a good urban environment. It follows the aims and objectives of the United Nations (UN) first, the Objectives of the Millenium, and its successors, the Objectives of Sustainable Development, specially, the results of the UN-HABITAT meetings (World Health Organization, 2011) and the so-called "Zagreb declaration"(World Health Organization,

2009). The Healthy urban planning “means planning for people. It promotes the idea that the city is much more than buildings, streets and open spaces, but a living, breathing organism, the health of which is closely linked to that of its citizens” (Barton & Tsourou, 2013, p. i). HC has favored the participatory process envisioned by Sanoff at the end of the XX century, as part of UN initiatives:

“the effect of the built environment on health, . . . , was highlighted that healthy urban planning covers several levels of urban planning and the provision of basic requirements like shelter, clean water, sanitation and access to food, and quality of life projects such as new parks and bicycle lanes. Another key element was the need in healthy urban planning to think and practice in an interdisciplinary fashion. This means using active community participation – not only involving different sectors, but also property owners, development entities, and urban residents.” (World Health Organization, 2011, p. 3).

The intervention area chosen for the workshop was the municipality of Mixco; with an area of about 99 km² and a population of 483.705 inhabitants (Instituto Nacional de Estadística, 2014), makes, with its neighbor Guatemala City, and Villanueva, an urban area of about five million people, the biggest urban area between Mexico City and Medellin in Colombia (Smith, 1988). In this study, we will concentrate on the historic center of Mixco (Fig.1), with a surface area of 1.37 km², and a population, according to the population density of Mixco of 4.200 inhabitants, as a case study.



Figure 1. The six neighborhoods of Mixco, Municipalidad de Mixco (2017)

With these premises and with this specific topic, the Faculty of Architecture of Sapienza University of Rome and University of San Carlos of Guatemala, have experimented an innovative didactic methodology in favor of students and professors, proposing concrete project ideas to the Municipality of Mixco.

3. Methods and materials

A qualitative, participative research model was employed, with the participation of 20 students of the Ejercicio Profesional Supervisado (EPS), and the supervision of 9 teachers of USAC, and 4 teachers as coordinators, 1 from Sapienza University of Roma and 3 from USAC.

After sharing the workshop program with EPS professors, to collect impressions and to review the activities, the EPS students were gathered to develop a five-day workshop. The structure of the workshop was developed as follows:

- The first two days were dedicated to establish the theoretical framework of HC, making conferences and discussion groups where students began to acquire the basic knowledge on the subject of HC. The conferences have addressed the following objectives and topics: *Healthy city and architecture; A methodology of work on Healthy City; Territorial information System, its application and importance in urban planning; Case Study the City center of Mixco; Urbanism and resilience; The interview as a research technique; Healthy city and urbanism principles*. At the end of the conferences, the results of the questionnaire to the employees of the Municipality of Mixco were shown to students and professors. The activities were developed at the facilities of the Faculty of Architecture, USAC, in Guatemala City. After the conferences, students were then divided in four groups, corresponding to the following key categories of analysis: Public spaces; infrastructure; risk; transportation and have begun to work in groups simulating the interviews that were going to make to the citizens.
- In the following three days the whole task group has moved to the Municipality of Mixco, where the activities began with free interviews to key stakeholders. The purpose of the interviews was to acquire an understanding of the critical aspects of the territory, and then, divided in groups, the students have interviewed, with the aid of a structured questionnaire adjusted by the coordinators, a random sample of 200 citizens of Mixco, who inhabit six neighborhoods around the city center: El Cenicero, El Cementerio, Pansalic, Siguiche, El Cerrito, El Progreso. The questionnaire to the citizens was made in printed format, but later, students transferred the responses to the Google forms software, with the objective of reading the data comparatively.
- With the data and the results of the interviews and questionnaires, students, accompanied by their teachers, have developed project ideas that have been presented first to the Municipality of Mixco, and later, to the entire group of EPS students at USAC in Guatemala City (Fig.2).



Figure 2. Workshop activities in City of Guatemala and in the Municipality of Mixco (2017)

3.1 The questionnaires

The questionnaire to the employees of the Municipality of Mixco, was sent directly to the institutional mail of Mixco. The data was then processed online, with the google form platform, so that it was possible to have an insight of the critical aspects in the city center of Mixco, before the workshop started, and for the preparation of the questionnaire to the citizens.

The questionnaires applied to citizens by the students of EPS, explored the four main categories described above, and has been structured in five parts, as follows:

- The first part “General aspects” structured in four questions that give an overview of the participants, the so-called “demographic module” of the questionnaire (sex, age group, place of residence, work and study) and closes with a direct question: the city of Mixco is perceived as a healthy place to live?
- The following four parts are articulated around the main categories of analysis: public space, urban mobility, risk, urban equipment and public services.
- The final part asks the interviewed, to indicate, in a scale from 1 to 10 which of the four key aspects objective of the research are the more critical aspects, and a last and final open question: If you were the city Major of Mixco what would you do? What would be your priority to regenerate the city?

The students, apart from the printed questionnaire have in hand a city map with the area of research, this, to aid the citizens in the lecture of the territory and in the identification of the critical aspects.

At the end of the questionnaires, each group of students could upload the answers of each people surveyed, using the Google forms software.

With the data, in a comparative way, students, always divided in groups have developed project solutions, as an answer to the needs identified by the citizens, the people interviewed, the stakeholders, and even before, the questionnaires to the employees of the Municipality of Mixco.

The results of the workshop were presented by the students first, to the local Municipality in Mixco and, then, after one more day of work, the proposals, were presented at the USAC to other EPS students and professors to share not only the results but the work methodology (Fig.3).



Figure 3. Interviews and design work, Municipality of Mixco (2017)

4. Results

The experimental workshop shows that it is desirable to develop a participative process in a higher education environment, particularly, in architecture and urbanism. Students were interested in the methodology and showed interest in the completion of the task. Assigned and working outside the classroom, in contact with the local community, feel more motivated and involved. Even the professors who have worked with this methodology for the first time have recognized their potential in terms of increasing the number of students.

The workshop, through active learning, a ‘depravity’ of the teaching activity and a participatory activity, creates a community of practice with the aim of producing organized and quality knowledge in terms of design.

The experience described has been of short duration and experimental in nature. We have to take into account that participatory processes require longer times. The limit of such processes is the effective transfer of the results to the community, in terms of the realization of the proposed interventions, this aspect is, however, linked most of the time to political decisions, and to the possibility of funding.

We can conclude that in the participatory processes, urban planners and architects play a new role as mediators and facilitators of implementation processes. Thus, a new role for

architects is emerging, out of the traditional academic programs run by faculties of architecture around the world.

References

- Barton, H., & Tsourou, C. (2013). *Healthy Urban Planning*. Taylor & Francis. Retrieved from https://books.google.com.gt/books?id=MaJRDbX_8-oC
- Cheng-Man Lau, D. (2001). Analysing the curriculum development process: three models. *Pedagogy, Culture & Society*, 9(1), 29–44. <https://doi.org/10.1080/14681630100200107>
- Giofrè F., Djukanovic Z. (2017). *Healthy urban environment and design: the outdoor spaces*. In: Book of Proceedings Keeping up with technologies in the context of urban synergy Place and technologies 2017. pp. 155-168, Sarajevo:CIP, ISBN: 9789958691560, Sarajevo, 8-9 giugno 2017
- Instituto Nacional de Estadística. (2014). Caracterización departamental de Guatemala. Guatemala.
- Salama, A. (1995). *New trends in architectural education, designing the design studio*. Raleigh.
- Sanoff, H. (1988). Participatory Design in Focus. *Architecture and Behaviour*, 4(1), 24–42.
- Sanoff, H. (2007). Multiple views of participatory design. *International Journal of Architectural Research*, 2(1), 57–69.
- Smith, G. (1988). Guatemala, a fragile democracy. *National Geographic*, 173(6), 768–803.
- World Health Organization. (2009). *Zagreb Declaration for Healthy Cities*. Zagreb. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0015/101076/E92343.pdf
- World Health Organization. (2011). *Healthy Urban Planning. Report of a Consultation Meeting*. Kobe.

A critical view to current economic topics through an Online-Forum activity

Caballer Tarazona, Vicent^a; and Caballer Tarazona, María^b

^aDepartment of Economics and Social Sciences, Universitat Politècnica de València, Spain

^bDepartment of Applied Economics, Universitat de València, Spain

Abstract

In order to address the critical thinking and the knowledge of contemporary problems an online forum activity is proposed in this paper. The activity was applied within the World Economy subject in the degree of Business Administration. The main aim of this teaching proposal is to discuss some current issues and events in the international economic context which likely are not addressed in the syllabus. Through an online forum both teacher and pupils posted comments about some relevant topics related with the subject content. Students have the opportunity to express their own opinion and provide additional information and resources such as news links, documentaries, Youtube videos and other kind of audio-visual material. Despite of this activity was non mandatory, the response was positive, high proportion of pupils (67.1%) were involved in it and 877 comments were published. Thus, the result was satisfactory but there was also some aspects to improve. In addition, this activity is suitable for other subjects or even other university degrees as well and can be easily adapted and modified.

Keywords: *Innovative material; Teaching and learning experiences; Education economics, e-learning*

1. Introduction

World economy, like many other social, technical and medical sciences, is rapidly changing. Even more in the next years. Logically, subject syllabus can not contemplate the important alterations produced in the world along the academic year but students should know them. For instance, in the field of International Economics, some important events have occurred in recent times such as Bitcoin irruption, protectionist policies in United States or the advancement of renewable energies in some countries. The economic conditions may vary one year to the next. These kind of topics is not usually addressed along the course because the subject content is planned in advanced but it is convenient that the students discuss about that to develop critical thinking and the knowledge of contemporary problems. Moreover, it is possible that professor wants to show some additional content related with the subject but due to the lack of time can not be displayed. To achieve these and other aims a internet forum activity is proposed in this paper.

As it is possible to find in the literature about high education, online forums have been used for a long time for different purposes in higher education [1] especially in e-learning and blende education [2].

These kind of activities have a double goal. By one hand, regarding contents of the subject, student's implicit task is to be up to date with the subject, review what has been discussed in class, get competences progressively, detect possible concepts that have been misunderstood to realize about their weaknesses.

On the other hand, and regarding to the skill adquisition, these kind of activities are useful to promote self-learning among students and encouragion them to discover and make links between realty and theoretical contents taught in class.

In this line, according to Lee et al. [3], research-based methodologies allow students to develop skills such as self-reflection, critical thinking and responsibility for their own learning, thus producing intellectual growth and maturity.

Under this context, the aim of this paper is to presents an online forum activity in the World Economy subject which is taught in the second course of the Business Administration Degree at the Universitat Politècnica de València (UPV). Its content is related mainly to trade policy, comparative advantage and international context of economy.

2. Material and methods

UPV provides an online platform for managing all subjects taught in this university called Polifomat [4]. This tool allows professor to oupload teaching material for students, publish marks, sent emails, post announces and other features. Among these, it is the online forum,

which is not always used by professors and other times, its purpose is to solve doubts about the content or the course development. And the teacher either the students can propose doubts or debate topics and participate in the discussion.

2.1. Subject context

Table 1 shows information about the subject in which the activity was apply.

Table 1: Subject information.

Subject	World Economy
ECTS Credits	4.5
Course	Second
Degree	Business Administration
Number of students	76
Language	Spanish
Modality	Presence-based

2.2. Teaching activity

The online forum was enabled through Poliformat. The teacher posted documentaries, news, videos or any other audiovisual material related with subject content. Due to the characteristics of the subject, this complementary material covers a wide range of topics. For instance, some teacher publications on the forum were the documentary Inside job [5], and videos or news about the Comprehensive Economic and Trade Agreement (CETA), North America Free Trade Agreement (NAFTA), current state of the world economy and globalization, the evolution of exports and imports in Spain, climate change, energy or world development, poverty and inequality. After reading or watching the content of the post, the students could express their opinion of the topic address and contribute with futher information. These participations should be reasoned and well-argued and not be copied from internet sites. Pupils had also the possibility to open new topics provided that these are linked with the syllabus. In addition, all comments had to be respectful and tolerant with both partners and any collective of persons. They could be expelled from the activity in case of not following these rules. All instructions were published in a forum rules post at

the beginning of the activity. The forum stayed available along most part of the course, from one week after the beginning to three weeks to the end, what means 13 weeks.

2.3. Assessment

This was a non compulsory activity. Each participation on the forum added 0,05 extra points in the final subject mark up to maximum one extra point as long as the comments fulfilled the rules. The grading system in Spain ranges between 0 to 10, where 10 is the best mark and 0 the worse, and the pass is achieved with 5. Nevertheless, to taken into account the score of the forum activity, the students had to get a minimum of 4 in the written exam of the subject.

3. Results

The implementation of this forum-activity within the subject “World Economy” produced good results. Regarding participation, 51 out 76 pupils (67,1%) participated in the forum. A total of 877 comments were posted on the forum, 176 of these were written by professor. None of them had to be removed due to disrespectful or insulting content. It was detected 35 copied writings from other websites which were not considered in the assessment. Regarding the new topics opened by students, some of them were quite suitable but other were more distant to the syllabus although these were not eliminate. Table 2, shows some of the most relevant topics proposed in the forum by students.

Several students posted about the economic questions regarding the Catalonian crisis. This is a very sensitive political issue exceeding the subject content and might result in a nasty discussion among pupils due the tense atmosphere involving this problem. Therefore, the topic related with this were blocked.

A topic about electric cars was the most dicussed with 42 comments. In general terms, the participants showed interest in the activity and their participations were quite accurate. Nevertheless, some ideas were repeated, specially in the last days in which the forum stayed opened.

To assess the level of satisfaction of the students, an online survey was available during the last two weeks. It consisted of a enquiry in which pupils could give their opinion and propose improvings about the activity. As filling this survey was no mandatory, anonymised and not providing additional mark, only two studenst replied it, but their responses were very positive.

Table 2: Topics proposed by students

TOPICS
The image of the Spanish economy abroad
The Banco Popular purchase by Banco Santander
Advantages and disadvantages of international commerce
The digital challenge in small business
Solutions to save the oceans
Sustainable growth
Outsourcing
Economic repercussions of the Catalan crisis (5 topics)
The rise of the oil price and renewable energies
Offshoring in textile industry
The inflation in Spain
Household debt in Spain
Unemployment in Spain
Spanish self-employed workers law
Spanish tax amnesty
Relationship between happiness and wealth in Qatar
The role of stock market
Basic income
Draught in Spain
Alibaba investment in research centers
Space debris
The highest growing economies
Electric cars
Spanish trade deficit
The Syria's war

4. Discussion

We firmly think that specially in subjects within the social science field, it is basic to connect the subjects syllabus with reality. It is important to offer tools to understand past and current dynamics of society, and therefore to be capable to prepare for the future.

In the case of economics and business administration degrees, it is important to remark that reality it is much more complicate than the theoretical economic models. A good professional in the field, should keep in touch with real cases of the economy in order to understand as it is basic to introduce new social variables which are not reported in the theoretical models.

With this goal in mind, we proposed a forum-activity to promote among students critical thinking about real and contemporary economic topics.

By the implementation of this activity, we have verified its utility in achieving the teaching goals. And that is, the forum-activity encouraged the active and autonomous participation of students and they also train their critical and respectful thinking on current economic problems.

There are some points in this activity which may be enhanced. For instance, allowing students to create new topics encourage the participation and the motivation but it also provokes some drawbacks. For this reason, any student wanting to initiate a new topic, send an electronic mail to professor for his validation and approval. In this way, new threads are more suitable and non-repeated.

This activity can be applied to other subjects in the Economics and Business administration degrees, specially in Macroeconomics, Marketing or Corporate Finance or even other university degrees.

The assessment may also vary depending on the characteristics and context of each subject. Mandatory participation, assessment criteria modification or greater demand in the content publication are some of the possible modifications that could be introduced in the future.

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References

- Thomas, M.J.W.: Learning within incoherent structures: the space of online discussion forums. *J. Comput. Assist. Learn.* 18, 351–366 (2002). doi:10.1046/j.0266-4909.2002.03800.x
- Eileen, W., Jones, A., Barker, P., van Schaik, P.: Using e-learning dialogues in higher education. *Innov. Educ. Teach. Int.* 41, 93–103 (2004). doi:10.1080/147032903200017274
- Lee, V.S., Greene, D.B., Odom, J., Schechter, E., Slatta, R.W.: What is Inquiry-Guided Learning? In: Lee, V.S. (ed.) *Teaching and Learning through Inquiry: A Guidebook for Institutions and Instructors* (2004)
- Sakai: Poliformat, <https://poliformat.upv.es/portal/site/!gateway-en/tool/9d61d2a6-5102-4570-bdac-c92c458eac77>
- Ferguson, C.: *Inside Job*. Sony Pictures Classics, United States (2010)

Summative Peer Review of Teaching

Crisp, Geoffrey

PVCE Portfolio, University of New South Wales, Australia.

Abstract

We describe the introduction of a summative peer review of teaching process at the institutional level for the purpose of providing additional, independent evidence of the quality of teaching for teaching awards and academic promotion. This paper will describe the introduction of a formal processes at two universities where the peer review reports are used for decision making purposes. We describe why it is important to separate formative peer review of teaching for professional development and self-improvement purposes from summative peer review for high stakes decision making purposes.

Keywords: *peer review of teaching, summative peer review of teaching.*

Introduction

The criteria and standards used for academic promotion processes within a university is a formal statement by the institution on what is valued; it is the message that academics understand when it comes to knowing what their institution will reward and the promotion criteria will determine how most academics will allocate their limited time and resources. Academics often feel that research is privileged over teaching and/or service when it comes to promotion because it is considered easier to define comparative quantitative measures of quality in research, despite reservations about the current research metrics (Visser-Wijnveen, *et al*, 2014). Peer review in research is seen as independent evidence by experts in the field on the quality of the reviewee's work. It is possible to have independent peer reviewed evidence of the quality of teaching but for face to face teaching activities that are observed it is not possible to have blind peer review unless the reviewers are physically separated from the reviewee and students.

Formative peer feedback for professional development and improving an aspect of one's teaching is now quite common in universities (Bell, 2012), but the use of peer review of teaching for summative or decision making purposes is not as common and continues to be resisted by many academics (Iqbal, 2013).

The most commonly used form of feedback on teaching comes from student surveys which are undertaken routinely at most institutions across the world. Students can provide feedback on their experiences of the academic's teaching and this is commonly used as evidence in teaching award applications and academic promotion (Smithson, *et al*, 2015). However, students provide evidence of their experience and their perceptions of the quality of the teaching and the academic; students normally do not evaluate the academic. Evaluation implies expert knowledge and understanding, it assumes the reviewer is appropriately qualified to evaluate against criteria that are clearly understood by both the reviewer and the reviewee. As important as student feedback is in the university quality cycle, we must be cognizant of its purpose – to provide students with an opportunity to reflect and inform the institution on their experience of the teaching.

This paper describes the introduction of a formal, summative peer review of teaching process at two universities and the lessons learnt from the large scale introduction of the process. The summative peer review of teaching fills a current gap in the quality cycle in many universities as it provides a more formal, structured process of independent evidence against specific criteria and attempts to minimize personal opinion of teaching quality.

Summative peer review of teaching process

The genesis of the methodology for this summative peer review process was an Office for Learning and Teaching national project that sought a process for peer review of teaching

for academic promotion (OLT, 2006). The whole of university summative peer review of face to face teaching was introduced initially at a large, comprehensive institution, RMIT University in Australia. RMIT had previously adopted a successful formative process of peer feedback of teaching called peer partnerships (Chester, *et al*, 2013). This process was voluntary and collegial with individual academics choosing their peer partner and working with them to mutually agree on the aspects of teaching to be reviewed. Importantly, the reports from the peer partnership process belonged to the reviewee and were not required for academic promotion or teaching awards but could be used as evidence of a commitment to continuing professional development.

A formal decision was made to have two distinct peer feedback processes with separate names, peer partnerships for the formative process and peer review for the new summative process. Both processes were important and had a crucial part to play in the quality cycle of the university, but they served different purposes; it is important to label processes clearly so that all the participants are aware of the outcomes from the activity and what can be expected to happen with the peer review reports.

At RMIT the development of the summative peer review documentation followed a lengthy consultation process involving a working group with representation from students, Human Resources, and academics. When draft documentation was developed this was sent to a wider group of academic stakeholders for feedback. Through an iterative process the documentation and the details of the methodology were refined and an implementation plan for the review of face to face teaching was approved. The RMIT documentation consisted of nine core dimensions of teaching (the criteria) and they are based on literature precedence for active learning and the promotion of student engagement (RMIT, 2017). The peer review report consists of both “quantitative” and “qualitative” components. The “quantitative” section is not a numeric scale but rather an indication of the volume of evidence observed during a single session of face to face teaching; no apparent examples, some examples, many examples and extensive examples. Any type of face to face session could be observed, including lectures, tutorials, studios, workshops, team teaching, seminars, laboratory classes and two peer reviewers were present at the same session. One peer reviewer was a broad discipline expert and the other was a specialist in learning and teaching. The “qualitative” component relates to the apparent effectiveness of the examples in the particular context being observed; effectiveness not clear, effective, very effective, exceptionally effective. It is made very clear to the reviewers during the training sessions that they are not there to provide a personal opinion of the quality of the teaching, but rather as an independent observer documenting what they have seen for this particular session against the specified criteria.

The appointment of appropriate peer reviewers is an important part of the overall process as both the institution and the reviewees must have confidence in the chosen reviewers. This is

where the formative and summative processes are quite different. In a formative process it is common for the reviewee to choose their reviewer and the dimensions of teaching to be reviewed. For this summative process the reviewee cannot choose their reviewers, but does have a right of veto over their nominated reviewers if there is a conflict of interest. Peer reviewers were chosen based on their known evidence for scholarship in learning and teaching, publications and grants in learning and teaching, the receipt of teaching awards or teaching fellowships or having held positional responsibility for learning and teaching within the institution. The names of the approved peer reviewers were publicly available on the institutional web site and being nominated as a peer reviewer was a measure of esteem.

Potential peer reviewers had to participate in a training workshop where a series of videos of different teaching situations were analysed for instances of the stated dimensions of teaching and whether the examples appeared to be effective from the students' perspective. As expected, there were often significant differences amongst the academics on the examples and what constituted effectiveness. The purpose of the workshop was to have an open and honest discussion on these differences and to move academics towards a consensus on what contextual evidence and effectiveness looks like. A minimum of two videos and often three were required before broad consensus was reached. The selection of appropriate peer reviewers and the training process for both reviewers and reviewees proved critical to the acceptance of the overall process. The workshops for the peer reviewers lasts two to three hours and consensus is usually reached within this time. Very occasionally a potential reviewer pulls out of the process if they do not agree with their colleague's judgements. Peer reviewers are not expected to agree exactly since each reviewer sees the teaching activity through their own lens. Reviewers do come to understand that they are not applying a personal judgement about whether this is an appropriate way to teach. Peer reviewers do not give formative feedback to the reviewee as this would undermine the purpose of summative peer review for decision making and begin to mix the formative and summative processes. Peer reviewers do not make any judgement about whether a reviewee should receive a teaching award or be promoted. The reviewer is providing independent evidence that they observed a teacher do particular things and it appeared to be effective or not from the students' perspective.

Approved peer reviewers were expected to complete at least two peer reviews a semester and a minimum of two reviews annually and attend an update session once every two years. At RMIT up to 120 peer reviewers were active in the system and around 170 peer reviews annually were conducted when the system was fully operational. There was also a process for peer reviewers to be removed from the register if their reviews continually differed from their peers over a period of time.

An important part of the independence of the process was that peer reviewers could not review a colleague from their own school. This meant that reviewers were not content

experts and the strength of the process rests on both this independence and the fact that reviewers are not “biased” by how they think teaching should be conducted in a particular discipline. The reviewee liaises with the two reviewers to determine which session will be observed – the reviewee has complete choice over the session to be reviewed. Only one session has to be observed unless there is an unforeseen disruption to the teaching session in which case a new session is reviewed. If the two reviewers differ markedly in their reports then the central administering group seeks a third reviewer who independently reviews another teaching session of the reviewee. This happens each year with an average of three review sessions having to go to a third reviewer. In these cases, all the peer review reports are submitted to the relevant decision-making panel.

A slightly revised set of documentation was introduced at the University of New South Wales (UNSW). The major changes involved reducing the number of dimensions of teaching from nine to eight and reducing the reviewer selection boxes from four down to three (UNSW, 2017). These changes were made on the basis of feedback from academics at UNSW and observations on the use of the four selection boxes at RMIT. The selection, training and reporting process retained the same features as introduced at RMIT. At UNSW there are now over 70 trained peer reviewers and the process is being introduced over a two-year period.

The definition of what constitutes effective teaching in the context of the review session has been discussed widely as part of the implementation process at UNSW. For the purposes of the summative peer review, effective teaching means that students are actively engaged in a process that enhances their learning during the session being observed.

We have found that a mandatory pre-observation meeting between reviewee and the two reviewers is required so that the reviewee can briefly outline the types of students who will be at the session, the context for the session and whether any of the dimensions of teaching will not be used for the particular session to be observed. At UNSW we have stated that a minimum of six of the eight dimensions must be observed. The main dimension not used by some reviewees is that related to actively using links between research, industry or professional practice and teaching. There is no implied hierarchy in the order of the dimensions and we have found that reviewees will usually demonstrate a preference for some dimensions over others in their teaching. There is the option to have a post review meeting if there has been some unexpected disruption during the session reviewed and the reviewers and reviewee can discuss whether this was serious enough to warrant a second opportunity for the reviewee to be reviewed. No formative feedback is given although the reviewee receives the copies of the review reports. We do not allow reviewees to request a second review session on the grounds that they could have done a better performance; only unforeseen disruptions trigger a second review.

The summative review process under the conditions described in this paper will provide reports that are different to those generated under a formative process. The reviewers in the summative process are independent of the outcomes sought by the reviewee, whereas in the formative process the reviewers have been sought out by the reviewee and form a trusted relationship within which to provide suggestions for improvement in the reviewee's teaching. Some universities have combined the two processes so that the same protocols, reviewers and documentation are used for both formative and summative peer review. One reason for this approach is efficiency, since the same reports can be used multiple times, and this reduces the workload on both reviewers and reviewees. However, we thought that a single process with two different purposes could lead to confusion for all stakeholders, including the decision-making panels. Academic promotion panels have been concerned with the use of peer review reports because they are often conducted under voluntary conditions where reviewees are able to choose their own reviewers and where the reviewer is making a personal judgement about how the reviewee could improve their teaching (Thomas, *et al*,2014). The process described in this paper makes it very clear the purpose of the peer review and the conditions under which the reports are generated. The promotion panel can have confidence that the reviewer is an independent observer and is not making subjective judgements or has a personal interest in the success of the reviewee in their application.

We have found that having two peer review reports, one from a learning and teaching expert and one from a broad discipline expert is important to ensure no inherent bias is introduced into the process. There is still concern from some academics that peer reviewers who do not have expert discipline knowledge will not be able to make a valid judgement about their teaching. Over the several hundred reviews conducted at RMIT and UNSW this has not been observed and our peer reviewers have expressed confidence in being able to judge the effectiveness of the teaching when using the dimensions specified in the template. It is true that new reviewers are sometimes apprehensive about whether they will be able to determine the effectiveness of examples observed during the session, but after one or two reviews this apprehension disappears. In feedback sessions with reviewers they have indicated that the training session using the videos is a crucial component of the process as it allows them to align their approach to the peer review with the observation of evidence against the dimensions. We have found the alignment of reviewer and reviewee in terms of their own teaching methodology is more important than the alignment of discipline area. So, if we have academics teaching predominantly online, we assign reviewers who have experience in this mode of delivery. Likewise, we attempt to match reviewers who are familiar with team teaching or studio teaching where this is the format of the session to be observed, although the availability of specific reviewers can limit this approach.

We have an annual workshop and debrief session for reviewers and reviewees so that they can provide advice on any improvements to the process and discuss how the training might be more effective. Peer reviewers have routinely described the act of observing other academics teach as a form of professional development for themselves and that taking part in this process has improved their own teaching. Being a peer reviewer is a form of professional development in its own right as the peer reviewer is engaging with the dimensions of teaching and observing how effective particular approaches to teaching are in enacting these dimensions. The peer reviewers have commented that they have adapted some of the approaches of the reviewee to their own teaching. So, although we have stated that peer review was for decision making purposes and not for professional development, a consequential outcome of the process is an improvement in teaching practice.

An extension to the summative peer review process at UNSW has been the development of a template for the summative peer review of online teaching. This is still in its early stages and will be trialed in the coming semester. We have not yet revised the original documentation from the OLT project for the summative peer review of curriculum documentation (OLT, 2006). Many promotion applications include evidence of impact at the curriculum level in addition to quality classroom delivery practices. We are working further on adapting the OLT project documentation on evidencing quality curriculum design and assessment tasks to further complement our use of peer review of classroom practices.

Conclusions

Universities are required to demonstrate that they have a quality assurance process in place and the criteria and evidence used for the academic promotion process is a key part of this activity. Research metrics have been relatively stable over many years even if refinements are applied in different countries. Expert peer reviewed scholarly output in highly ranked journals, citations and peer reviewed external competitive grants are the main currencies used to measure the quality of research.

Common metrics for describing the quality of teaching in promotion applications have been less universally accepted, except for the use of student feedback. Designing and implementing a more structured process for the collection of independent evidence of the effectiveness of teaching provides one step in the process of creating a more generally acceptable measure of teaching quality. This paper has described only one part of the process, that of a teaching session that can be observed by others. There is still a need to fully test the documentation and processes for the peer review of online programs and teaching and the peer review of curriculum design and assessment.

References

- Alderman, L., Towers, S. & Bannah, S. (2012). Student feedback systems in higher education: a focused literature review and environmental scan. *Quality in Higher Education*, 18(3), 261-280.
- Bell, M. (2012). *Peer Observation Partnerships in Higher Education*. 2 Edn, Higher Educational Research and Development Society of Australasia, Milperra.
- Chester, A., Clarke, A., Wingrove, D. & Denny, B. (2013). *Talking about teaching: empowering staff through peer partnerships*, in Andrea Nolan (ed.) Proceedings of the 10th Enhancement and Innovation in Higher Education conference, Glasgow, United Kingdom, 11-13 June 2013, pp. 568-575.
- Iqbal, I. (2013). Academics' resistance to summative peer review of teaching: questionable rewards and the importance of student evaluations. *Teaching in Higher Education*, 18, 557-569.
- OLT (2006). *Peer Review of Teaching for Promotion Purposes: a project to develop and implement a pilot program of Peer Review of Teaching at four Australian Universities*. Retrieved from <http://www.olt.gov.au/project-develop-implement-pilot-program-unsw-2006>.
- RMIT (2017). *Peer Review of Teaching*. Retrieved from <http://www.rmit.edu.au/teaching/peer-review>
- Smithson, J., Birks, M., Harrison, G., Nair, C.S, Hitchins, M. (2015). Benchmarking for the effective use of student evaluation data. *Quality Assurance in Education*, 23(1), 20-29.
- Thomas, S., Chie, Q.T., Abraham, M., Raj, S..J. & Beh, L-S. (2014). A Qualitative Review of Literature on Peer Review of Teaching in Higher Education. An Application of the SWOT Framework. *Review of Educational Research*. 84(1), 112-159.
- UNSW (2017). *Peer Review of Teaching*. Retrieved from <https://teaching.unsw.edu.au/peerreview>.
- Van Vugt, M., Hogan, R., & Kaiser, R.B. (2008). Leadership, followership, and evolution: Some lessons from the past. *American Psychologist*, 63(3), 182-196.
- Visser-Wijnveen, G.J., Stes, A. & Peter Van Petegem, P. (2014), Clustering teachers' motivations for teaching. *Teaching in Higher Education*, 19(6), 644-656.

Student perceptions of a proposed generic e-learning template aligned with the Engineering Council of South Africa accreditations template

Luwes, Nicolaas^a and Van Heerden, Leanri^b

^a Department of Electrical and Computer Engineering, Central University of Technology, Free State (CUT), South Africa, ^bCentre for Innovation in Learning and Teaching, Central University of Technology, Free State (CUT), South Africa.

Abstract

The Engineering Council of South Africa (ECSA) audits engineering programmes every four years to grant accreditation to higher education institutions. During this audit, ECSA requests evidence of the four year instruction in a specific format. The problem is that lecturers each have their own e-learning layouts according to preference. This paper proposed and implemented a generic e-learning template that is aligned with the ECSA specifications for ease of archiving necessary evidence for the audit. It is however important to evaluate student feedback on this generic format so that the main purpose for e-learning as a learning tool is not missed by utilising it as a backup method. An exploratory study was employed to gather student perceptions on the new generic e-learning template. Four electrical engineering subjects' students were used as the sample group and Google Forms was used to collect the data in an online questionnaire. Of the 36 students who responded to the questionnaire, 94% would recommend that all subjects adopt this generic e-learning template and 89% felt that having all their subject menus the same will make it easier to locate items. Due to the results of this study, the generic e-learning template will be adopted by all engineering subjects at the Central University of Technology, Free State with the addition of an introduction that explains the purpose and procedure of ECSA accreditation.

Keywords: *e-learning; engineering education; engineering accreditation; ECSA; Engineering Council of South Africa.*

1. Introduction

“Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skilful execution; it represents the wise choice of many alternatives, the cumulative experience of many masters of craftsmanship. Quality also marks the search for an ideal after necessity has been satisfied and mere usefulness achieved” by William A. Foster (Forbes, 2017). At the Central University of Technology (CUT), National Diploma in Electrical, Electronic and Computer Engineering, quality is assessed by official accreditation bodies such as the Engineering Council of South Africa (ECSA). This is to provide quality engineering education programmes which adhere to the high standards set forth by the Washington, Sydney and Dublin Accords (ECSA, 2012).

Accreditation is appraised every four years, evaluating methods, evidence and outcomes. To ease this quadrennial accreditation visit the authors proposed, designed and implemented a generic e-learning template, aligned with the ECSA accreditations layout. The proposed layout could also ease site navigation for students. Preliminary implementation was done on four subjects namely; Control Systems III, Digital Systems I, Logic Design III and Digital Signal Processing IV. Student feedback was gathered in an online questionnaire using Google Forms. Feedback is used to evaluate the layout before the full deployment to all engineering subjects.

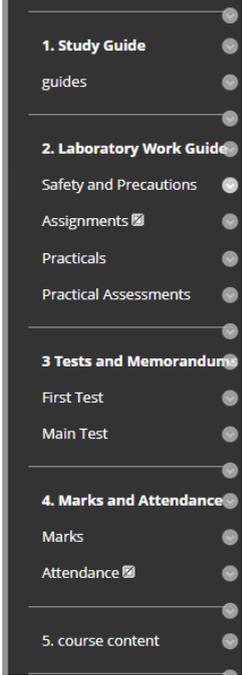
2. Literature review of accreditation, e-learning and feedback

Section 13 of the Engineering Profession of South Africa Act (No. 46 of 2000) indicates that ECSA must conduct accreditation visits to any education institution at least once during a four-year term. ECSA, in consultation with the Council on Higher Education (CHE), will then either conditionally or unconditionally grant, refuse or withdraw accreditation for any engineering programme offered at an institution of higher learning in South Africa.

Benefits of accreditation of any University of Technology programme means that it is recognized as satisfying the criteria prescribed for the relevant cadre of engineering practitioner. Additional benefits of accreditation confirm that the graduates from the respective programmes are ready for employment and are equipped to continue learning throughout their careers. It confirms that the qualification has a benchmark that can be used to establish its comparability with international qualifications, assure the public of the quality of the programme and encourage improvement and innovation in engineering education in response to national and global needs (ECSA, 2012).

This four-year cycle accreditation is done by an accreditation team of two or more members from industry, one or two members who are active in the profession and one or two members who are academics. This team would request from the relevant lecturers (among other things) subject files for the last four years consisting of subsections as seen in Table 1. Note that included in the safety and precautions heading is an additional HIV and AIDS brochure that was develop with student feedback as presented at the International HEAD’16 (Luwes, Meda, & Swart, 2016).

Table 1. Screenshot of proposed template course menu.

Print screen of the e-learning layout	ECSA required sections
	<p>1. Study guide Mission statements, outcomes, purpose, information on professional registration, assessment methods, guidelines for improving performance, year programmes and learning units</p> <p>2. Laboratory Work Guide</p> <p>2.1 Safety and Precautions. Safety I the workplace and HIV and AIDS in a work environment.</p> <p>2.2 Assignments. This includes samples of actual student works from previous years.</p> <p>2.3 Practical Assessments. This includes samples of actual student works from previous years.</p> <p>2.4 Memorandum of practicals. This includes rubrics and memorandums of all practical works.</p> <p>3. Tests, main tests and memorandums In addition to the memorandums it must also include assessed student tests and main tests.</p> <p>4. Marksheets and attendance lists</p>

The table show the correlation between the ECSA required sections and the e-learning layout.

e-Learning might be a device that can assist in the four-year cycle accreditation as a backup tool. e-Learning is defined as instruction delivered on electronic devices that is intended to support learning, enabling students both on and off campus access to learning from any location where they have an Internet connection (Sleator, 2010). This means that e-learning is an umbrella term for all types of training, education and instruction that occurs in a digital medium, such as hand-held devices and computers using different types of media

such as multimedia, social media or virtual classrooms. This trait makes it an effective tool in higher education as it allows the learning experience to transcend the traditional classroom.

Getting students to accept, and more importantly, continually use the e-learning component of their course, is essential for facilitators to blend technology with education (Hosam, Bee, Ahmed, & Nasser, 2017). It is important to use student feedback in the design process and this may encourage them to keep using it.

Literature indicates that the adoption of student feedback was initially a contested topic, where it was mainly used as a performance management tool, but with on-going educational research, it has grown in recognition as a tool to enhance teaching and learning. Care must be taken in the design of suitable feedback questions that would generate relevant data for analysis. When analysing the data, one should focus attention on the use of the results rather than on the results themselves. A successful sustainable action plan should be implemented based on these results (Nair & Mertova, 2011).

3. Research Methodology

An exploratory study was employed along with descriptive statistics involving quantitative analysis of the collected data. An exploratory design may set the stage for future research and usually involves only a single group of respondents (McNeill & Chapman, 2005) (De Vos, Strydom, & Delport, 2011). Descriptive statistics are used as the results are interpreted with regard to the proposed e-learning layout. Quantitative analysis is important as it brings a methodical approach to the decision making process, given that qualitative factors such as “gut feel” may make decisions biased and less than rational (Reddy, Higgins, & Wakefield, 2014).

The target population was restricted to the students enrolled Control Systems III, Digital Systems I, Logic Design III and Digital Signal Processing IV of electrical engineering subjects. For ease of use Google Forms was used to obtain student demography and perspectives on specific questions relating to the new proposed layout. Closed-ended questions, featuring Likert scales, were used.

4. Results and discussions

The purpose of this paper is twofold. One, to propose a layout to assist in ECSA accreditation backup. Second, to present the students’ feedback on the new proposed layout as well as perceptions on accreditation.

4.1. The proposed layout

e-Learning has become an integral part of teaching. Thus, to utilize it for backup should be easy. The problem is that there are almost as many layouts as there are lecturers. A layout should be generic to ease navigation for students and assessors alike.

4.2. Student perceptions

The first few questions were designed to determine demography and perceptions on accreditation. A sample survey of thirty-six students answered the questionnaire. It consisted of 61% second year, 28% third year and 11% fourth year students. Their age representations are as follows: 18-21 years (33%), 22-25 years (50%), 26-29 years (11%) and 30-34 years (6%). Questions to determine what students knew about the accreditation process and accreditation bodies, showed that 33% did not know what or who ECSA was and a more concerning 50% did not know what ECSA accreditation meant for their institution. The same 50% did not know that lecturers needed to keep samples of practicals and assessments. Figure 1 shows the percentages of the students' perceptions on the menu layout.

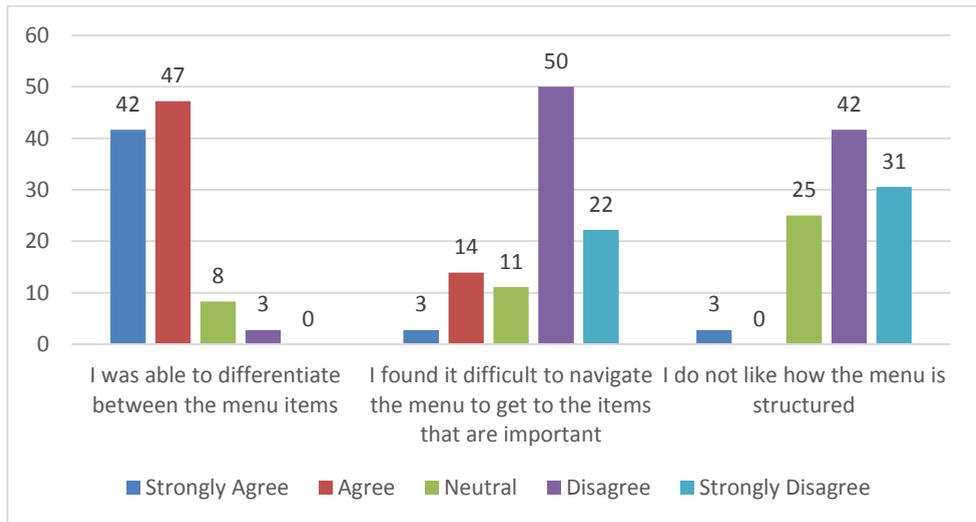


Figure 1. Student's perceptions on the menu layout

The questions as seen in Figure 1 “I was able to differentiate between the menu items”, “I found it difficult to navigate the menus to get to items that are important” and “I do not like how the menu is structured” were setup to really evaluate the presentation of the menu layout. Eighty-nine percent (42% strongly agree and 47% agree) indicates that students found it easy to differentiate between menu items and this correlates with the 72% (50%

disagree and 22% strongly disagree) that did not find it difficult to navigate the menu to get to the items that are important. Further validation is that 73% (42% disagree and 31% strongly disagree) liked the menu structure. To assist in the backup process, it would mean that all practicals need to be handed in online. These perceptions were tested as follows. Figure 2 show the percentages of the perceptions on online submissions.

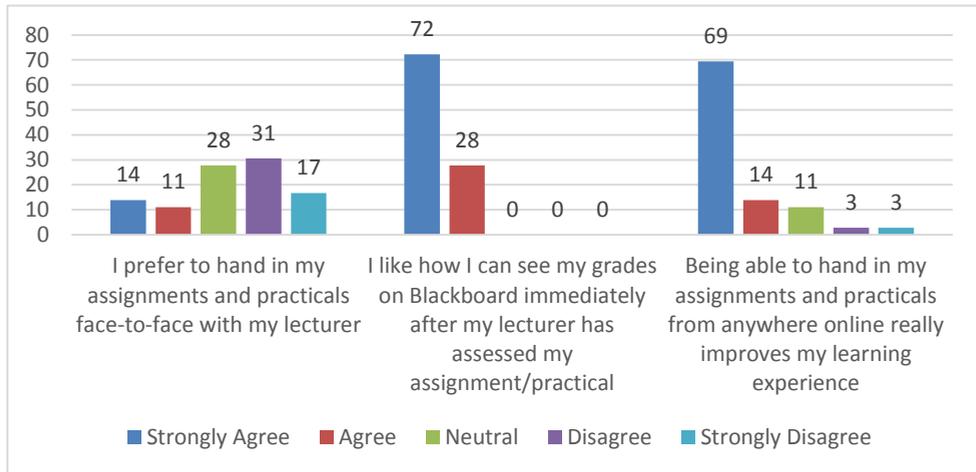


Figure 2. Perceptions on online submission.

These results are not overwhelmingly positive, but the distribution does indicate that it will be acceptable. This shows however a shift in the perception of submitting online as it contradicts previous perceptions that showed the majority of African undergraduate engineering students (more than 50%) did not prefer to submit their practical work online (Luwes *et al.* 2015). Reasons seem to be that students appreciate the idea of being able to hand in assignments and practicals from anywhere online and that grades can be seen immediately after the lecturer has assessed it.

The new ECSA layout has different headings for assignments and practical assessment. The intent is that assignments are theory based and practical assessments are a multi-part assessment project that includes preparation, lab results and a report. A question was set up to see if students knew the difference. The overwhelming majority think that assignments are pieces of work that require an understanding of the theory, and that practicals are physical tasks or projects to be constructed and demonstrated. Some answers for this include: “Assignment could be practical but practicals are not necessarily assignments”, “Assignments are pieces of work that require an understanding of the work done and research is necessary to understand. Practicals are when you see and understand the theory of a certain subject” and “This is a task that is allocated to a student or learner and it is to be handed in a specified time. Practicals are tasks that are physically done by a student with

relevance to a module in a lab/class.” These responses suggest that some students think assignments are preparation for practicals as seen in the following answers: “Assignment are usually research you do before doing the actual practical work” and “an assignment is something that you do research to find answers and practical you conduct an experiment to find answers”. It also seems that students think assignments are the reports for practicals: “practicals are demonstrated immediately while assignments are submitted later”. Figure 3 show the percentages of the overall perception.

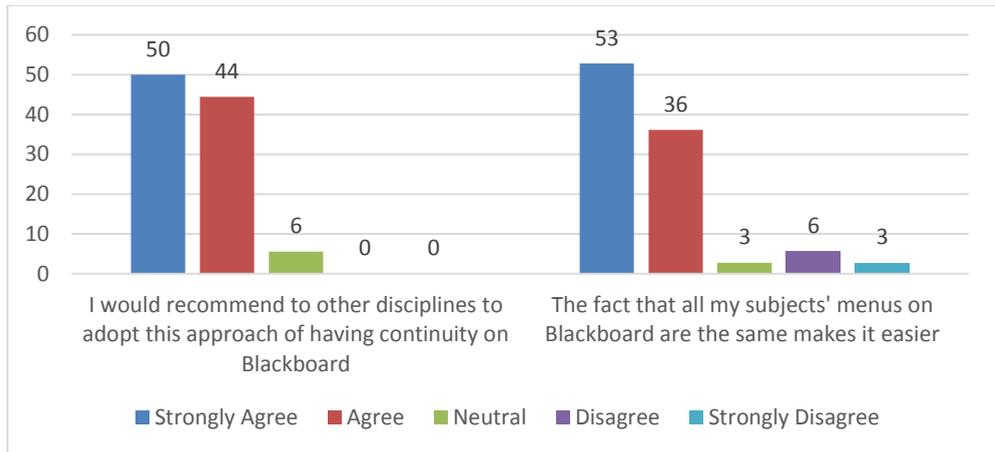


Figure 3. Overall perception

The overall perception of the generic layout is positive. Students indicated that they would recommend to other disciplines to adopt this approach of having continuity in the e-learning environment Only one student said no for the question “Would you prefer that all your lecturers adopt this template?” Students indicated that if all their subjects' e-learning menus would be the same that it would makes it easier (50% strongly agreed and 44% agreed).

The following responses were noteworthy: “The recent interface design changes make it look nicer than the last design”, “It would be easier if eThuto notifications can be assessed instantly as WhatsApp, like whenever I have a notification it can pop up on my mobile device just as easily as possible” and “like an email, there should be an indication of announcements read and unread and also the dates.”

5. Conclusions

This paper contribution is an e-learning layout to ease accreditation and student site navigation. It is however not known if ECSA would accept this form of backup, but as all evidences is in the required form it should suffice. Student perceptions was determined

using feedback forms. Results showed a concerning fact that half of the respondents were not aware what ECSA accreditation meant to their institution, nor that their lecturers were required to keep evidence of their work. This indicates that student awareness of the reasons behind the design of their curriculum should improve. The majority of students found the new template design easy to navigate and positive perceptions of its use in other and future subjects. This shows that students enjoy the continuity of a generic template used in all their subjects. This generic template will be implemented as standard practice for all engineering subjects with the addition of an introduction that thoroughly explains to students how and why their curriculum is designed the way it is to align with the ECSA standards. Students will also be briefed on the mobile application of Blackboard that will allow them to receive notifications for any communication on their mobile devices. Positive feedback indicates that this generic template aimed to do backup should also improve the e-learning experience.

References

- De Vos, A., Strydom, H., & Delport, C. S. (2011). *Research at grass roots: For social sciences and human service professions*. Pretoria: Van Schaik Publishers.
- ECSA. (2012, November 22). Policy for accreditation of technology programmes in engineering. Retrieved from Engineering Council of South Africa: https://www.ecsa.co.za/about/pdfs/Accreditation_Universities_Technology_Section_1.pdf
- Forbes. (2017, November 22). Thoughts on the business of life. Retrieved from Forbes: <https://www.forbes.com/quotes/9698/>
- Hosam, A. S., Bee, K. T., Ahmed, I. A., & Nasser, A. (2017). e-Learning continuance satisfaction in higher education: a unified perspective from instructors and students. *Studies in Higher Education*, 1-18.
- IEA. (2012, October 5). Homepage. Retrieved from International Engineering Alliance: <http://www.ieagrements.org/>
- Luwes, N., & Swart, A. J. (2016). Student perspectives of practical work done in a laboratory - a case study from Logic Design III. ICEE.
- Luwes, N., Meda, L., & Swart, A. J. (2016). Academic and student perceptions on the integration of HIV and AIDS education in an electrical engineering curriculum at a South African University of Technology. 2nd. International conference on higher education advances (HEAD'16) (pp. 160-168). València: Editorial Universitat Politècnica de València.
- McNeill, P., & Chapman, S. (2005). *Research methods* (3rd ed.). New York: Routledge.
- Nair, C. S., & Mertova, P. (Eds.). (2011). *Student feedback: the cornerstone to an effective quality assurance system in higher education*. Elsevier, 53-69.

- Reddy, W., Higgins, D., & Wakefield, R. (2014). An investigation of property-related decision practice of Australian fund managers. *Journal of Property Investment & Finance*, 282-305.
- Sleator, R. D. (2010). The evolution of eLearning background, blends and blackboard. *Science Progress*, 319-334.

Game of phones: Integrating mobile technology into science and engineering classrooms

Crump, Vanessa^a and Sparks, Julie^b

^aScience & Engineering Program, UTS Insearch, Australia, ^bEngineering & IT Program, UTS Insearch, Australia.

Abstract

Mobile technologies are ubiquitous in the lives of our students. Rather than seeing the presence of these devices in the classroom as a hindrance or a distraction, educators should embrace the opportunities for greater student engagement, collaboration and useful feedback.

This paper reports some uses of mobile technologies in classrooms at UTS Insearch and the responses of science and engineering students. We hope that our reflections will be a useful guide to other educators and suggest simple ways to integrate flipped learning and gamification into undergraduate classrooms.

UTS Insearch has a blended learning approach to teaching where students learn through seamless integration of technology-enhanced strategies and face-to-face activities. We focus on our experiences using learning tools, such as Kahoot! and Mentimeter, to demonstrate practical applications of gamification in science and engineering classrooms.

The teaching style used in Australian universities incorporating student-centred flipped learning is foreign to many students, especially those from Non-English Speaking Backgrounds, but data from surveys and reflections allow us to conclude that a majority of students value the use of emerging technologies in learning and that they assist with motivation, formative assessment, collaborative learning and student engagement.

Keywords: *Mobile technologies in learning; gamification in education; new tools for teaching; engineering and science students; Non-English Speaking Background students; flipped learning.*

1. Introduction

This paper reports on the different ways educators can encourage the on-task use of mobile devices through the targeted use of tools such as quizzes, polls and discussion boards.

UTS Insearch is a registered higher education institution and pathway provider to the University of Technology Sydney (UTS). Our students come from various educational backgrounds and over 90 different countries, with most originating from Australia, China, Vietnam, South Korea, Saudi Arabia and Nepal. In the Science and Engineering programs we are responsible for the subjects Introduction to Technical Communication; Engineering Communication; Chemistry 1; and Principles of Scientific Practice.

The response by some schools and universities to the perceived dangers of distraction by mobile device usage in classrooms has been to ban their use. Rather than resisting their presence in classrooms, we offer solutions that allow educators to integrate flipped learning and gamification into lessons. Learning tools such as Kahoot! and Mentimeter can enhance motivation and engagement, provide formative assessment feedback, stimulate discussion and debate and support both independent learning and teamwork.

In this paper, we share some of the ways we implement these learning tools, primarily from our own experience and the perspective of our students. These findings will be of practical interest to educators working in a range of teaching and learning contexts, and at all levels of education, who wish to incorporate mobile technologies into the classroom.

2. Mobile devices in education

Smartphones are the mobile device universally used by our students. UTS Insearch has a policy of using blended learning, or a ‘flipped’, approach to teaching and learning. Students are required to use smartphones, tablets or laptops and encouraged to ‘bring your own device’ (BYOD) and connect to Wi-Fi to access learning resources and participate in and complete class activities.

While we would not encourage students to record lectures or photograph boards full of notes, we do encourage their use in our classrooms. Students can photograph instructions given informally in class or the working to a problem to refer to later. A photo is a quick and accurate way for a student to record a web address or directions to other resources. We have used mobile devices to send an email to students because we are delayed and want them to remain in class until we get there. Students text each other to let us know they are running late, or cannot find the room. Our students of Non-English Speaking Backgrounds can be observed using Google Translator to check the meaning of words. Data needed for problem-solving, such as the Periodic Table, can be quickly sourced. Students with

accessibility needs can use mobile devices as assistive technology (AT), with the benefit that this is less stigmatizing than using traditional AT devices (Musti-Rao & Walker, 2017).

Students from different backgrounds use technology in different ways, and educators must establish expectations around the use of mobile devices in classrooms. We have found that negotiated sensible use is more fruitful than trying to control student behaviour by completely banning mobile phones in classrooms. Smith-Stoner (2012) suggests that some rules are non-negotiable, such as not using mobile devices during tests. Other protocols might include ringers turned off or set to vibrate, students leaving the room to make or receive important calls, having permission to record or photograph anyone in the class and only texting in class if it is relevant (Smith-Stoner, 2012).

We note that the literature reflects a mixed bag of responses from educators and students regarding the benefits of mobile phone use. Walker (2103) reported that students, while acknowledging the potential for distraction and even harm, felt that they benefitted from the use of their devices at school and were creative in finding ways to use their devices educationally. Beland and Murphy (2016) surveyed the literature and concluded the mere presence of technology has a minimum impact on test scores, but that when used purposefully has the potential to enhance student outcomes. However, in two experiments, Ward, Duke, Gneezy, and Bos (2017) demonstrated that the presence of a mobile device nearby was sufficient a distraction to reduce cognitive capability and suggested that potential negative effects on student engagement, learning and test performance merits the cautious use of mobile devices.

We aim to make our lessons engaging and student-centred, so mobile devices are not used as a distraction from boredom but recognise that positive experiences may not be reported by all. Sensible protocols for the use of such devices should be implemented. Nonetheless, we would assert that these technologies provide so many benefits that their use is not to be feared.

2.1 Mobile technologies – what the literature shows

Mobile phones have been found to be a powerful tool to support student-centred and directed learning opportunities (Preston et al., 2015) when used to record lectures, instructions for assignments, or to photograph experimental or fieldwork. Another constructive use is for student collaboration (Corbeil & Valdes-Corbeil, 2007), which is necessary for the successful implementation of active learning. Multiple studies (O'Bannon et al., 2017; Thomas et al., 2014; Purcell et al., 2013) have confirmed that the anywhere, anytime learning opportunities provided by access to the Internet are perceived by both educators and students as the primary benefit of using mobile phones in the classroom.

In Australia, Farley et al. (2015) found that 87% of tertiary students favoured the idea of using their mobile devices in or out of class to support their learning. Students used their devices primarily for discussion forums (94%), and to access lectures slides (90%). Nonetheless, most in-class use (61%) was to access course materials rather than because instructors required their use as part of the in-class activity.

2.2 Gamification in the classroom

Kiryakova et al. (2014) assert that students lack engagement and the motivation for active participation in the learning process, but Roblyer (2016) proposed that the appropriate use of technology could overcome this issue. Gamification is the process of adapting a non-game experience, in this case specifically a learning activity, with game-like elements to engage and motivate and promote problem-solving and learning (Kapp, 2012). The key features of gamification are that users are participants; the challenges provided progress towards defined objectives; points are assigned, and users are ranked based on their achievements (Kiryakova et al., 2014).

We see gamification as a key element of flipped learning, and in our experience, it can support group work, active learning and give individualized feedback to students. Information and communications technology can provide tools with strongly competitive game elements to engage students while allowing educators to process students' data, track progress and generate detailed reports. The feedback is useful to students and educators alike. Some of the most popular tools include Quizlet, Kahoot!, Mentimeter and FlipQuiz™ and are accessed on mobile devices via cloud services, require no special software, and can be used at any time or location where Wi-Fi is available.

3. Gamification and flipped learning

Flipped learning was pioneered by Bergman and Sams (2014) to engage students more actively in their learning. Students individually prepare before coming to class using videos or online notes, allowing in-class time to be used for group work and individualised attention. The key elements of flipped learning include flexible spaces, so students choose when and where to learn; a student-centred approach; intentional content; and reflective educator practice (Flipped Learning Network, 2014).

Students at UTS Insearch are drawn from a range of international backgrounds, with many used to a traditional, direct instruction classroom style. They are unused to self-directed learning, collaboration, creative and problem-solving approaches. In other words, they do not expect to have fun. We use several learning tools with elements of gamification to implement flipped learning and student-centred activities in our classrooms, including Kahoot!, and Mentimeter. What do these students think of this use of mobile technologies?

3.1 Using Kahoot! in the classroom

Kahoot! is a learning tool that administers quizzes or surveys to the whole class in real time. It has largely replaced earlier audience response polling tools such as clickers. It is a game-based response system where multiple-choice, true/false or yes/no questions are projected onto the screen. Teachers can easily design and edit quizzes and can embed images or videos. Students log into the learning game and play as individuals, or in teams, answering the questions on smartphones, tablets or laptops. Kahoot! has 70 million monthly users and has been played in 206 countries (Kahoot!, 2017).

We feel that using learning tools, such as Kahoot! presents several advantages for students and educators. It is a low stake, low-risk task and students receive their feedback privately and in real time, thus allowing students the freedom to fail. Students can celebrate their victory when they improve their score or head the leaderboard. The games are social, engaging and entertaining. For educators, the feedback can be used informally to check the understanding of the class broadly. Alternatively, the data can be downloaded, and the responses of an individual student can be analysed or used for assessment purposes. Some of the ways that Kahoot! has been used in our classrooms are detailed below.

Students are asked to watch a video or read a journal article as part of their preparation for class. A Kahoot! quiz is then used at the start of the lesson to check their preparation. We find that this is a reliable way to make students engage with stimulus material in their flipped learning and ensures a better level of preparation for class. Other advantages are that students arrive punctually to class and are immediately engaged as they have to log on quickly in order to participate. The instructor gets immediate feedback on the level of preparation and students who are not prepared are aware their lack of preparedness is noted and recorded. The key concepts previously covered can be summarised before starting new work.

Weekly Kahoot! quizzes are used in Chemistry lectures, usually at the end of a topic, for two reasons. Firstly, they are a way of allowing the lecturer to assess the general understanding of the cohort. Questions are used that will draw out common misunderstandings of concepts. The number of incorrect responses is an indication of the number of students who need to have these misconceptions challenged. The instructor can briefly discuss the concept before continuing the quiz. A similar question can then follow to see if improvement has occurred. Secondly, the student gets immediate, individualized feedback that allows them to see what concepts they have understood and if they are in the majority or minority. The feedback is private; they have not been ‘called out’ making an error.

In the Introduction to Technical Communication subject, students choose a creative way to tell the class about their project. Some students use Kahoot! as their delivery method. They create their own questions and thus take ownership of the technology. Student participation rates in either individual or group quizzes are consistently 100%.

At the end of each semester, Chemistry 1 students are asked to reflect on their learning experiences, and these surveys provide a rich source of data. Most students (n = 512) report that they found the use of Kahoot! quizzes useful (very useful = 43.9%; somewhat useful = 38.3%). A handful of students (1.4%) say they did not participate in these activities, and only 16.4% felt that Kahoot! quizzes were not very useful.

There are disadvantages to the use of this teaching tool. The nature of the game favours speed and accuracy, and yet a slow and methodical approach to problem-solving is something we encourage in our engineering and science students. We note that not all student responses are positive, that any one type of technology should not be overused. Other students felt that without access to the questions and correct responses later the work could not be reviewed, however this information could be made available to students if necessary. Most students reported the quizzes were enjoyable, motivating and useful for monitoring their progress.

3.2 Using Mentimeter in the classroom

Mentimeter is a learning tool that encourages active class participation as students respond anonymously to questions or surveys using multiple-choice, open-ended questions or scales. The instructor can assess the opinions or understanding of students in real time and display the data in tables, charts or word clouds. Mentimeter can be used to elicit feedback, frame discussions, rate solutions or compare work samples. The use of anonymous responses via mobile phones, laptops or tablets encourages greater engagement and a higher participation rate, compared to normal response methods, such as hand-raising. The use of such electronic response systems has been shown to be useful in actively engaging students (Morrison, 2015).

Some of the ways that Mentimeter has been used in our classrooms are detailed below. We have found it positively improves the level of attention and participation in the classroom environment, supports quality learning through encouraging interaction and discussion from even the most introverted students, and gives useful feedback to both the instructor and students.

In the subjects Introduction to Technical Communication and Engineering Communication, students are expected to watch videos that outline the conventions used for referencing. Once in the classroom, students work in pairs to write a correct citation for a book. They

use the UTS Library website and interactive referencing guide and submit their answers via Mentimeter. Together the class decides which citations have obvious errors and these are removed. A second round uses a journal article, as these are more complex to reference. There are fewer errors as students develop their mastery of this skill.

One of the grading criteria for a task in Introduction to Communication is assessing how engaging the presentation was for the audience. Students use Mentimeter to vote and rank the top three presentations. Students do not have to reveal their votes publicly, so the feedback is assumed to be more honest than a paper vote or show of hands. Students value the real-time feedback given immediately after presentations are delivered. The overall ranking is used to assign the grades for this criterion, and Mentimeter results have consistently matched the overall opinion of the Tutor, indicating student honesty in voting.

Principles of Scientific Practice students explore an ethical scenario and in small groups weigh the advantages and disadvantages of a variety of possible responses. Mentimeter is used for consensus building and to rank the preferences and establish the majority view.

3.3 Other mobile technologies

Google Forms and SPARK^{PLUS} - These educational technologies are used in our subjects for self and peer assessment. Students often feel that group work assessment can lead to students receiving equal marks for unequal contributions. Using these technologies allows students to rate the contributions of their peers confidentially. As with Mentimeter, we believe that using these types of technologies results in more honest and thoughtful responses. Another advantage for educators is the ease with which forms can be set up, modified and reused. Summaries of the data are easily accessed and analysed via software, such as Excel.

Videos, E.g. TED talks - During twenty-minute breaks in three-hour workshops, students were observed to be watching video clips on their phones. This 'wasted' time is now used by students to watch an assigned clip, such as a TED talk. The presentations are chosen because they are controversial and will spark a debate. The students are asked questions on their return and expected to justify their opinion. In their reflections, students report their enjoyment of these discussions and clearly relish the challenges they present.

4. Conclusion

Mobile technology surrounds us and is assumed to be a backdrop to the learning environment. Although educators sometimes witness circumstances where mobile devices cause distractions, our experiences show there are many opportunities for incorporation of gamification and mobile technology in conventional and flipped-learning classrooms. Clear

guidelines for the use of this technology should be established. Positive applications of mobile technologies include polling, quizzes, access to videos and search engines and photographing information or results. This is a rapidly developing area, but our experience has shown that embracing this technology is positive for student engagement and learning and provides rich feedback to the educator.

References

- Beland, L. P., & Murphy, R. (2016). Ill communication: technology, distraction & student performance. *Labour Economics*, 41, 61-76.
- Bergmann, J., & Sams, A. (2014). *Flipped learning: Gateway to student engagement*. International Society for Technology in Education.
- Corbeil, J., & Valdes-Corbeil, M. (2007). Are you ready for mobile learning? *EDUCAUSE Quarterly*, 30(2), 51–58.
- Farley, H., Murphy, A., Johnson, C., Carter, B., Lane, M., Midgley, W., ... & Koronios, A. (2015). How do students use their mobile devices to support learning? A case study from an Australian regional university. *Journal of Interactive Media in Education*, 2015(1).
- Kahoot! (2017). *New year, new heights: Kahoot! grows by 75% to reach 70 million unique users* Retrieved from <https://kahoot.com/press/2018/01/18/kahoot-grows-reach-70-million-unique-users/>
- Kapp, K. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. John Wiley & Sons
- Kiryakova, G., Angelova, N., & Yordanova, L. (2014). *Gamification in education*. Proceedings of 9th International Balkan Education and Science Conference.
- Mentimeter (n.d.) *Guides* Retrieved from <https://www.mentimeter.com/guides>
- Morrison, J., (2015). The effects of electronic response systems on student learning.
- Musti-Rao, S. & Walker, Z. (2017). *Use of mobile technology in the classroom*. Retrieved from <http://www.council-forlearning-disabilities.org/infosheets-supporting-translation-of-research-to-practice>.
- Network, F. L. (2014). The four pillars of FLIP.
- O'Bannon, B., Waters, S., Lubke J., Cady, J. & Rearden, K. (2017). Teachers and students poised to use mobile phones in the classroom, *Computers in the Schools*, 34(3), 125-141
- Preston, J., Wiebe, S., Gabriel, M., McAuley, A., Campbell, B., & McDonald, R. (2015). Benefits and challenges of technology in high schools: a voice from educational leaders with a Freire echo. *Interchange*, 46 (2), 169–185.
- Purcell, K., Heaps, A., Buchanan, J., & Friedrich, L. (2013). How teachers are using technology at home and in their classrooms. Washington, DC: *Pew Research Center's Internet & American Life Project*.
- Roblyer, M., (2016). *Integrating educational technology into teaching* (7th ed.). Boston, MA: Pearson.

- Smith-Stoner, M. (2012). Class is about to start: please turn on your cell phones: 10 uses for cell phones in nursing education. *Teaching and Learning in Nursing, 7*(2), 42-46.
- Thomas, K., O'Bannon, B., & Britt, V. (2014). Standing in the schoolhouse door: teacher perceptions of mobile phones in the classroom. *Journal of Research on Technology in Education, 46*(4), 373-395.
- Ward, A. F., Duke, K., Gneezy, A., & Bos, M. W. (2017). Brain drain: the mere presence of one's own smartphone reduces available cognitive capacity. *Journal of the Association for Consumer Research, 2*(2), 140-154.

First-year business students' entrepreneurial attitudes

Kakkonen, Marja-Liisa

Department of Business Management, South-Eastern University of Applied Sciences, Finland

Abstract

Entrepreneurial competences consist of attitudes, knowledge and entrepreneurial skills. Several higher education institutions support and promote students' learning of entrepreneurial competences during their studies. In order to verify the development of these competences they should be first examined at the early phase of the studies. Therefore, in the autumn 2017 when a new curriculum was launched in the business department of a Finnish university of applied sciences, a follow-up study with three sub-studies was planned to annually survey students' attitudes towards entrepreneurship, generic competences and subject-specific competences of entrepreneurship.

This article presents the results of the first sub-study which examined the first-year students' attitudes in the beginning of their studies. According to the findings, it seems that all in all their attitudes towards entrepreneurship are quite positive. Although the aim is not to generalize the results of the study beyond this student group, the findings provide a solid starting point for the implementation of the curriculum in its higher education institution, and thus, for the development of students' even more positive attitudes towards entrepreneurship during their studies.

Keywords: *Attitudes, Entrepreneurship, Business students*

1. Introduction

In the autumn 2017 a new curriculum (OPS2017) was launched in the business department of a Finnish university of applied sciences. Besides developing business skills the curriculum of business studies aims at supporting the development of entrepreneurial competences of students, and already enhancing the students' entrepreneurial behaviour during the studies. In addition, the new curriculum better supports the development of competences for setting up and running one's own company.

In order to make the development of students' entrepreneurial competences feasible, these competences can be examined by a follow-up study. It consists of three sub-studies related to entrepreneurial attitudes, generic entrepreneurial competences, and business-related entrepreneurial competences. Later, the development of the competences will be examined annually. The results of three sub-studies during the first year will create a solid starting point for the whole follow-up study, and each of them will be conducted again during the second and third year studies. Finally, the comparison of the results will be conducted and the development of the entrepreneurial competences documented.

This article introduces the results of the first sub-study related to the first-year business students' attitudes towards entrepreneurship. Thus, the findings create a starting point for follow-up studies in order to examine the impact of education on the attitudes.

2. Attitudes towards Entrepreneurship

In general, an attitude represents a summary evaluation of a psychological object. Further, one's own belief associates the object with a certain attribute, and the person's overall attitude towards an object is determined by the subjective values of the object's attributes in interaction with the strength of the associations. Only beliefs that are readily accessible in memory influence attitudes at any given moment (Ajzen 2001). Thus, an attitude is a mentally prepared state for any known subject, and a subjective consciousness that is affected by the environment. The attitude towards entrepreneurship, in turn, is an individual's conception of entrepreneurship, assessment and his or her inclination towards entrepreneurial behaviour or self-employment. (Chen & Lai 2010, 3).

The basic intention-based process model demonstrates the role of attitudes in an individual's behaviour. It is argued that attitudes towards the behaviour, subjective norms, and perceptions of behavioural control affect one's own intentions. In addition, according to the theory of planned behaviour, people act in accordance with their intentions and perceptions of their control over the behaviour. (Ajzen 2001; Krueger & Carsrud 1993). For example, to start a business is intentional and can best be predicted by intentions. Starting a business cannot be predicted by attitudes, beliefs, personalities or demographics. However,

intentions are best predicted by certain attitudes. In other words, attitudes predict intentions which, in turn, predict behaviour, and further, only intentions directly affect behaviour, while attitudes affect intentions. (Ajzen 2001; Krueger & Carsrud, 1993). Therefore, it is worth emphasising that his study makes a clear distinction between attitudes and an entrepreneurial intention.

3. Implementation of the study

According to the findings of an earlier study, entrepreneurial characteristics, interest and motives were quite a high level (means = 3.59-3.76) among international students (Kakkonen 2012a). This study focused on a national student group in Finland and it was conducted in September 2017. An invitation and a link for the Webropol questionnaire was sent by email to all the first-year business students who studied on a full-time basis on the campus (N = 65). By opening the link students were able to answer the questions in the questionnaire at the beginning of their classes of Professional Growth. There were 61 respondents in total.

The questionnaire included 27 statements related to four main themes: Entrepreneurial characteristics and behavior (9 variables), Interest in one's own enterprise (4 variables), Entrepreneurial motives (6 variables) and Barriers of entrepreneurship (8 variables). It is worth mentioning that the statements were not introduced under any themes in the questionnaire. They were displayed in rows without any information on the main themes. In addition to 27 statements as variables (alternatives for describing how well the statements corresponded with their own opinions: 1 = not at all 2 = not well 3 = fairly well 4 = well 5 = very well), the students were asked to give background information on gender, and academic year.

The data analysis was made as follows. First, the frequencies, means and standard deviations were examined by each variable, and then the means of the variables were combined as the combined variables according to the four themes introduced above.

4. Results

The results are introduced below by the means of the variables (statements), and the means of the combined variables.

4.1. Respondents' background information

There were 61 respondents of which 34 were male students and 26 female students. Half of the respondents (n=30) were either 20 or 21 years old. Figure 1 presents the age groups of the respondents.

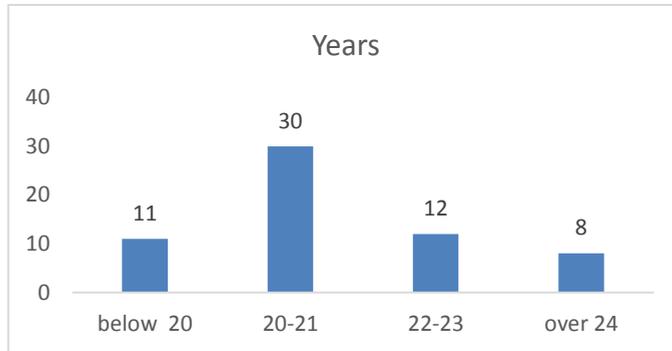


Figure 1. Age groups of the respondents

The question "Are there entrepreneurs in your close family?" received a negative answer from more than half of the respondents (n=34). Those who had entrepreneurs in their close family reported that their father, mother or both of the parents were entrepreneurs. Almost half of the respondents (n = 29) told that there are entrepreneurs among their circle of acquaintances. These entrepreneurs were uncles, aunts or friends. In addition, there were four alternative answers to find out about students' attitudes towards setting up a business: I have not thought about it, I have sometimes toyed with the idea, I have made preliminary plans, and I have already set up a business. Figure 2 presents the results by these alternatives.

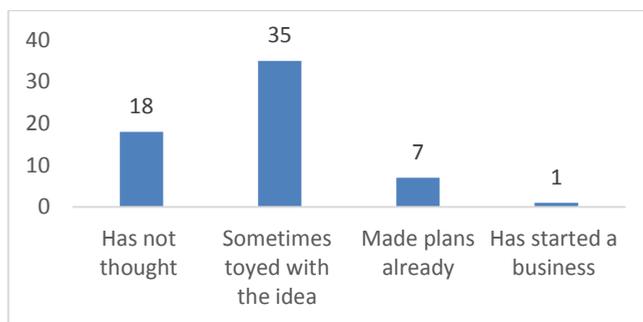


Figure 2. Students' attitudes towards setting up a business

4.2 Entrepreneurial characteristics and behavior

The lowest mean of the statements of the theme Entrepreneurial characteristics and behavior related to the statement "The entrepreneurial risk is not for me" (2.9) and the

highest mean related to the statement “An entrepreneur can affect his success with his own actions” (4.5). The mean of all the means of this theme (the combined variable) was 3.61. Table 1 introduces the means of the statements of this theme.

Table 1. Means of the statements related to entrepreneurial characteristics and behavior

Statements	n	Mean	Median	St. Dev.
The entrepreneurial risk is not for me.	60	2.9	3	1
I like to work in changing circumstances.	61	3.6	4	0.8
An entrepreneur can affect his success with his own actions.	61	4.5	5	0.6
I cannot tolerate financial uncertainty.	61	3.1	3	1.2
As an entrepreneur I have a chance to succeed.	61	4	4	0.8
In my work I want to advance resolutely to the goals I have set.	61	4.1	4	0.8
If you work hard you can make it as an entrepreneur, too.	61	3.9	4	0.9
I want to work in a familiar and safe environment.	61	3.2	3	1
Entrepreneurs are usually doing quite well financially.	60	3.2	3	1

4.3 Interest in one's own enterprise

There were six statements to ask about the interest in one's own. The statement "Entrepreneurship just does not interest me" had the lowest mean and the statement "As an entrepreneur I can take responsibility for my work" received the highest mean (4.3) of all the statements. The mean of all the means of the statements of this theme was 3.58. Table 2 presents the means of all the statements of this theme.

Table 2. Means of all the statements of the theme Interest in one's own enterprise

Statements	n	Mean	Median	St. Dev.
An entrepreneur holds an esteemed position in society.	61	3.7	4	0.9
Entrepreneurship is interesting and challenging.	61	3.6	4	1
I would like to utilise my education in my own enterprise.	61	3.5	4	1.1
Entrepreneurship just does not interest me.	61	2.9	3	1.4
As an entrepreneur I can take responsibility for my work.	61	4.3	4	0.7
I would become an entrepreneur, if a suitable opportunity appeared.	61	3.5	4	1.2

4.4 Entrepreneurial motives

The questionnaire included four statements to ask about entrepreneurial motives. The statement "As an entrepreneur the quality of life is better than if I worked in a paid job" scored the lowest mean (2.8) and the statement "An entrepreneur has the chance to be independent. his/her own master" scored the highest mean (4.4) of all the statements. The mean of all the means of the statements of this theme was 3.65. Table 3 presents the means of all the statements.

Table 3. Means of the statements related to entrepreneurial motives

Statements	n	Mean	Median	St. Dev.
An entrepreneur has the chance to be independent, his/her own master.	61	4.4	4	0.6
My income level is better as an entrepreneur than in paid work.	60	3.1	3	1
As an entrepreneur the quality of life is better than if I would work in a paid job.	61	2.8	3	0.9
As an entrepreneur I can make independent decisions.	60	4.3	4	0.6

4.5 Barriers of entrepreneurship

There were eight statements to ask about barriers of entrepreneurship. The statement "My education does not support becoming an entrepreneur" got the lowest mean (1.8) and the statement "It is no use becoming an entrepreneur without practical experience" got the

highest result (3.4) of all the statements. The mean of all the statements of the theme was 2.66. Table 4 shows all the means of the theme.

Table 4. Means of the statements related to barriers of entrepreneurship

Statements	n	Mean	Median	St. Dev.
It is no use becoming an entrepreneur without practical experience.	61	3.4	4	1.1
You cannot educate yourself for entrepreneurship; it is a native talent or a trait learned at home.	61	2.1	2	0.9
Entrepreneurship takes all of the time, and there is not enough time left for the family or my own hobbies.	61	3.2	3	0.9
As an entrepreneur I cannot develop myself enough.	61	2.2	2	0.9
My education does not support becoming an entrepreneur.	61	1.8	2	1
I do not master the skills required in business.	61	3	3	1
I do not want to be responsible for the enterprise and its employees.	61	2.7	2	1.2
An entrepreneur's life is nothing but toil.	61	2.9	3	1

5. Summary and conclusions

This study aimed at finding out the first-year business students' attitudes towards entrepreneurship. The study was implemented in the beginning of the first-year students' studies in September 2017. The questionnaire consisted of 27 statements as the variables. Table 5 sums up the highest and the lowest means of the statements by each statement. In addition, it shows the means of the means by each main theme.

Table 5. Summary of the means by the main themes

The main themes	Mean
1. Entrepreneurial characteristics and behavior	3.61
2. Interest in one's own enterprise	3.58
3. Entrepreneurial motives	3.65
4. Barriers of entrepreneurship	2.66

Attitudes can affect and predict intentions (Ajzen 2001), therefore it can be concluded that since the attitudes of the students were quite positive, the students might develop an entrepreneurial intention for a new venture later. However, the impact of entrepreneurship studies can be studied later. According to earlier studies, entrepreneurial attitudes can become more negative during the studies in higher education, when the students' general awareness of entrepreneurship will be increased (Pihkala 2008) and when the students will learn more the entrepreneurial competences in higher education (Kakkonen 2012b). Therefore, it is relevant to examine the development of attitudes during the studies later.

Based on the findings, it seems that all in all the students' attitudes towards entrepreneurship are quite positive. Although the aim is not to generalize the results beyond this student group, the findings give a good starting point for the implementation of the curriculum in this higher education institution, and thus, also for the development of students' even more positive attitudes towards entrepreneurship during their studies. How this will succeed, remains to be seen in the future.

References

- Ajzen, I. 2001. Nature and Operation of Attitudes. *Annual Review of Psychology* 52, 27-58.
- Chen, Y. & Lai, M. 2010. Factors Influencing the Entrepreneurial Attitude of Taiwanese tertiary-level business students. *Social Behavior and Personality* 38 (1), 1-12.
- Kakkonen, M-L. 2012. International Business Students' Attitudes of Entrepreneurship. *Advances in Business-Related Scientific Research Journal* 1 (1), 67-78.
- Kakkonen, M-L. 2012. Learning entrepreneurial competences Learning Entrepreneurial Competences in an International Undergraduate Degree Programme. A Follow-Up

Study. Publications of the University of Eastern Finland. Dissertations in Education, Humanities, and Theology. No 36. University of Eastern Finland, Joensuu.

Krueger, N. & Carsrud, A. 1993. Entrepreneurial Intentions: Applying the Theory of Planned Behavior. *Entrepreneurship & Regional Development* 5, 315-330.

Pihkala, J. 2008. Ammattikorkeakoulutuksen aikaiset yrittäjyysintentioiden muutokset. Finland: Ministry of Education. University of Tampere. Doctoral dissertation.

The influence of globalisation and massification on public higher education in Malta: assessing the contextual realities

Borg, Colin

Department of Public Policy, University of Malta, Malta

Abstract

The main question that this paper seeks to explore is: What contextual factors and conditions are contributing to the present higher education environment in Malta?

To address this question, the author conducts a systematic study by examining the changing context of higher education from a legislative, economic and political perspective. The aim of this paper is to outline the determining influences that are shaping Malta's higher education context.

The research methods employed in this paper are mainly two: the first method involves the analysis of documents and data published in international academic journals and local reports. Statistics published by the National Commission for Further and Higher Education (NCFHE) and the National Statistics Office (NSO) were the main sources of local Maltese statistics. The second research method involves national and institutional data that was specifically requested by the author and that was never published before. NCFHE, the University of Malta (UM) and Malta College for Arts, Science and Technology (MCAST) were asked to provide data in order to present a comparative analysis by comparing local data with what has been published internationally. UM and MCAST are the two main public Maltese higher education institutions. In all instances headcount data is presented.

Keywords: *Context, Massification, Globalisation, Performance.*

1. Introduction: exploring two main contextual phenomena - massification and globalisation

Higher Education Institutions (HEIs) across the globe, not least in Europe and Malta, are changing rapidly in an unprecedented manner. Massification and globalisation are two linked factors that led to a 'revolution' in the way institutions are governed and managed. Although 'revolution' seems an exaggeration, statistics show the extent of change that has happened in the last half of the twentieth century (Altbach, Reisberg & Rumbley, 2009).

Globalisation was the first main contextual factor that led to a changing higher education scenario. International collaborations, students exchange programmes and the significant increase in the incoming full-time international students changed the student profile, especially when non-EU students hailing from many different cultures come to study in one of Malta's HEIs. These developments meant that higher education is no longer dominated by monopolistic structures but it is becoming increasingly competitive, both domestically and internationally. This phenomenon is mirrored in Malta's higher education governing system since public higher education institutions are no longer the sole players but are competing with private institutions that are enrolling an increasing number of students and have now become major players in this sector.

The second major contextual factor involves the significant increases of students that were experienced in Europe, North America and other parts of the world in the second half of the twentieth century. Zgaga, Teichler, Schuetze & Wolter (2015) attribute the massification of higher education around the globe to two major causes: first, the economic development that resulted in an increasing demand for highly skilled and knowledgeable workforce. The first cause led to the second source of massification: that of having social mobility which essentially means that students coming from the working class started to register for higher education courses. Both causes were accentuated by the heavy investment and the political decisions of national governments that were intended to increase substantially the percentage of citizens attending higher education courses.

What has happened around the globe is reflected in Malta's experience in the last thirty years. In the final years of the 1980's the Maltese government's vision was of significantly increasing the number of students at tertiary level. Higher education has become accessible to a much higher percentage of the total Maltese population and this inevitably led to the massification of the University of Malta as the highest academic institution on the island and to the creation and eventual massification of MCAST, the main vocational higher education institution in Malta. Although higher education enrolment rates are still comparatively low, 26% when compared to an average of 40 % in the EU (NCHFE, 2016), it can be safely argued that higher education is no longer accessible only to the few intellectuals or well-off, high-status citizens. Malta's higher education became a way to

move up the social ladder and to gain admission to a wide spectrum of professional careers. Consequently, the student population of Malta's higher education institutions is now socially and geographically diverse.

Both globalisation and massification significantly altered the manner in which institutions are governed and managed in various dimensions including: (i) the revisiting and the creation of new governing structures; (ii) more focus on managerial processes and active involvement of students and staff in management given the tough competition arising from a growing private sector; and (iii) stronger coordination with stakeholders.

The aim of this paper is to focus on the contributing factors towards a paradigm shift in the way that HEIs are governed and managed. Section 2 presents a statistical analysis of the growing private sector vis-à-vis the public sector from a Maltese national higher education perspective as well as the increasing use of online learning. Section 3 assesses the developing students' clientele from a massification perspective by presenting five main changing dimensions.

2. The globalisation effect: erosion of state power and weakening of public HEIs' market share?

The term 'globalisation' is becoming more frequently used than 'internationalisation': it not only represents the blurring of boundaries between nations but is also a direct reflection of worldwide economic developments. Furthermore, it embraces international higher education experiences that correspond to the erosion of the nation state's authority in determining higher education policies (Guri-Rosenblit, Sebkova & Teichler, 2007). Around the world, changes in the context of higher education derived by globalisation led to a significant growth of private higher education institutions (Altbach, 2016).

The idea of having higher education exclusively offered by public institutions is now seriously challenged. In fact, Table 1 reveals that the number of private institutions more than doubled, from 31 to 73, over the span of 5 years. It is important to note that this table excludes public self-accrediting institutions: MCAST, UM and the Institute for Tourism Studies (ITS) that are not required to apply for a license from NCHFE. The significant increase in private HEIs is a relatively recent development, since traditionally Malta's higher education has been predominantly provided through the University of Malta.

The increase in private HEIs is paralleled by the rise in the number of private sector students. Table 2 discloses an almost three-fold increase in the private sector market share in just five years, from 2010 until 2015.

Table 1: Number of HEIs: public versus private

Academic Year	2011	2013	2014/15	2015	2016/17
Total number of licensed HEIs	64	64	59	71	80
Total private HEIs	3	55	54	65	73

Source: NCHFE (Data collected by the author)

Table 2: Share of Higher Education Students Population in terms of Private and Public Sector

Year/Students	2010	2011	2012	2013	2014	2015
Public Sector	9,805	10,405	12,403	12,988	12,440	13,187
Private Sector	921	1,301	2,315	3,691	2,598	2,833
Total	10,726	11,711	14,718	16,679	15,038	16,020

Source: NCHFE (2015)

This indicates that the private sector is growing rapidly and, consequently, the public sector is experiencing tough competition from private higher education organisations. In fact, while the ratio of students in public and private organisations was 11:1 in 2010, the gap decreased significantly in 2015 to a ratio of 5:1 (NCHFE, 2015: 27).

This development is consistent with what happened in the international arena where the growth of private higher education has been one of the most remarkable developments. In fact Sursock (2015) estimates that 30% of today's global higher education is private. The change in the composition of Malta's student population has been accentuated by policy decisions adopted by the Maltese government. Legal notice 150 of 2015, which was introduced to inject greater internationalisation and pluralism into higher education, is a case in point. The Maltese government took a political decision to build a higher education niche with the aim of having a spill-over effect on the economy. As part of this national strategy, a new American University of Malta (AUM) and the Barts Medical School were brought to invest in Malta and Gozo respectively. The concern among many critics was that the new Legal Notice and the new policy direction of the Labour Government were indeed changing the parameters and foundations of higher education. This policy direction brought about fear of reducing the quality of Malta's higher education. The NCFHE explained that the main driving force behind the introduction of such changes was to give the possibility to Universities to obtain a licence even if they do not offer a wide range of programmes.

Globalisation also led HEIs to open branches overseas, to engage more in inter-institutional partnerships and business or community partnerships while receiving and sending a

significant number of students on exchange programmes. Adroit use of information technology did help HEIs to catch the attention of new cohorts of students who could not be targeted before. HEIs are nowadays able to provide courses through e-learning or hybrid learning. The result was that distance learning courses have become more popular either by Universities developing a distance learning infrastructure or by setting up an entire e-University, as was the case in Estonia and Switzerland. In Iceland 17% of the students undertook distance learning courses in 2009 (Beerkens-Soo & Vossensteyn, 2009).

Table 3 shows that the number of online courses at UM is still very limited when considering that in Academic Year 2016/17 out of a total of 842 programmes only 40 were delivered online. In percentage terms this signifies a minimal figure of 5%. A marginal percentage of 2% of all the study-units offered involve some form of online delivery when considering that out of a total of 5,000 study-units, only 102 units have an online method of teaching delivery.

Table 3: Number of Online Courses and Study-units delivered by UM and MCAST

Academic Year	2007/8	2012/3	2016/7
Number of Online Courses – UM	15	33	40
Number of Online Courses – MCAST	0	0	0
Academic Year	2007/8	2012/3	2016/7
Number of Online Study-units - UM	33	77	102
Number of Online Study-units - MCAST	0	0	157

Source: UM and MCAST (Data collected by the author)

Despite these low figures and percentages, the number of courses and study-units that include online teaching increased by almost three times in the span of ten years. Interestingly, although there are no online courses delivered at MCAST, the number of online study-units exceeds that of UM by a significant amount. This fact is surprising when considering the relatively high number of study-units offered by UM.

In summary, globalisation brought about tougher competition from the private sector, and stimulated further collaboration with international partners, while ICT facilitated the advent of online learning. Globalisation also contributed to the massification phenomenon that is reviewed in section 3.

3. Massification: analysing student numbers and changes in the composition of the student body

Five massification scenarios were identified in the course of this study. They influenced higher education governance and management either from a specific governmental policy direction or through the creation of new institutional structures, programmes, and initiatives as a response to the changing circumstances.

The first scenario involves the broadening of the Maltese HEIs' social base by providing free education and a stipend to all undergraduate students. This development can be explained either by the economic progress and societal developments that helped to shape today's modern societies or by multi-level policy actions steered by the EU and the national governments in order to increase the percentage of citizens who are studying and eventually graduate at higher education level. Europe's 2020 target strategy is a case in point. The main aim is to achieve a percentage figure of 40% of the population aged 30 to 34 who have completed tertiary or equivalent education. In 2013, Malta's share was relatively low, only 26%, when compared to the EU's average of 36.9% (NCFHE & MEDE, 2014) despite the Maltese government's policy of offering free tertiary education and stipends to all students. These favourable conditions are also accessible to repeating and mature students.

Across Europe, the EU's and national governments' efforts resulted in a significant increase in the student population in HEIs. In a study conducted by the European University Association (EUA), in 2015, among 451 higher education institutions, 62% of the Universities experienced an increase in the number of students during the last five years (Cited in Sursock, 2015). In Malta, legislation compounded with societal changes led to a substantial increase in total student numbers. NCFHE analysed the number of students in higher education in the last twenty years (2015: 25). It was discovered that the student population at tertiary level increased from 6,362 in the year 2000 to 15,038 in 2014, a more than two-fold increase. In 2014 the University of Malta, as the country's main public HEI of the three islands (Malta, Gozo and Comino), had a share of 76% (11,476) of the total higher education student population (Malta Parliament, 2015). In 2017, the number of UM students remained at the same level and was significantly higher, six times as much, when compared to the figure of 1,928 MCAST students that were studying at MQF level 5 and upwards.

Policy decisions to abolish fees for higher education in 1974 and to provide stipends for all higher education students in 1979 meant that social groups that had never dreamt to make it to the higher education sphere were now attending tertiary level courses. The broadening of the social base was accentuated in 1987 when the Ministry responsible for education, in collaboration with the University of Malta, abolished the 'numerus clausus' system that was in force for a decade. Such a system meant that only students who were ranked in top

positions through a points system were accepted for a University course. It was instead decided that students be accepted for almost all University courses if they are in possession of the necessary academic qualifications. MCAST was set up in order to encourage the upward trend in the number of higher education students between 1987 and 2000. This dedicated vocational college was also a response to Malta's decision to join the European Union and consequently to the globalisation forces. MCAST provides a route to higher education for those capable and highly-skilled students that are more oriented to vocational areas rather than academic domains.

Increasing women's participation in higher education represents the second factor, stemming from economic and societal developments that are a direct and an indirect result of both globalisation and government policy-making. While on one hand, globalisation had fuelled the idea of having a more active involvement of women in societal affairs and in the labour market, Malta's policy after EU membership in 2004, on the other hand, encouraged women to work rather than staying at home either through fiscal incentives or through practical initiatives such as free childcare. These policy decisions encouraged women to pursue careers and seek courses at tertiary level. A number of policy frameworks and strategies that include 'The Framework for Education Strategy for 2014 to 2024', 'The National Lifelong Learning Strategy 2020' and 'The Higher Education Strategy' highlighted the importance of reducing the gender gap and of having more active involvement of women in the labour market (NCHFE, 2016).

Societal changes and government decisions have therefore been crucial in attracting women as HEIs clients. The increase of women's participation in Malta's public higher education can be traced in Table 4. In the period 2008 to 2015 the percentage of women attending higher education courses when compared to the total public higher education students was 57%, as an approximate average figure. Women's participation tallies with the female graduation rates that in 2015 achieved the mark of 56% (NCHFE, 2016).

Table 4: Number of public higher education students in Malta by gender

Gender/ Ac. Year	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Female	5,536	5,685	6,073	6,900	7,350	6,888	7,276
Male	4,080	4,124	4,332	5,350	5,744	5,552	5,664
Total	9,616	9,809	10,405	12,250	13,094	12,440	12,940

Source: NCHFE (Data collected by the author)

This has been a global trend: Germany witnessed an increase of approximately 15% from 1975 to 2002 (Wolter, 2016) and a percentage of 58% will be reached by the year 2025. This is not an isolated case as the probability ratios of women participating in higher education courses are rising in all countries and in most countries the percentage figure will exceed 50% by the year 2025. It is being projected that by that year countries such as Austria, United Kingdom and Iceland will achieve high percentage figures of 72%, 71% and 68% (Vincent-Lancrin, 2008).

The third factor consists of the growing number of international students from both EU and non-EU countries. The population of international students at the University of Malta is almost 10%. This percentage figure compares well with countries such as the Czech Republic (10.5%), Denmark (10.3%) and the Netherlands (10.2%) but is less than in Luxembourg (45.9%), UK (18.5%), Cyprus (17.5%), Austria (15.9%) and Belgium (11.2%) (Eurostat, 2017). The increasing number of international students resulted in a threefold increase in the fees generated by the University of Malta. In Academic Year 2008-2009 the fees paid by EU and non-EU students totalled 1.5 million euros. The amount paid in Academic Year 2015/2016 increased to 5 million euros (Times of Malta, 2017). This meant more financial leverage for the University to invest in its infrastructure and programmes. The focus on international students especially on International Masters Programmes (IMPs) led to a dedicated organisation and a building situated at the Valletta Campus. Student mobility is not only measured in terms of regular students but also through other EU initiatives such as Erasmus programmes. Since 1987, Erasmus programmes has supported more than 3 million students to spend a few months in a foreign HEI. In Malta, the percentage student mobility through exchange programme is relatively low, only 2.5%, when considering that the target of the Higher Education Area is of 20% (NCHFE, 2016).

The fourth factor involves programmes or initiatives stemming from HEIs that are intended to cater for a segment of the population that never had the opportunity to study at tertiary level. Two examples could be cited from the University of Malta. The first involves the University's innovative programme of the Liberal Arts and Sciences introduced in Academic Year 2014/2015, which attracted a staggering figure of 797 students until Semester 1 of Academic Year 2016/2017. This programme is fundamentally different from all University courses since students can follow individual study-units instead a pre-set course of studies and it does not involve a time-limit if the registered students decide to continue their studies and obtain a certificate, diploma or even a degree. The second example comprises the UM's initiatives to target mature and part-time students. Mature students over 23 years of age can apply for almost any University course and can be potentially accepted following an interview by the Board of Faculty or Institute concerned.

The fifth factor is directly linked to the state-institutional initiatives to link programmes of study to today's industry-oriented professions since these career-oriented professions

increase the chances of students becoming employable. Examples of academic areas that are heavily associated with the labour market and are an avenue to increase students` demand to attend higher education courses are ICT, banking, finance, insurance, engineering and health-care. In six years, from academic year 2007/2008 to 2013/2014, an increase in student population of 39% was registered in social sciences, business and law; 50% in Science; 27% in Engineering, Manufacturing and Construction; 49% in Health and Welfare and 70% in other essential services.

Concluding remarks

The development of a competitive global economy shaped national higher education systems in a manner that most scholars refer to as ‘managed education’. This study is the first to investigate the domestic and global context influencing the trajectory of Malta’s higher education system. The study sheds light on the fact that higher education is not only being influenced by the globalising effects but also by the decisions being taken domestically either by the government or by the HEI institutions themselves. The link between contextual change, governance and management requires further analysis in a separate paper. The increasing students` clientele is a contributing factor to multiplying structures and increasing staff within HEIs. This scenario could directly influence the wide array of performance indicators that are determined within institutions. The more complex the context, the more laborious are the structures and as a result it becomes more challenging to achieve the institutional and national performance targets.

References

- Altbach, P. (2016) *Global Perspectives on Higher Education*, Johns Hopkins University Press.
- Altbach, P., Reisberg, L., & Rumbley L. (2009) *Trends in Global Higher Education: Tracking an Academic Revolution*, UNESCO.
- Beerkens-Soo, M., & Vossensteyn, H. (2009) *Higher Education: Issues and Trends from an International Perspective*, Centre for Higher Education Policy Studies.
- Eurostat (2017) *Learning Mobility Statistics – Statistics Explained*. Retrieved from: http://ec.europa.eu/eurostat/statistics-explained/index.php/Learning_mobility_statistics
- Guri-Rosenblit, S., Sebkova, H., & Teichler, U. (2007) *Massification and Diversity of Higher Education Systems: Interplay of Complex Dimensions*, Higher Education Policy, 20 (4), 373-389.
- Malta Parliament (2015) *Parliamentary Question 16556*. Retrieved from: <https://www.parlament.mt/en>.

- NCHFE & MEDE (2014) *Higher Education Strategy for Malta*, Malta's National Commission for Higher Education and Ministry for Education and Employment.
- NCHFE (2015) *Further and Higher Education Statistics 2013-2014*, Malta's National Commission for Higher Education.
- NCHFE (2016) *Further and Higher Education Statistics 2014-2015*, Malta's National Commission for Higher Education.
- Sursock, A. (2015) *Trends 2015: Learning and Teaching in European Universities*, European University Association.
- Times of Malta (2017) *MCAST: An Investment in Malta's Future* - Article written by Louis Galea – a former Education Minister. Retrieved from <http://www.timesofmalta.com/articles/view/20030405/opinion/mcast-an-investment-in-maltas-future.152858>.
- Times of Malta (2017) *Figures of foreign University students' fees shoot up*. Retrieved from <https://www.timesofmalta.com/articles/view/20170404/local/figure-of-foreign-university-students-fees-shoots-up.644414>.
- University of Malta, (2018, 11 January) *Facts and Figures*. Retrieved from <http://www.um.edu.mt/about/uom/facts>.
- Vincent-Lancrin, S. (2008) *The Reversal of Gender Inequalities in Higher Education: An On-going Trend, Higher Education to 2030*, OECD, 10 (1), 265-298.
- Wolter, A. (2016) *Massification and Diversity: Has the Expansion of Higher Education Led to a Changing Composition of the Student Body? European and German Experiences*, Humboldt-Universität zu Berlin, Germany.
- Zgaga, P., Teichler, U., Schuetze, H., & Wolter, A. (eds.) (2015) *Higher Education Reform: Looking Back – Looking Forward*, Higher Education Research and Policy (HERP), Peter Lang Edition.

An experimental tailor-made ESP course: experience of teaching English to students of Economics

Shirokikh, Anna Yurievna

Department of Foreign language Studies, Financial University under the Governemnet of the RF, Russia.

Abstract

The purpose of the study was to find out how enhanced learner autonomy techniques can influence students' professional communication skills, subject-specific knowledge, levels of motivation in studying the language and general satisfaction from the studies. The problem under investigation is if students should be allowed to choose the materials for language input and if the teacher will be able to work out an appropriate didactic approach in developing students' grammar accuracy, vocabulary range, speaking, listening and writing skills. The experimental course was designed for students of Economics. Students' responsibility, the use of online resouces and students' freedom in selection of teaching materials are viewed as key elements of the approach. The methodology of the course is worked out on the basis of close teacher-student interaction in and out of class. The results indicate that despite the fact that the course was time-consuming for both teachers and students, there are some positive results in respect of increased subject-specific knowledge and levels of motivation.

Keywords: *learner autonomy, didactics, choice of language input, guided and unguided activities, motivation, professionalization in language studies.*

1. Introduction

The present study was undertaken in response to criticism received from students who expressed disappointment about the contents of the English language course. They did not want to study traditional textbooks, e.g. *The Business* by John Allison et al., as they are not subject-specific enough. In general, most students voted for the use of mass media and Internet sources and wanted to learn more terminology of their field of knowledge. Such complaints are not new for ESP teachers who often state that traditional English textbooks are outdated and not close to reality, making it difficult to arouse students' enthusiasm for learning (Lou, 2017, p.121).

The aim of this article is to describe a teaching approach to constructing tailor-made, subject-specific courses and to evaluate their didactic benefits. The basis of the approach is learner autonomy concept, traditionally understood as 'the ability to take charge of one's own learning' (Holec, 1981, p. 3).

2. Literature Review

Learner autonomy has been in focus of teachers' attention for thirty years now. There is much theoretical research devoted to a healthy and realistic learning environment (Munzur, 2012, p.80); the new role of teacher as a facilitator or counsellor (Sharle&Szabo, 2000, p. 4); metacognitive knowledge with such dimensions as the learner, the learning task and the learning process (Crabbe et al., 2001, p.11); development of self-managerial skills and self-learning opportunities inside or outside the university (Sbaihi, 2015, p.102).

A facilitator of autonomous learning is the use of online technologies. Levy's study indicated that the use of online resources constitutes around 80% among students, which leads to new conceptions of teacher roles and materials development (Levy, 2014, p. 245). Immersion programs that add authenticity to the language studies can be created by the extensive use of ICT and multimedia (Muslem&Abbas, 2017, P.204).

Balsikani (2010, p. 95) believes that students must have freedom of choice of materials that they employ in the classroom despite the fact that there are considerable limitations on the extent to which autonomy can be productively promoted with learners (Borg, 2012, p.21). Another study reports that students' interaction with literature resources and learning independence, potential measures of selfmanagement increase with exposure to Internet-based assignments (Henri et al., 2018, P.508). Increased use of Internet leads to introduction of the notions of inverted teaching scenarios and flipped classroom. The concept of inversion is seen as a method to let the students study on their own and then take time to discuss their questions in class (Pfennig, 2017, p.74); to enable the development of skills that are conducive to professional success (Siegeris, 2017, P.357); to provide

interactive learning activities during lesson and individual teaching based on computer resources (Ayçiçek& Yelken, 2018, 386). All that indicates a shift to a learner-centered approach in teaching (Steinberger, 2017, p. 322).

3. Methodology

The idea that students are to be allowed to choose materials for language input on their own is not new. Thus, Siegeris (2017) proposes a LearnTeamPlenum method where the first stage is to get students investigate a certain topic on their own instead of giving them a prepared script. The novelty of the method suggested in this paper is that we believe it possible to give students freedom in selecting textual input not just for a lesson or two, but for more extended periods of time, e.g. a semester, and students prepare activities for group discussions and exercises on grammar and lexis on their own. Thus, the role of the teacher is just to supervise the process and issue guidelines on how to organize the activities (wordings, language input, types of assignments etc.)

The underlying methodology for designing a tailor-made subject-specific English language course includes eight stages. A more detailed view of the methodological approach is presented in the table below (Table 1). The evaluation of the teacher's role is based on Harmer's (2001, p.110) taxonomy, i.e. the roles of a controller, prompter, participant, resource or tutor.

Table 1.

	Activities	Teacher's role	Students' role
Step 1 (pre-stage) Choosing a theme and corresponding language input	After consulting colleagues, teaching professional disciplines, teacher initializes a theme for a series of lessons and recommends a number of Internet sites where relevant information could be found.	Tutor	Passive learners – recipients of information
Step 2 Working out a subject-specific problem for discussion and	Students' home assignment is to look through the sites and be prepared to brainstorm ideas about which issues are worth further investigation. Students are allowed to reformulate the theme and to add more Internet sites to the list of resources. Teacher distributes the tasks for the next	Tutor and Prompter	Active learners: Counsellors and process observers

distributing tasks	class, e.g. students may be asked to find an audio or text file and prepare comprehension questions on its contents, to make up a list of terms key to understanding the theme, a graph explaining a process etc.		
Step 3 Independent home assignments	Students complete their home assignments turning to teacher for help if necessary. They choose textual / audio / graphic resources and prepare comprehension and vocabulary assignments for in-class activities. Teacher provides extensive guidelines. Students share text / audio / graphic files with the rest of the group in online format – on Yandex disk. The other students read, listen, analyse the contents before the actual class.	Resource	Active learners: Personal activities and peer support (if asked to work as group) Individual / group out-of-class work
Step 4 Controlled practice	The lesson starts with controlled practice, i.e. a variety of comprehension and vocabulary assignments. Students come to class with prepared controlled practice activities based on textual (audio and visual) and graphic input: gap-filling, matching, dictations, quizzes, questionnaires, true/false questions, labelling a graph, chart or picture etc. It is possible that students prepare activities in digital format, e.g. on the platform “Quizzlet”. Teacher is to note any deficiencies in students’ performance, but does not give any feedback. The home assignment for the next class is to compile a glossary of thematic vocabulary. This glossary is kept as a Google table file accessible by all the students within the group and it represents a source of freer practice assignments worked out under the teacher’s supervision. The teacher’s role is also to suggest some theoretical aspects of lexis used, e.g. insights into semantics, etymology, degree of metaphorization,	Participant	Active learners: Case presenters Moderators Counsellors Process observers In-class / out-of-class group work

	contextual use of terms and peculiarities of translation. Teacher also issues instructions on the use of dictionaries and expands on properties of terms in respect of their concept-making functions.		
Step 5 Freer practice	The stage of freer practice is based on the glossary compiled by students as their home assignment. Activities can be quite different from “storytelling” (expand on the history of a term) to making up mind maps of the terms given, solving cases, comparing notions, listing, ranking, ordering, sequencing, classifying, describing pictures, maps or graphs. The role of the teacher here is just to explain what tasks may be applicable in the classroom context and check if the language is correct and appropriate to the theme.	Participant	Active learners: Case presenters Moderators Counsellors Process observers In-class group work
Step 6 Teacher’s feedback	Throughout the previous in-class activities teacher is to take notes about students’ verbal behaviour, i.e. the range of grammar structures and collocations, the style of message delivery, the depth of topic investigation etc. At this stage teacher is to offer students grammar and vocabulary exercises, suggest further oral assignments in the form of guided practice.	Controller	Passive learners: Receipients of information, guided practice In-class group work
Step 7 Students’ feedback	Students are usually asked to give some written or oral feedback on their own performance in content and method at the end of a series of lesson – to state which assignments they liked or disliked, found hard or easy, what information was missing and what roles they would like to perform in the next series of lessons. This feedback can take the form of a survey as well.	Tutor	Active learners: Self and peer evaluation In-class group work
Step 8 Preparing the product	The materials of all the assignments students do throughout the series of lessons (audio and text files, exercises, graphs, charts, PP	Tutor	Active learners Self and peer

of the series of lessons	presentations, glossary) are collected on Yandex disk, to which students and teacher have shared access. These materials are used further for revision before their end-of-the course test.		evaluation Out-of-class group work
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The cycle can be repeated several times throughout the course. Thus, students, who specialize in Business for the Energy Industry, studied ten themes during the school year, such as Sources of Energy, Industrial / Individual Energy consumption, Energy policies worldwide, Environmental protection and Eco-design, Marketing in the Energy Sector, Financial viability of Investment, Research and Product Development, The use of Blockchain technologies, Internet of Things for the Energy Industry. The framework of the syllabus was presented by the stages described above.

4. Results

The goal of this article is not only to present a didactic approach to constructing a tailor-made, subject-specific, “on-spot” course, but also to evaluate how helpful this approach may be in enhancing students’ hard and soft skills. At the end of the year, we carried out a survey in which 45 student respondents (three groups) were to assess the results of their studies by choosing “yes”, “no” and “I doubt” options in answer to the questions listed below. The first two questions refer to the development of hard skills, i.e. language skills and knowledge of their subject-specific domain, while questions 3-5 are about soft skills acquisition, i.e. more universal competencies, such as autonomy, time management and motivation:

1. Has the course helped you to develop professionally?
2. Has the course helped you to develop language fluency?
3. Can you say that you are more independent in your language studies now?
4. Is the course more difficult and time-consuming than your previous language studies?
5. Are you more motivated to learn the language now than before?

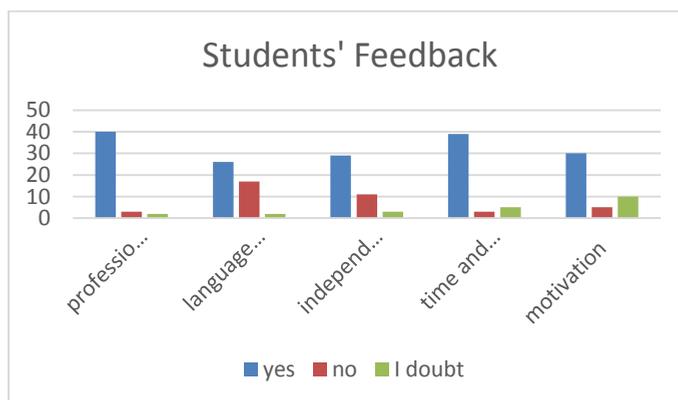


Figure 1.

The vertical axis in the bar chart represents the number of students and as the results show forty out of forty five students highly evaluated the impact of the course on their professional development. It means that the course allowed to expose students to more subject-specific language.

On the other hand, students did not quite achieve the expected level of language fluency (sisteen students said “no” in answer to the question if their knowledge of the language is enhanced). That may be explained by the fact that traditional textbooks are much more didactically viable than a course made “on spot”.

The independence aspect also was a bit disappointing, i.e. eleven students did not notice any positive trend in their learner’s autonomy. The reason is that students may find autonomous activities rather challenging as they have never been exposed to unguided assignments before. They have got used to rely on the teacher in his role of a supervisor.

Time and effort aspect resulted in increased preparation time. Thirty nine students from the target group complained that it took them too much time to prepare the assignments, to be in touch with their teacher and peer students on the regular basis. But in subsequent interviews they also stated that there was some sense of achievement in what they were doing.

Thirty students indicated that the course had had a profound impact on their motivation. In fact, most of them claimed that now they are able to learn the language on their own, as they have acquired the necessary skills for autonomous learning.

5. Conclusions

The rationale for the course was based on the assumption that learner autonomy and the use of internet sources instead of traditional textbooks may increase students’ professional

development, motivation in learning a language and general language skills. The change in contents and didactics in teaching ESP is undergoing major transformations with the increased use of digital technologies, learners' requirements of immediate results and the lag in time between publishing an ESP textbook and new trends in subject-specific areas. Thus, the content component of the course was provided by search for viable subject-specific topics, textual (audio and visual) verbal input and students' autonomous preparation of assignments for in-class and out-of-class activities. The teacher's role changed from class to class depending on the stage of the syllabus, i.e. from the role of a tutor to the role of a resource, a participant, a prompter or a controller.

The survey conducted at the end of the course suggests that more autonomy leads to enhanced motivation and professional development, but further research is needed in order to understand how tailor-made, "on spot" courses may compete with traditional textbook in respect of developing language fluency and communication skills. More experiments are needed to define the applicability of such courses for students of lower levels of language proficiency, different individual styles and different age groups.

References

- Ayçiçek, B., Yelken T.Y. (2018) The Effect of Flipped Classroom Model on Students' Classroom Engagement in Teaching English. *International Journal of Instruction*, 11, No.2, 385-398.
- Balzıkanlı, C. (2010). Learner Autonomy In Language Learning: Student Teachers' Beliefs. *Australian Journal of Teacher Education*, 35 (1), 90-103.
- Borg, S. (2012) *Learner Autonomy: English Language Teachers' Beliefs and Practices*. London, British Council.
- Crabbe, D., Hoffmann, A., Cotterall, S. (2001). Examining the Discourse of Learner Advisory Sessions in Learner Autonomy: New Insights. In L. Dam (ed.). *The AILA Review 15*. Huddersfield, West Yorkshire: The Charlesworth Group.
- Harmer J. (2001). *The Practice of English Language Teaching*. 3rd edition. Longman.
- Henri D. C., Morrell L. J., Scott G. W. (2018) Student perceptions of their autonomy at University. *High Education*, 75, 507–516.
- Holec, H. (1981). *Autonomy in Foreign Language Learning*. Oxford: Pergamon.
- Lou, M. (2017) Design of English Multimedia Teaching System Based on Diversification Theory. *International Journal of Emerging Technologies in Learning*, 12 (1), 119-129.
- Munzur, Z. (2012). Promoting Learner Autonomy through Portfolio. *Journal of Education and Future*, 2, 75 – 92.
- Muslem A., Abbas M. (2017) The Effectiveness of Immersive Multimedia Learning with Peer Support on English Speaking and Reading Aloud. *International Journal of Instruction*, 10 (1), 203-218.

- Pfennig, A. Flipping the Classroom and Turning the Grades – a Solution to Teach Unbeloved Phase Diagrams to Engineering Students. *Proceedings of the 3rd International Conference on Higher Education Advances, HEAd'17*. Universitat Politècnica de València, València, 73-81.
- Sbahi, M. (2015). Learner Autonomy for Learner Development (Reflections on the Moroccan University EFL Context). *International Journal of Technical Research and Applications*, 30, 101-104.
- Scharle, A., Szabo, A. (2000). *Learner Autonomy. A Guide to Developing Learner Responsibility*. Cambridge University Press.
- Steinberger, C. (2017) In Search of Reusable Educational Resources in the Web. *Proceedings of the 3rd International Conference on Higher Education Advances, HEAd'17*. Universitat Politècnica de València, València, 321-328.

Medical Physics in Expertia Program

Jiménez, F Javier ^{ab}; García, Eduardo ^a; Ponce, J Miguel ^c; Gascón, Marina ^c; Puertas, M Mar ^c; and Méndez, Agustina ^c

^aAtomic, Molecular and Nuclear Section, Theoretical Physics Department, University of Zaragoza, Spain, ^bMedical Physics and Radiation Protection Unit, University Hospital "Miguel Servet", Spain ^cRadiation Oncology Unit, University Hospital "Miguel Servet", Spain.

Abstract

Dosimetry and Radiation Protection, and Nuclear Physics and Technology are among the optional subjects in the degree in Physics of the University of Zaragoza. Both of them are taught by the Atomic, Molecular and Nuclear Area in the Faculty of Science. Since 2010, teaching staff on these subjects started to collaborate with a Medical Physics expert. The collaboration consisted of a seminar on Medical Physics and a guided tour to the clinical facilities. In these activities, the main tasks of a Medical Physicist and the way to access to the specialized training were explained. In 2015 University of Zaragoza launched the first call of the Expertia Program. This educational program adds professional experience to the academic programs. Since then, the teaching staff on Dosimetry and Radiation Protection, and Nuclear Physics and Technology have applied for the Educational Expertia (Expertia Docente) Program in all the editions and the collaboration has been enlarged to include several Radiation Oncologists' experiences in the activities.

Keywords: *Medical Physics; Expertia Program; Radiation Protection.*

1. Introduction

Medical Physics is a significant area of work for graduates in Physics. It can be broadly defined as a field in which applied physics techniques are used in medicine (Seuntjens, 2006). In particular, Medical Physics has traditionally dealt with ionizing radiation issues in the diagnosis and treatment of diseases. The Medical Physics expert is defined in the Medical Exposure Directive, 97/43/Euratom (European Commission, 1997) as an expert in his own right with a well-defined professional role. The European Commission established the European guidelines on Medical Physics expert (European Commission, 2014).

In Spain, students with a bachelor's degree in scientific or technical areas can access to certified specialized training programs passing an entry exam (MSC&MEC,1996). In this case, they join a three-year academic program of a certified healthcare center as resident physicist. After completion of this specialized training, they receive the corresponding certification for clinical Medical Physics practice.

An approach to Medical Physics is offered to students through training programs on Biophysics' or Bioengineering's degrees, as well as on Physics' degree. In particular, at the University of Zaragoza, students on the degree in Physics can enroll in the courses of *Dosimetry and Radiation Protection*, and *Nuclear Physics and Technology*, optional subjects that offer a first contact with Medical Physics. (for details about the subjects see their corresponding teaching guides on <https://estudios.unizar.es>) These two subjects are taught by the *Atomic, Molecular and Nuclear Area* of the Faculty of Science. They cover, among others, theoretical and phenomenological aspects of clinical dosimetry, clinical radiation sources, clinical radiation devices, or radiation protection in healthcare facilities. According to the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG, 2015), the teaching staff on these subjects encourage innovation in teaching methods. To do this, and in order to motivate students, they decided to include external experienced point of views. In this way, the theoretical and phenomenological aspects of the subjects could be complemented with external professional experiences which emphasize that Medical Physics is a physics field (in hospitals, industries, research laboratories, etc.) offering students a job opportunity and, in the long term, a specialization on which to develop their career.

As a result, in 2010, a Medical Physics expert started to collaborate with them in an informal way. The collaboration consisted of a seminar on Medical Physics and a visit to the corresponding clinical facilities of a hospital. In these activities, the main duties of a Medical Physicist and the way to access to the specialized training were explained. The fine reception given to these complementary activities encouraged to hold them every year.

In 2015 University of Zaragoza launched the first call of the Expertia Program (Unizar, 2017). This educational program adds professional experience to the academic programs.

The teaching staff of the University of Zaragoza can join to the Expertia Program through their Faculty or Center, and lay on institutional or business experiences to share with their students. It was an excellent opportunity to formally organize and consolidate the abovementioned external activities. Since this first call in 2015, the Medical Physics expert collaboration is framed in the Expertia Program. In this new more formal framework, several radiation oncologists' experiences have been added to the collaboration activities.

2. Material and methods

2.1. Main features of Expertia Program

The Expertia Program (see FEUZ 2017 for the last call) has been developed by Zaragoza Company University Foundation (*Fundación Empresa Universidad de Zaragoza*, FEUZ), aiming to strengthen cooperation between the field of university education and the business world.

The Expertia Program opens windows from the subjects corresponding to the studies of degree, university masters and doctorate to present the vision that the Society has in both, the academic disciplines and the entrepreneurial opportunities. The Expertia Program also promotes the adaptation of the university students' training to the current requirements of the labour and professional market. Another feature of Expertia Program is to foster entrepreneurial attitudes.

The Program is carried out by professionals from the field of the companies and institutions as well as by entrepreneurs who have started a business activity.

There are two Program modalities: *Expertia Docente* (Educational) and *Expertia Emprendedor* (Entrepreneurial). The teaching staff on *Dosimetry and Radiation Protection*, and *Nuclear Physics and Technology* chose the former modality. In *Expertia Docente*, external professionals (from companies or institutions) give lectures and present to university students real cases related to their professional experience and to the topics of their official curriculum. These activities match with the already existing collaboration between a Medical Physics expert and teaching staff of the *Atomic, Molecular and Nuclear Area* of the University of Zaragoza.

All the University of Zaragoza teaching staff giving classes in first or second cycle of the Physics degree, in masters or in doctoral studies, and interested on enhancing teaching with external experts' point of view can apply for a collaboration activity. The application can be submitted once a year to the corresponding Faculty or Center. Each Faculty/Center submits to FEUZ a global request including applications from all the degrees. The Evaluation Committee, composed of the Academic Vice Rector of the University of Zaragoza, the

Director of FEUZ, and all the Faculty Deans / Center Directors who have submitted a global application, reviews all the requests and approves those fulfilling the requirements for eligibility.

When the activities that have been approved by the Evaluation Committee are finished, the professor in charge of the activity sends to FEUZ a report about the completion of the proposed activities. Deadline for sending this report is a month since the activity has been carried out. With this report, FEUZ proceeds to send a certificate to the professionals who have participated on Expertia Program.

2.2. Expertia Program on Medical Physics

Teaching staff on *Dosimetry and Radiation Protection*, and on *Nuclear Physics and Technology* submitted requests to the three calls for proposals launched by the Expertia program up to now. The proposed activities included seminars conducted by two professionals from Servicio Aragonés de Salud (Salud), a Medical Physics expert and a Radiation Oncology expert, and a guided tour through the Medical Physics and Radiation Oncology facilities at University Hospital “*Miguel Servet*”. All the requests were approved by FEUZ and the different activities were carried out.

Seminar duration is approximately four hours, including discussion, and its contents are the following:

First, the Medical Physics expert presents his/her main duties in a hospital in absolute manner. These duties are grouped according to the hospital units where ionizing radiation is used, namely, Nuclear Medicine, X-ray Diagnosis, Radiation Oncology, and Hospital Radiation Protection. He/she gives details about the kind of radiation used, radiation sources or generators, measurement devices, and main purposes of radiation used on each area.

Next, the Radiation Oncology expert exposes the radiotherapy treatment steps from a clinical point of view. The sequence of steps is the following: Radiation Oncology Expert visit, localization images acquisition for planning the treatment (computed tomography, nuclear magnetic resonance, ecography, positron emission tomography, angiography,...), the medical treatment planning, the patient dosimetry evaluation from a clinical point of view, the treatment start-up, the treatment delivery and secondary effects of the treatment, and the dosimetric and clinical reviews after treatment. The Medical Physics expert also participates in the presentation explaining the physical aspects on the steps in which he/she participates: localization images acquisition for planning the treatment, the treatment planning, the patient dosimetry evaluation, the treatment start-up, the treatment delivery, and the dosimetric reviews after treatment. This second part of the seminar highlights the

interdisciplinarity on all over the process and the great synergy among all professionals who get involved in the radiotherapy process.

After that, the Medical Physics expert talks about the access to the specialized training on Medical Physics in Spain: procedure, official publication of the call, the exam and its contents, the number of posts offered each year and its historical evolution, etc. In addition, he provides relevant links to web pages of the Ministry of Education (Ministerio de Educación, Cultura y Deporte), the Spanish Society of Medical Physics (Sociedad Española de Física Médica), the Nuclear Safety Council (Consejo de Seguridad Nuclear), where students can widen this information.

The seminar closes with a forum to discuss with students the different issues raised and to solve their questions.

The second part of the collaboration, a guided tour in hospital facilities of approximately 3 hours, is conditioned upon clinical availability. When possible, the facilities visited have been: the Medical Physics and Radiation Protection Unit, and the Radiation Oncology Unit. In order to follow the Protection of Personal Data all the participants in the guided tour must previously sign a Confidentiality Protocol.

In the Medical Physics and Radiation Protection Unit the treatment planning systems for radiotherapy treatments are showed, as well as radiation measurement devices and phantoms used in quality controls in Nuclear Medicine, X-ray Diagnostic or Radiation Oncology. The Medical Physics expert discusses with students a real treatment planning, and its main aspects like the kind of radiation, energy, dose prescription and dose limits.

In the Radiation Oncology Unit, students follow the sequential treatment steps. They start in the consulting room where the first Radiation Oncology expert visit takes place. The next point is an imaging device, the computed tomography room, where the laser localization system, immobilization devices and patient positioning are explained. After that, they go to a treatment room where they can see a clinical linear accelerator. The Medical Physics expert details its main features and the radiation protection systems, and carries out a daily test for quality control of the accelerator.

These activities, whose objectives are motivate, stimulate and provide information to students about the Medical Physics field, are offered to them as voluntary and its contents are not included in the assessment of the corresponding subjects.

3. Results

In the first edition of Expertia Program (course 2015-16), 23 students of *Nuclear Physics and Technology* and 14 of *Dosimetry and Radiation Protection* participated. This

corresponds to 85% and 93% of the enrolled students, respectively. In this edition both, the four-hour seminar and the three-hour guided tour were carried out.

In the second edition (course 2016-17), 16 students of *Nuclear Physics and Technology* and 11 of *Dosimetry and Radiation Protection* joined to the Expertia Program. This means a similar percentage of students: 84% and 92%, respectively. In this edition, only the four-hour seminar could be carried out.

For the current edition (course 2017-18) the seminar has been carried out with 11 students of *Nuclear Physics and Technology* and 5 of *Dosimetry and Radiation Protection* which means percentages of 92% and 50%, respectively. At the time of writing this paper, a guided visit to the University Hospital “Miguel Servet” has been carried out for a reduced number of students. In the previous editions some students had expressed their satisfaction with the activities of the program to the teachers. In this edition, an anonymous survey has been designed to gather the students’ opinion, and perform a qualitative analyse at the end of the academic course.

The percentage participation during these years has been very high (see Figure 1) except for the students of *Dosimetry and Radiation Protection* this year (only 50%). In any, this decrease in the percentage attendance of students is not very significant due to the low number of students enrolled this year in the subject (only 10 students). The overall participation showed in Figure 1 with solid pattern bars, is above 70% every year.

In the forum that follows the talks of the seminar, we have observed that most of the students are not aware of the possibility of working in hospitals as physicists. They are very surprised with the variety of duties and responsibilities of a Medical Physics expert and with his/her continuous and so close collaboration with oncologists, surgeons, technicians and other hospital staff. Among the questions most frequently addressed during the forum discussion are those regarding the access to the profession (topics covered by the civil service examination, the most difficult aspects, how to prepare the examination, etc.), and about the workday and future career of a Medical Physics expert. They are also very interested in job opportunities in the day-by-day relationship with patients, and in the possibility to develop in parallel a research career. At this point, it is important to mention that this activity out of classes intends to attract students not only to the profession of Medical Physics expert, but also to the Medical Physics field in general (research, industries, radiological protection private companies, etc.).

As a result of the activity, several students have asked to UNIVERSA (an Orientation and Employment Service of the University of Zaragoza) for internship at University Hospital “Miguel Servet”. Until now, seven students have successfully completed an internship in the Medical Physics and Radiation Protection Unit. This internship is non-remunerated, and consists on a stay in the Radiation Protection Unit at University Hospital “Miguel Servet”.

The internship length depends on the Unit availability. Currently this length uses to be 100 hours, but sometimes it has been extended to 240 hours. Within the agreed time period the student goes with the Medical Physics experts while they are working, and he/she can be asked to do some task, but always under a Medical Physic expert's supervision. The student has a tutor from Faculty of Science who endorses the internship application, and another tutor from the Medical Physics and Radiation Protection Unit who schedules the student activities taking into account the unit calendar. The student spends about half his/her time on external radiotherapy issues, 30% on brachytherapy, 7% on nuclear medicine, 7 % on X-ray diagnostic, and 6% on radiation protection. The student is invited to give a presentation about his/her internship to the unit staff. Finally, the tutor of the hospital unit has to fill out a UNIVERSA form to evaluate the student attitude during the internship. Students can also request the recognition of academic credits (up to 5 ECTS in the case of the degree in Physics) for the internship. To do so, they have to provide a detailed report of the activity and the academic tutor has to fulfil a rating form.

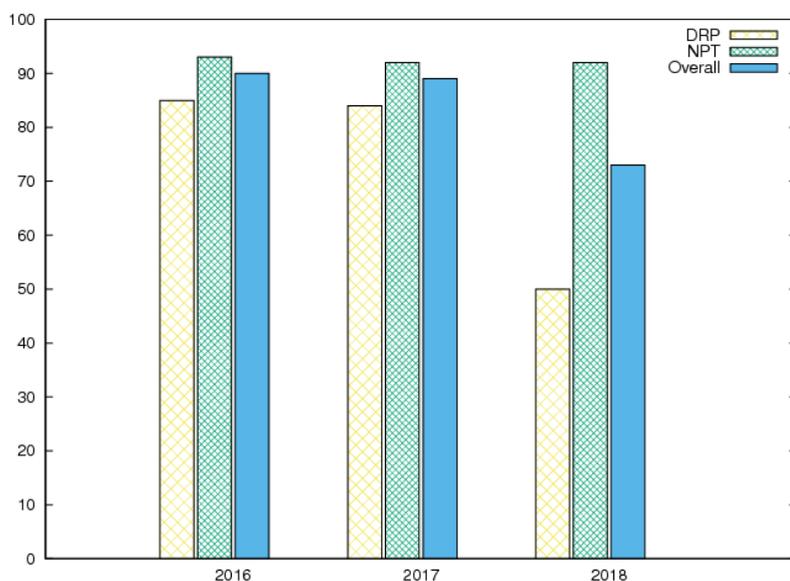


Figure 1. Percentage participation to the Expertia Program, by subject (DRP: Dosimetry and Radiation Protection; NPT: Nuclear Physics and Technology; Overall) and year.

4. Conclusions

The Educational Expertia Program (*Expertia Docente*) has served to consolidate and give a formal framework to the collaboration started in 2010 among a Medical Physics expert of

the University Hospital “*Miguel Servet*” and teaching staff of the *Atomic, Molecular and Nuclear Area* of the Faculty of Science of the University of Zaragoza.

The activities include the description of the access, training and duties of a Medical Physics expert, the full process of radiotherapy, and the different devices for radiation measurement, medical imaging and treatment. The program intends to increase the interest on Medical Physics among students of the degree in Physics, and to show Medical Physics field as a career opportunity.

Students satisfaction with Expertia Program in the three editions carried out has been very high, with an average on overall participation of approximately 80% of students. The activities met the students expectations. Moreover, up to now seven students have carried out an internship in the Medical Physics and Radiation Protection Unit of the University Hospital “*Miguel Servet*”. In the next years it is foreseen the continuation of the programme and a similar participation is expected.

Acknowledgements

The authors would like express many thanks to *Fundación Empresa Universidad de Zaragoza* (FEUZ) for its confidence in our project. The authors also wish to express gratitude to University Hospital “*Miguel Servet*” for making easier the guided tour through its facilities. This work is dedicated to Professor J.A. Villar of the University of Zaragoza, the initiator of this collaboration, who passed away in August, 2017.

References

- European Commission. (1997). Council Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposures. Official Journal of the European Communities
- European Commission. (2014) Radiation Protection No 174. European Guidelines on Medical Physics Expert
- Fundación Empresa Universidad de Zaragoza, (FEUZ, 2017). *FEUZ-Expertia Program*. Retrieved from <http://www.feuz.es/en/services/training/expert-partner-network/expertia-program>
- Ministerio de Sanidad y Consumo and Ministerio de Educación y Ciencia, (1996). Guía de Formación de Especialistas. Separata: Radiofísica Hospitalaria
- Seuntjens, J. (2006). Medical physics in *Current Oncology*. *Current Oncology*, 13(2), 46.
- Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). (2015). Brussels, Belgium
- University of Zaragoza (Unizar, 2017). 3rd EXPERTIA Program Call. Retrieved from <https://www.unizar.es/institucion/vicerrectorado-de-profesorado/3a-convocatoria-programa-expertia>

Why recognising and rewarding excellent teaching in universities matters for students

Chalmers, Denise

Office of the Deputy Vice-Chancellor Education, University of Western Australia, Australia

Abstract

There is greater focus on the quality of higher education teaching and how we reward and recognize excellent teaching. There are questions from governments about the quality of teaching and a desire to identify excellence. In Australia and beyond, higher education institutions have been working towards clarifying their criteria and expectations of what constitutes excellent teaching. They are reviewing their policies and practices to enable their excellent teachers to access development and support so they might be rewarded through promotion. An increasing number of universities and higher education institutions are now promoting their excellent teachers through to professor level. This is important not just for the academics and teachers themselves, but for the quality of education that students receive.

Keywords: *Recognising and rewarding teaching excellence, higher education*

Introduction

Despite decades of arguing for the importance of recognising and rewarding excellent teaching in order to provide a quality learning experience for students, higher education institutions have made little headway towards achieving this. It should therefore not be surprising that governments and major stakeholders in the sector continue to express concern about the quality of teaching in higher education institutions and the quality of the student learning experience.

Decades of neglect

The lack of appropriate mechanisms that reward and recognition excellent teaching has been recognised for decades, yet little has changed over this time. Illustrative examples demonstrate this failure in the USA, UK, Europe and Australia.

In the United States, Boyer in his seminal paper ‘Scholarship Reconsidered’ (1990) argued that universities should recognize the richness of academic work and reward contributions in what he proposed were four different forms of scholarship - teaching, integration, application of knowledge and discovery. He also argued that academic reward systems should stress the forms of scholarship most closely aligned with the university mission. How disappointing then that in 2017, the Commission on the Future of Undergraduate Education asserts that “...good teaching is generally undervalued. Faculty are rarely trained, selected and assessed as teachers and their effectiveness as instructors is rarely recognised or rewarded” (2017, p 13). The Commission argues for a national priority to strengthen the student educational experience through addressing the “widespread inattention to teaching quality” (p22), including the reward and recognition of both tenure-track and fixed terms teachers in higher education and includes providing stable professional working environments and careers.

In the United Kingdom, the influential Dearing Report (1997) stated that teaching was of low status in relation to research, promotion was awarded for disciplinary research performance, that little or no funding was available for research and development projects in learning and teaching and that there was no national policy on the quality of teaching (DfES, 2003; Gosling, 2004). Despite years of government and quality initiatives to enhance the status and quality of teaching (Chalmers, 2011), and changes evident in promotion to reward teaching excellence in UK higher education institutions, significant barriers were found to remain (Cashmore, Cane & Cane, 2013). Research carried out in UK universities from 2008-2013 by Cashmore, Ramsden and colleagues documented the progress made on rewarding and recognising teaching, including the development of teaching criteria and ways in which they are measured and presented. They found that while there had been progress with more universities developing teaching criteria and evidence across the sector overall, there remained substantial variation in different types of

universities and within the disciplinary communities. Of greatest concern was that limited progress had been made on embedding the teaching criteria and establishing standards within the institutional systems and policies, and the persistent scepticism among academic teachers worldwide that their teaching contributions would be recognised and rewarded with career progression. (Cashmore et al, 2013; Locke, 2014). Subsequently, the UK government white paper ‘Success as a Knowledge Economy’ (Crown, 2016) noted that “For too long, teaching has been the poor cousin of research. Skewed incentives have led to a progressive decline in the relative status of teaching as an activity” (2016 para 23, p. 12). This has contributed to the governments’ decision to introduce the Teaching Excellence Framework (TEF).

In Europe, the European Commission (EC) report (2013) stated that while quality teaching should be a priority in the higher education institutions, their research indicated that a “real commitment to quality teaching was not universal, sporadic at best and frequently reliant on the enlightened commitment of a few individuals” (EC, 2013, p.14). The report noted that there were outstanding individual examples of practical support for up-skilling teachers and recognition and reward of effective teaching, but that these were rarely sustained over time. The EC group for the modernisation of higher education has prioritised quality teaching and learning noting that improvements to the quality of teaching and learning in higher education can bring about a ‘sea change’ for Europe’s future. The EC endorsed a set of Guiding Principles for Quality Teaching (2013, p 15) identifying both institutional and individual responsibilities to ensure high quality of teaching through setting standards, and developing, recognising and rewarding those who demonstrate those standards.

In Australia, the national government instituted a number of teaching quality initiatives, primarily targeted at the institutional level. For example, from the mid 1990s, the government established national student surveys, reporting of student progression and institutional quality audits with a strong focus on teaching quality and processes. The Learning and Teaching Performance Fund (LTPF) scheme, established in 2003, was a controversial initiative designed to differentially reward the higher education providers that best demonstrated excellence in learning and teaching based on a limited number of quantitative and qualitative indicators. The rationale for the fund was to promote teaching quality within the sector and to place excellence in learning and teaching alongside research excellence.

The Australian Learning and Teaching Council (ALTC) was established in 2004 to provide a national focus to enhance learning and teaching in Australian higher education institutions. The ALTC was preceded by a number of limited-term committees to promote and support teaching and learning in higher education, with the first established in 1990. These provided funding for competitive grants and projects, for example, funding for professional development, using technology to enhance teaching and learning, student

learning, research and discipline-based projects (Chalmers, 2007). The focus for these initiatives were individuals and teams within and across universities to provide them with access to competitive funding to parallel research funding models, encourage academics to engage in teaching and learning issues in scholarly ways and to enhance the overall quality of teaching and learning in universities.

Another initiative was the Australian Awards for University Teaching, established in 1997 to celebrate and reward excellence in university teaching. The national teaching awards were expanded over the years to include teams, disciplines and institutional programs. While these initiatives were well-received, and led to many changes in teaching and support for students, there remained limited changes in the policies and practices of institutional reward and recognition of teaching, particularly in the career progression and promotion of excellent teachers.

The teaching quality initiatives in Australia and the UK were designed in large part to address the perceived lack of change by institutions to recognize and reward teaching and to enhance the status of teaching relative to research. By establishing incentives, the governments wished to prompt universities to pay attention to the quality of their teaching and learning and to implement reward and recognition processes and practices that were comparable or equivalent to those in research. Yet as Probert (2013) noted, the inclination to separate out academic roles as ‘teaching-focused’ or ‘teaching-intensive’ (as distinct to teaching-research academic roles or in US terms, tenure track academics) as a way to build an alternative career path has, to date, done little to raise the status or recognition of excellent teaching. Blackmore’s (2016) work on the prestige assigned to academic work contributes insight into the ways in which academic work is valued through the lens of a prestige economy and why teaching persistently retains its lower status in comparison to research in the eyes of both institutions and individuals.

These illustrative examples from the USA, UK, Europe and Australia all lead to the same conclusion: excellent teaching remains undervalued and poorly recognised and rewarded. More concerning is that institutions have failed to link the quality of teaching and the quality of student learning and engagement, despite the strong evidence that persistently and consistently demonstrates the relationship (Commission on the future of undergraduate education, 2017; EC, 2013)

Australian University Teaching Criteria and Standards (AUTCAS)

The Australian University Teaching Criteria and Standards (AUTCAS) Framework (Chalmers et al, 2014; 2015) was developed an exemplar framework for institutions to use to develop their own teaching criteria and standards, setting expectations for each level of appointment and indicators to guide the collection of evidence used to substantiate claims for performance and promotion (Chalmers & Hunt, 2016). The impetus for the

development of the AUTCAS framework was in response to changes in the higher education sector in the last decade that were occurring globally. Many Australian universities were increasingly recognising that quality teaching was a key feature in attracting and retaining students, and therefore enhancing standards of excellence in learning and teaching was critical to securing a competitive edge.

The AUTCAS project was designed as a national strategy for creating a teaching excellence framework that drew on good practice principles and evidence-based measures of teaching performance, selected on the basis that they contributed directly to student learning and engagement (Chalmers et al., 2014). The AUTCAS framework was devised to be flexibly utilised and contextualised by institutions as a multi-dimensional resource to inform their recruitment, probation, promotions, professional development and policy development related to quality teaching. The AUTCAS was also designed to provide individual academics with clarity on expected levels of teaching performance for the purpose of career planning. The background and strategy for the AUTCAS project is described in “A national strategy for teaching excellence – one university at a time” (Chalmers & Tucker, 2018). This work then led into a National Senior Teaching Fellowship program to extend the use and application of the AUTCAS framework across the Australian higher education sector and internationally.

The scope of the Fellowship program was extensive (Chalmers, 2018). It built on the AUTCAS work which initially had engaged 21 universities and professional teaching associations. It engaged with the higher education sector organisations such as Universities Australia and the Tertiary Education Quality and Standards Agency (TEQSA) and international organisations such as the Higher Education Academy and Ako Aotearoa.

In terms of number of institutions that have engaged in the Fellowship activities with their representatives in senior leadership roles (Hunt & Chalmers, 2017), it is estimated that 60 Australian higher education institutions were involved, including the majority of the 40 universities. Internationally, more than 230 international institutions were involved through direct communication and/or participation in presentations and workshops through the Fellowship program 2015-2017. The outcomes of the Fellowship have contributed to the Australia tertiary sector’s engagement in an evidence and standards-based approach to rewarding and recognising teaching and informed international initiatives.

This extensive engagement with the higher education sector across Australia and internationally has contributed to the conversation of what constitutes excellence in teaching and how it can be recognized and rewarded within institutions (Broughan, Steventon & Cloude, 2018). More broadly, it has contributed to a growing consensus on expectations of teaching standards and practices relevant for different academic levels of appointment. These are positive outcomes that offer the potential to significantly benefit not

only teachers, but more importantly, their students. The critical point is that any teaching excellence criteria and expectations MUST be focused on criteria that have been substantiated by research to promote student learning and engagement.

References

- Blackmore, P. (2016). *Prestige in academic life: Excellence and exclusion*. Oxon, UK. Routledge.
- Boyer, E (1990). *Scholarship reconsidered: Priorities of the professoriate*. Carnegie Foundation for the Advancement of Teaching.
- Broughan, C., Steventon, G., & Clouder, L (Eds) (2018). *Global Perspectives on Teaching Excellence: A new era for higher education*. London: Taylor and Francis Books.
- Cashmore A., & Ramsden, P. (2009) [Reward and recognition in higher education: Institutional policies and their implementation](#). York, HEA
- Cashmore, A., Cane, C. & Cane, R. (2013). [Rebalancing promotion in the HE sector: is teaching excellence being rewarded?](#) York, HEA.
- Chalmers D, Cummings, R., Stoney, S, Tucker, B, Elliott, S, Wicking, R & Jorre de St Jorre, T. (2014) *Australian University Teaching Criteria and Standards Project: [Final report](#)*. Canberra, OLT.
- Chalmers D, Cummings, R., Stoney, S, Tucker, B, Elliott, S, Wicking, R & Jorre de St Jorre, T. (2015) *Australian University Teaching Criteria and Standards Project: [Extension report](#)* Canberra, OLT.
- Chalmers D., & Hunt, L. (2016). Evaluating teaching. *HERDSA Review of Higher Education*, vol 3, p 25-55. <http://herdsa.org.au/herdsa-review-higher-education-vol-3/25-55>
- Chalmers, D. (2007). *A review of Australian and international quality systems and indicators of learning and teaching.V1.2. [Report](#)* Canberra ALTC
- Chalmers, D. (2011). Progress and challenges to the recognition and reward of the scholarship of teaching in higher education. Special issue: Institutional approaches to SoTL, *Higher Education Research and Development Journal*. 30(1), 25–38
- Chalmers, D. (2017). *Inhibiting creativity of supporting quality? A teaching standards framework*. HERDSA News 39(1) Summer (pp. 3-4).
- Chalmers, D. (2018). *Recognising and rewarding teaching: Australian teaching standards and expert peer review. Fellowship program*. <http://recognisinguniteaching.edu.au/>
- Chalmers, D., & Tucker, B (2018). A national strategy for teaching excellence – one university at a time (Chapter 7) In Broughan, C., Steventon, G., & Clouder, L (Eds)

- Global Perspectives on Teaching Excellence: A new era for Higher Education*. London: Taylor and Francis Books.
- Commission on the future of undergraduate education (2017). *The future of undergraduate education: the future of America*. American Academy of Arts and Sciences. Cambridge, Massachusetts. <https://www.amacad.org>
- Crown (2016). *Success as a Knowledge economy: teaching excellence, social mobility and student choice*. White paper presented to Parliament, UK. May https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/523396/bis-16-265-success-as-a-knowledge-economy.pdf
- Dearing Report (1997) formally known as the reports of the National Committee of Inquiry into Higher Education. London UK. Department of Education and Skills.
- DFES. (2003). *The future of higher education*. London: Department for Education and Skills.
- European Union (2013). *Report to the European Commission on improving the quality of teaching and learning in Europe's higher education institutions*. [High Level Group on the Modernisation of Higher Education](#). Luxembourg: Publications Office of the European Union. June.
- Gosling, D. (2004). The impact of a national policy to enhance teaching quality and the status, England, the United Kingdom. *Quality Assurance in Education*. 12(3), 136-149.
- Hunt, L., & Chalmers, D. (2017). Change leadership, management and strategies to promote quality university teaching and learning. In S. Mukerji, & P. Tripathi (Eds.) *Handbook of Research on Administration, Policy, and Leadership in Higher Education* (pp. 377-403). Hershey.
- Locke, W. (2014) [Shifting academic careers: Implications for enhancing professionalism in teaching and supporting learning](#). York, HEA.
- Probert, B. (2013) [Teaching-focused academic appointments in Australian universities: recognition, specialisation, or stratification](#). Office of Learning and Teaching (OLT)

Transnational student consultancy – an integrated approach to business students' learning

Lehmann, Tine^a; Saulich, Christina^a and Wohlgemuth, Veit^a

^aBusiness School (FB3), HTW Berlin University of Applied Sciences, Germany

Abstract

Higher Education Institutions (HEI) are under pressure to enhance graduate employability. The concept of graduate employability refers to a mix of specific skills, knowledge, and personal attributes; among others internationalisation, innovation, and entrepreneurship skills. This paper asks the question: How can HEI enhance students' internationalisation, innovation, and entrepreneurship skills in order to foster graduate employability? The authors provide insights into a transnational student consultancy teaching approach that was implemented simultaneously at five European HEI in the winter term of 2017/2018. The paper adds to the practical dimension of internationalisation, entrepreneurship education, and innovation pedagogy by presenting an example of how these interrelated concepts can be integrated into a course for business students. The authors discuss important challenges of implementing transnational consultancy projects at HEI, such as varying academic calendars and administrative requirements, matching student teams and small and medium-sized enterprises (SMEs), as well as managing expectations. Based on participant feedback, this paper draws three lessons learned for lecturers that are involved in transnational teaching projects.

Keywords: *internationalisation, student consultancy, entrepreneurship education, innovation pedagogy, employability.*

1. Introduction

In the face of increased international business dependencies and shortening half-life of knowledge, Higher Education Institutions (HEI) are under pressure to “*produce highly mobile graduates able to respond to the ever-changing needs of the contemporary workplace*” (Andrews & Higson, 2008, p. 411). This has sparked a debate on a growing gap between the skills and capabilities of graduates and labour market requirements that is closely linked to the concept of graduate employability (Kinash, Crane, Judd, & Knight, 2016). Employability refers to the “*capacity to obtain and/or create work*” (Kinash & Crane, 2015, p. 150) and encompasses a mix of specific skills, knowledge, and personal attributes. HEI and graduates alike are often unsure of the necessary skills that contribute to graduate employability (Lödermann & Scharrer, 2010). In particular, internationalisation, innovation, and entrepreneurship skills are considered as key factors in enhancing employability (Saulich & Lehmann, 2017). However, specific teaching approaches related to the three concepts often remain vague. This paper asks the question: How can HEI enhance students' internationalisation, innovation, and entrepreneurship skills in order to foster graduate employability? The authors provide insights into a transnational student consultancy teaching approach that was implemented with business students at five European HEI in the winter term of 2017/2018. The paper seeks to add to the practical dimension of internationalisation, entrepreneurship education, and innovation pedagogy by presenting an example of how these interrelated concepts can be integrated into a course for business students.

The remainder of the paper is structured as follows: Section 2 reflects on the theoretical foundations of the student consultancy teaching approach. Section 3 delivers a detailed description of the approach and section 4 discusses the challenges that HEI faced while implementing the teaching approach. Section 5 concludes and draws three lessons learned.

2. Theoretical Foundation

The educational concepts of internationalisation, entrepreneurship education, and innovation pedagogy seek to increase the employability of students and staff at HEI while focusing on different sets of skills and methods. Internationalisation skills incorporate intercultural skills as well as the ability to interact in global settings (Altbach & Knight, 2007). Entrepreneurship skills comprise task oriented skills related to business development and management as well as behaviour oriented skills which are linked to specific personal traits (Henry, Hill, & Leitch, 2005a, 2005b; Neck & Greene, 2011). Lastly, innovation skills refer to a number of individual, inter-personal, and networking skills which are needed in innovation creating processes (Kettunen, J., Kairisto-Mertanen, L., Penttilä, T., 2013). Saulich and Lehmann (2017) argue that the three concepts require broadening

traditional content-focused curricula and making use of teaching methods that foster deep learning (Bennet & Bennet, 2008), best acquired through active methods and learning in real work situations. Table 1 summarises the sets of skills and related teaching approaches proposed by research on internationalisation, entrepreneurship education, and innovation pedagogy. The transnational student consultancy teaching approach presented in section 3 seeks to incorporate all three sets of skills.

Table 1. Relevant Sets of Skills for Internationalisation, Entrepreneurship, and Innovation

	Internationalisation	Entrepreneurship	Innovation
Set of skills	<ul style="list-style-type: none"> • Intercultural skills • Foreign language skills • Global awareness • Ability to interact in global settings 	<ul style="list-style-type: none"> • Task-oriented skills: small business development and management • Behaviour-oriented skills: personal traits 	<ul style="list-style-type: none"> • Set of individual, inter-personal and networking skills needed in innovation creating processes
Tools/ Methods	<ul style="list-style-type: none"> • Intercultural trainings • Distance learning • Student/staff mobilities • Credit/degree mobility • International networks • Off-shore campuses 	<ul style="list-style-type: none"> • Entrepreneurship as a method • Active: learning by doing • Practicing skills in real life/work situations 	<ul style="list-style-type: none"> • Creating intra-HEI & regional networks • Applied research • Group interactions • Entrepreneurial and international activities

Source: Saulich and Lehmann (2017, p. 903)

3. Transnational Student Consultancy

The transnational student consultancy approach is part of the international project “INTENSE – INTernational Entrepreneurship Skills Europe”, supported as a strategic partnership under Erasmus+. The project is implemented by five partner universities from five European countries (Belgium, Croatia, Finland, Germany, the Netherlands) and runs for a period of three years. The overall aim of INTENSE is to promote the internationalisation of small and medium-sized enterprises (SMEs) and HEI in Europe by 2019 and to enhance the employability of students and HEI staff. The project outputs include a transnational teaching module on the internationalisation of SMEs. The module focuses on different internationalisation strategies of SMEs (see Saulich, Wohlgemuth, & Lehmann, 2017 for a literature review) and on challenges that SMEs face while internationalising. As part of this teaching module, students participate in a transnational student consultancy project.

3.1. Student Consultancy Component

The teaching module is held parallel at the five universities which are partners of the INTENSE project. In each country, students provide advice to two SMEs with the aim to promote the SME’s internationalisation. Universities established contact with SMEs

beforehand with the help of local mediators, e.g. the chamber of commerce. The consultancy project is designed for students who are in the midst or end of their bachelor studies and have completed (or are currently taking) classes on project management and international management (which are other components of the teaching module of the INTENSE project). Students work together in teams of five to seven students, each collaborating with one SME.

The consultancy project was supplemented by a course that follows a blended learning approach; meaning that some lectures took place as regular lectures in the class room while others were e-learning and individual counselling sessions. The course started off with task related knowledge, provided mainly in regular lectures. It focused on research skills, project management skills, e.g. defining team roles or developing a work breakdown structure, and international management components. This was combined with behavioural skills such as teamwork, consultancy skills, and business etiquette that were taught in interactive classroom sessions and workshops by external experts.

In order to prepare the consultancy project, lecturers had initial meetings with the companies to discuss the implementation and the specific topic of the consultancy project. The actual consultancy project started with a kick-off workshop with companies and student teams organised by the lecturer at the beginning of the academic term. During the kick-off workshop, students interviewed the companies based on interview outlines which they had prepared beforehand and agreed on specific tasks. Afterwards, students were responsible to coordinate the cooperation with the company by themselves. Four to six weeks after the kick-off workshop, students presented their preliminary findings to the company. The mid-term presentation served to clarify questions, gather additional company information, and to further specify the tasks of the students. At the end of the academic term, students presented their findings to the companies at an intermediary institution, e.g. the chamber of commerce, and handed over their final consulting report. The final presentation served as a multiplier event to attract companies for further consultancy projects.

The student consultancy project enhances students’ entrepreneurship skills by training task-related and behaviour-oriented knowledge through active teaching methods. It also transmits innovation skills by encouraging students to create networks with SMEs and intermediary institutions.

3.2. Transnational Component

As mentioned above, the student consultancy projects were implemented simultaneously in five countries. In order to enhance the students’ internationalisation skills, student teams cooperated transnationally as demonstrated in the example in Figure 1.

Team A in Germany collaborated with SME A also based in Germany. SME A wanted to internationalise to the Netherlands. Team A was supported by team B, based at a HEI in the Netherlands. Team B provided team A with relevant knowledge on the Dutch market. At the same time, team A provided specific information on the German market to team C. Team C is based in Finland and collaborated with the Finish SME C who seeks to internationalise to Germany.

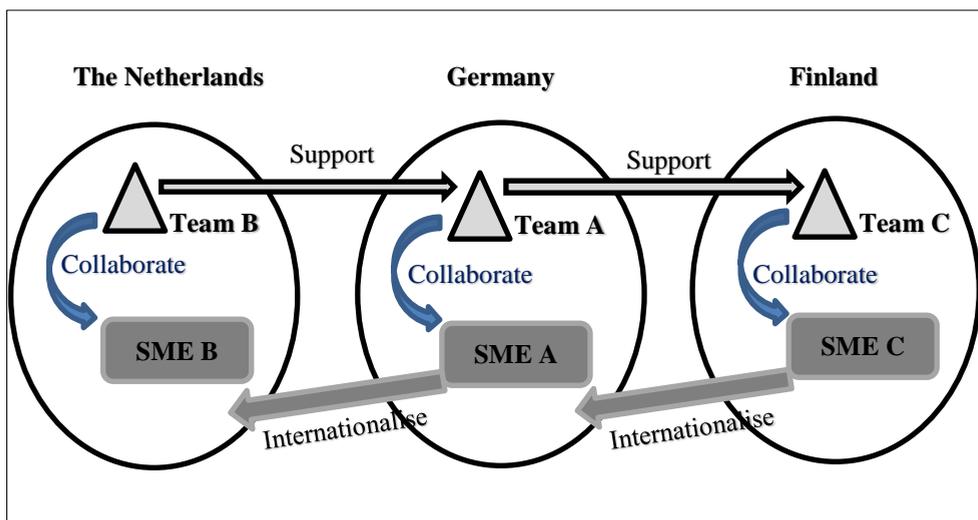


Figure 1. Transnational Student Consultancy

This system of providing support to another team and receiving support by another team ensured that students acquired market-related knowledge in two European countries – the country in which they are based and the country to which the SME they are collaborating with seeks to expand. Moreover, students gained insights into two different companies and products: first, the company they are collaborating with; and second, the company of the foreign team they are providing support to. Furthermore, each team has to cooperate with two other teams with different cultural backgrounds. This enhances the teams' networking and teamwork skills by fostering inter- and intra-group cooperation. The transnational consultancy project supports intercultural learning among students, helps them to establish international networks, and increases their language skills. Inter-team collaboration partly took place at a one-week student meeting that offered students the opportunity to jointly work on their projects and to participate in workshops on entrepreneurship and an intercultural training. Students also collaborated virtually and thereby trained their distance learning and virtual team skills. In sum, the consultancy project increases the students'

ability to interact in international settings and enhances their understanding of international business.

4. Challenges of Implementing Transnational Consultancy Projects

The following section discusses some of the challenges we faced and draws lessons learned. Each issue will be addressed rather shortly, as we focus on completeness instead of detail.

4.1. Differing Administrative Processes and Academic Schedules between Countries

Even though we were aware that this would be an issue before starting the project, we were surprised how much the academic calendars at the partner universities varied. For instance, exam periods and breaks between terms overlapped in such a way that the international student meeting could only be implemented in one week of the term. Also, cooperation between student teams was difficult as some students started their consultancy projects in early September while others started in November. Hence, when students of the five partner countries met, the progress of their projects was at very different levels.

Integrating the INTENSE teaching module into the curricula at all HEI also turned out to be a challenge. At some HEI all components of the module (International Management, Project Management, Transnational Student Consultancy) were taught in one term or within one extracurricular module. Others spread them over various modules and academic terms. What is more, the assessment requirements, number of ECTS points, and time period for the consultancy project varied as it had to be adapted to the regulations of the respective HEI.

4.2. Matchmaking of Student Teams and SMEs

We tried to find SMEs that wanted to internationalise to one of the participating countries to ensure a circle of support between the student teams (s. Figure 1). Finding SMEs that met this criterion took some effort. Also, we had to make sure that not all SMEs want to internationalise to one specific market, as this would have meant a more extensive workload for the students of this country. Furthermore, recruiting SMEs, scheduling meetings before the consultancy projects started, and organising the kick-off meeting and the event for the final presentations make this course exciting but time-consuming for the lecturer.

Another challenge that we faced was the steering of enrolment numbers for the consultancy project, due to university regulations in some countries. In Germany for instance, lecturers did not know how many students would participate in the course and what their background knowledge was until the first class meeting. Furthermore, students were – by university

regulations – entitled to disenrol from the course throughout the first three weeks of the course, which lead to a rather late kick-off of the consultancy project.

4.3. Managing Expectations of SMEs and Students

We faced diverging expectations on several ends. The intermediary organisations which we approached to recruit SMEs were surprised to hear that we could only support two SMEs per country and academic term and would have preferred a larger scale. This would have been impossible in terms of student supervision and coordination efforts. Even though students were eager to work on a real-life case, some were overwhelmed and expected more support or upfront instructions on how to be a consultant. To give students a better idea of consultancy work and to discuss specific challenges they were facing it was extremely helpful to organise a workshop with an external consultant. Interestingly, many students expected SMEs to have a clear and detailed vision and workplan for their internationalisation process. They were surprised to learn that SMEs did not address them with a clear-cut task and, as a first step, they had to find out what the needs and expectations of their client were.

5. Conclusion and Lessons Learned

The aim of this paper was to add to the practical dimension of internationalisation, entrepreneurship education, and innovation pedagogy by presenting an example of how these interrelated concepts can be integrated into a course for business students. The authors presented an example of a transnational student consultancy project that seeks to enhance students' international, entrepreneurial, and innovation skills; all contributing to graduate employability. In particular, the consultancy project fosters students' task-related skills in the areas of SME internationalisation as well as behaviour-oriented capabilities, such as teamwork, networking, consulting, and intercultural awareness. All of these skills are crucial to excel in globalised work environments.

The authors like to emphasise three important lessons learned. First, when implementing transnational consultancy projects, all teams should start simultaneously at all participating HEI in order to ensure that the student teams are at similar stages when they start to cooperate with each other. Lecturers need to start planning well in advance to overcome diverging academic calendars and HEI regulations. Second, it is important that lecturers provide extensive support to students through individual counselling sessions by adapting the course syllabus to students' changing needs throughout the project (delivering inputs just-in-time), and by involving external consultants to discuss specific challenges that students face while collaborating with SMEs. Finally, lecturers are advised to discuss the requirements and limitations of the consultancy project proactively with external

stakeholders, e.g. chambers of commerce, students, and SMEs beforehand and during mid-term evaluations. One way to manage expectations is to prepare a handout for all stakeholders that lists the scope of the consultancy project, its outputs, and some requirements for all participants.

Further research is needed on the impact of the project on students' competences. During the second run of the transnational student consultancy project with more students in the academic winter term 2018/19, the partner HEI will conduct an evaluation of the students' competence improvement with the help of the INCODE barometer.

References

- Altbach, P. G., & Knight, J. (2007). The Internationalization of Higher Education: Motivations and Realities. *Journal of Studies in International Education*, 11(3-4), 290–305.
- Andrews, J., & Higson, H. (2008). Graduate Employability, 'Soft Skills' Versus 'Hard' Business Knowledge: A European Study. *Higher Education in Europe*, 33(4), 411–422.
- Bennet, D., & Bennet, A. (2008). The Depth of Knowledge: Surface, Shallow or Deep? *VINE*, 38(4), 405–420.
- Henry, C., Hill, F., & Leitch, C. (2005a). Entrepreneurship Education and Training: Can Entrepreneurship be Taught? Part I. *Education + Training*, 47(2), 98–111.
- Henry, C., Hill, F., & Leitch, C. (2005b). Entrepreneurship Education and Training: Can Entrepreneurship be Taught? Part II. *Education + Training*, 47(3), 158–169.
- Kettunen, J., Kairisto-Mertanen, L., Penttilä, T. (2013). Innovation Pedagogy and Desired Learning Outcomes in Higher Education. *On the Horizon*, 21(4), 333–342.
- Kinash, S., & Crane, L. (2015). Enhancing Graduate Employability of the 21st Century Learner. *Proceedings of the International Mobile Learning Festival 2015: Mobile Learning, MOOCs and 21st Century Learning, May 22-23, Hong Kong SAR China*, 148–171.
- Kinash, S., Crane, L., Judd, M.-M., & Knight, C. (2016). Discrepant Stakeholder Perspectives on Graduate Employability Strategies. *Higher Education Research & Development*, 35(5), 951–967.
- Lödermann, A.-M., & Scharrer, K. (2010). Beschäftigungsfähigkeit von Universitätsabsolventen – Anforderungen und Kompetenzen aus Unternehmenssicht. *Beiträge zur Hochschulforschung*, 32(4), 72–91.
- Neck, H. M., & Greene, P. G. (2011). Entrepreneurship Education: Known Worlds and New Frontiers. *Journal of Small Business Management*, 49(1), 55–70.

- Saulich, C., & Lehmann, T. (2017). Boosting the Employability of Students and Staff at European Higher Education Institutions: An Educational Framework for Entrepreneurship, Internationalisation and Innovation. In J. Domenech i Soria, M. C. Vincen Vela, E. de La Poza, & D. Blazquez (Eds.), *Proceedings of the 3rd International Conference on Higher Education Advances* (pp. 899–907). Valencia: Universitat Politècnica València.
- Saulich, C., Wohlgemuth, V., & Lehmann, T. (2017). Fit for Internationalization. In M. Knaut (Ed.), *Industrie von morgen: Beiträge und Positionen 2017* (pp. 90–94). Berlin: BWV Berliner Wissenschafts-Verlag.

Educational Models against ageism in higher education

Requena, Carmen^a; Álvarez-Merino, Paula^a and Plaza-Carmona, María^b

^aDepartment of Development and Education psychology , University of León, Spain, ^bChair of Aging at all ages, University of León, Spain.

Abstract

There have always been old persons, but their number has unprecedentedly grown and it is expected to overtake any other age group in contemporary developed societies. Instead of taking this process as a success of mankind, ageism grows on a par with ageing. It is well documented how standard educational models fail to correct implicit ageistic stereotypes, thus new emerging theoretical models such as generational intelligence and identity in old age put forward experiential methodologies designed to educate both explicit and implicit ageistic stereotypes. Both theoretical models incorporate the subjective first-person perspective on ageing, which complements the standard university curriculum for ageing-related professionals in health, social or educational sectors. The practical implementation of these educational models involve experiential methodologies such as life stories. A crucial educational element in the practical success of this methodology lies in understanding intergenerational education not only as a gathering of generations, but as the intentional production and evaluation of educational ends. Moreover, the paper focuses on life stories as an experiential methodology applying the theoretical models previously described in this work.

Keywords: Higher education, Ageism, Life stories, Generational intelligence, Identity.

1. Introduction

The following syllogistic argument vividly illustrates the deep connections between ageism and education. The sources of ageism are double. A first source is located in our knowledge about ageing phenomena and constitutes the *epistemic* origin of ageism. A second source lies in our negative disposition towards ageing and constitutes the *attitudinal* origin of ageism. Now, both knowledge acquisition and attitude change are precisely the two main intervention areas and goals of education. Therefore, educational tools are in principle properly suited and can be extremely useful in facing ageism but also can contribute to maintaining ageist behaviors and beliefs.

Ageism has an epistemic source in outdated but still influential paradigms which define old age in terms of decay. The linear decline of certain cognitive and physical measures with chronological time (Salthouse, 2016) does not warrant the identification of ageing and decay, since human development is not necessarily monotonic in all dimensions. Only a small percentage of functional cognitive variance among older persons is explained in terms of chronological age (Ritchie et al., 2016). Moreover, the emotional behavior during the old age is more refined and complex than in other adult stages, even if the interest in cognitive development decreases (Cadar, 2017). Both the socioemotional selective theory of ageing and its conceptual alternatives identify nonmonotonic relations between cognition and emotion in ageing. In any case, it is necessary to dismantle certain modes of being old, fossilised by beliefs, negative stereotypes, myths and prototypes about ageing phenomena, which combine with the Pygmalion effect and perpetuate ageism against the older age. Consider for example the different social treatment given to ‘forgetting the keys’ in the case of a young person in contrast with an old one. The young person is justified with expressions such as ‘what was in her mind’, while the same fact in the older person case may worry the family and the older person with the fear ‘she is losing her mind’ or requiring medical attention.

Another root of ageism is not conceptual but attitudinal, as it is present either manifested in explicit stereotypes or implied in ageistic dispositions. For example, studies on the professional preferences among higher education students of degrees such as medicine, social work or education show that they prefer to work with children or young persons, while the practice with older persons is generally neglected to the last ordinal preference (Chonody, 2015). This lack of interest is related not only with false beliefs and myths about age, but also with the professional practice young students observe during their training. For example, students observe how accurate diagnoses are relaxed for older persons, how the consultation time is less than other age groups, how treatments for older persons are preferably pharmacological and not psychological, and finally observe how older persons are placed in the last positions for surgical interventions. All these observations generate anxiety towards ageing specially among students in the fields of social and health sciences.

Often, educative institutions program intergenerational activities to eradicate ageism. However, the mere contact and mutual acquaintance between generations does not imply the reduction of negative prejudices and a positive change in perceptions and attitudes for each group to the other. An illustrative study in this kind of setting was developed by Argentinian psychology students, whose ageist attitudes were evaluated following several standardised instruments measuring explicit and implicit attitudes towards older persons. During the experiment, the students contacted older persons in programmed and spontaneous activities which gave them the chance to know these persons in certain depth, interact with and listen to them and share their mutual perceptions. The researchers found that the students' explicit attitudes and beliefs were modified, but not their implicit attitudes and beliefs, which resisted any change and remained invariable in the medium term (Greenwald & Nosek, 2006). Similar results were found in other cultural contexts (Kahana, Slone, Kahana, Langendoerfer, & Reynolds, 2017). The ageist attitudes are rooted in essentialist categories, and the values suggest that neither mere instruction nor contact between generations is enough. Several studies have focused on cultural sources of ageism, namely historical factors imposing (or retrieving) sense and relevance to patterns of interaction implied in the ways younger persons interact with older adults, and also older adults with each other. For example, it has been confirmed that in China attitudes towards older adults tend to be, on average, more positive than those found among the Latin-American population, whose attitudes towards aged persons are better than those of the English-speaking population. In these results, it seems relatives play a role as promoter of respect and veneration towards older persons in the family in contrast to intergenerational groups linked by purely educational bonds (Luo, Zhou, Jin, Newman, & Liang, 2013).

The objective of this research is to identify theoretical frames and their corresponding methodologies which can be implemented in higher education context to effectively contribute to eradicate ageistic stereotypes. These methodologies are characterized by a definition of ageing as development which highlights the affective dimension in social relations among cohorts. The methods identified go beyond the classical "inter-group contact hypothesis" (Pettigrew, 1998), which argues that persons change their negative attitudes to other groups when they interact with them under certain conditions including the establishment of friendship relations, as it has been later partially confirmed (Pettigrew, Tropp, Wagner, & Christ, 2011).

2. Educative models facing ageism in the 21st century

Educational research and experience during the last decades helps to delineate basic features of successful educational methods against ageism. A first wave of research during the second half of the 20th century demonstrated the usefulness of the following three

essential features: development of intergenerational activities (contact theory), experiential learning and training, design of evaluable and measurable interventions. Current trends in educational research point to new additional features we describe in this section, namely: generational intelligence, age identity and first-person approach.

We present two educational models based on a subjective vision of ageing which complements without contradicting the objective physiological and psychological facts about ageing. The subjective focus is meant to confront implicit stereotypes through activities in which different generations participate with a first-person involvement. These models predict the eradication of stereotypes through the knowledge of vital experiences narrated in the first person. Moreover, these methods are easily incorporated into the factual curriculum of higher education studies in health, education and social realms.

2.1. Generational Intelligence

The social classification of people according to age influences the expectations of the roles played by citizens at different ages: children play, young people study, adults work and the elderly rest. However, the real plurality of significant roles played by older persons (such as support for the family, caring for their grandchildren and support for the community through volunteering) goes beyond the tripartite social structure education-work-pension (Miles, 2012).

The emerging educational model called "generational intelligence" offers a conceptual frame and its corresponding practical tools to face and interpret the complex and multidimensional issue of intergenerational relations (Biggs & Lowenstein, 2013). This educational model works in the perspective of incoming demographic change and its method consists in anticipating new cultural demands in the life cycle of individuals, families and social systems. Generational intelligence is defined as the capacity to reflect and act towards the comprehension of oneself and others as members of an age group, of a cohort, and of a family living in a present social and cultural context. Ageing is a relational phenomenon in the following sense: while chronological time is common to all ages, functions and roles are divergent in different generations. For example, the older persons were in the past the holders of wisdom while currently young persons have a better access to knowledge. In the past, the tripartite social role structure education-work-pension was significantly less dependent on chronological age. Work was distributed in terms of family needs, not in chronological terms when children had to leave school to work and help at home. Therefore, in contemporary societies there are several temporal contexts sharing the same chronological time. Educating the ability to understand the temporal context of others is an essential feature of generational intelligence. This model does not search for a neutral age and does not presuppose that age is irrelevant, but rather the model focuses on creating spaces where age is distinctive from several generational points of view that must be taken

into account within a pragmatic negotiation process (Cavanaugh & Blanchard-Fields, 2018).

2.2. Old Age Identity

Personal identity does not only concern adolescence, as some life-cycle theories once considered. Identity is rather a perdurable process, present during the whole adult life, including old age (Panagakis, 2015). This continuous and flexible perspective on personal identity processes contributes to minimising ageist attitudes and beliefs which tend to conceive ageing apart from other life periods. While traditional conceptions of personal identity based on the alleged psychological-physical continuity of persons across time have received crucial objections in the current literature (McCarthy & Heraty, 2017), the trends which preserve personal identity across time are abstract and complex events such as interests, values, meanings and plans which permeate the entire life. Personal identity is conceived as a balance between flexibility and continuity. Flexibility makes it possible to integrate new experiences even if they bring substantial changes. It also eases the exploration of genuine alternatives. In some periods of life commitment prevails while in others exploration predominates.

The theory of identity (Sneed, Whitbourne, Schwartz, & Huang, 2012) is particularly adequate for adulthood and old age. Three processes are defined regarding identity: identity assimilation, identity accommodation and identity balance. Assimilation concerns the selfconscious preservation of the self, which implies selecting and interpreting information in a consistent way with respect to self-schemes, together with the selection and interpretation of information on individual bases. Accommodation refers to identity changes as an answer to new experiences. Finally, identity balance refers to the flexible use of the two previous styles. This flexibility makes it possible for the self to adapt and integrate changes related to age, while preserving the sense of consistency and internal stability (Kogan & Schoenfeld-Tacher, 2017).

3. Life stories: Experiential methodologies to confront ageism in higher education

How can we generate knowledge, attitude change and professional good practices regarding ageing? Several investigations on pedagogical practices in pre-graduate, graduate and postgraduate studies favour a model in which students receive exhaustive information on ageing plus direct exposure to old persons in real life situations (Requena, Swift, Naegele, & Bosems, 2018). Experiential methodologies combine the knowledge in the classroom with real world experience, which obliges students to train their communication skills in the generational context. Experiential training is present in several forms of practical learning,

such as service learning, which is known to correct stereotypical ageist behavior, beliefs, vocabulary and expressions (such as “at my age...”) (McCarthy & Heraty, 2017). In order to avoid also implicit ageistic stereotypes it is useful to qualify experiential learning with a first-person approach to the knowledge of human development at a personal and at a generational cohort levels (Boswell, 2015). This is precisely the methodological objective of life stories as an educational method.

The social element in life stories refers not only to the context where the interaction takes place, but also to the intentional evocation of personal memories as a social act, which presupposes some form of empathy of and from the receiver of the narrative. Empathy implies a minimal degree of 'emotional atonement' present when we are able to understand what is being intelligibly communicated, including feelings and affections. Therefore, occasionally the function of sharing personal memories is trying to bring about understanding from other persons and get them to 'emotionally attune' with us (Sneed et al., 2012). From an educational viewpoint, the autobiographical approach characterizing life stories offers discents of all ages the chance to capture the most subjective qualities of ageing, namely what Kenyon and Randall call "the interior of ageing" (Randall & Kenyon, 2001). This subjective perspective crucially complements the theoretical approach of cycle life psychology which usually works from an objective perspective and is driven by quantitative data. Several solid experimental works demonstrate the efficiency of life stories as a didactical and therapeutical tool (Kogan & Schoenfeld-Tacher, 2017).

In the context of ageing research, identity processes such as structure updating and openness to change can be studied with the help of life stories. A study on retirement in times of cultural change has found that some individuals are more prone than others to incorporate cultural change into their own life narrations, and this propensity was directly related with the way in which they interpret their own ageing (Sheilds et al., 2015). Persons who locate themselves in an open horizon are also eager to explore new possibilities in the present, while they maintain less erroneous beliefs and myths on ageing. At the same time, those who stick to the past are more prone to understand the old age as a continuation or an epilogue of past life. These persons adopt a narrative foreclosure at the end of their lives, namely the premature conviction that the story of one's own life has finished and it is not possible to add any new chapters to it (O'Hora & Roberto, 2018). Narratively foreclosed persons do not consider new intelligible experiences, interpretations and commitments in their own life. This ageist attitude stands against selfing, which is an untold or unfinished narrative process open to new challenges and responsibilities, where the normal all-ages open narrative has not stopped. Older persons with ageist identity usually have not developed their own identity in their lives; they are not committed to social values and are convinced that it is impossible or too late to make any essential transformation. These persons can feel a strong wish to rewrite the past or change the direction of their life, but at

the same time they realize they do not know how to do it (Robinson & Murphy-Nugen, 2018).

In order to achieve a better understanding of experiential methodologies based on life stories, the following are useful documentary examples from the visual arts: “The Remains of the Day” (1993) directed by James Ivory; the Japanese movie ‘Ikiru’ (1956), by Akira Kurosawa; or the Icelandic film ‘Eldfjall’, by Rúnar Rúnarsson (2011). The following written document is also useful: (Villar, 2006).

4. Conclusions

The subjective or first-person perspective on ageing phenomena is an essential contribution of experiential learning to higher education. New theoretical models face mutual intergenerational comprehension beyond inter-group theories. To fight against implicit and explicit ageism in educational contexts, the generational intelligence model unifies a transversal or simultaneous view of two or more generations with a longitudinal perspective which includes several temporal horizons. Age matters: it is not an empty variable, but the learnable modal capacity to understand other generations. On the other hand, age-related identity is demystified from its adscription to adolescence. Identity is not restricted to any chronological period, since it is never late to add new stories to our own identity. Finally, life-stories are proposed as an experiential learning methodology based on mutual interdependent structured interviews. Success in anti-ageistic education requires combining the subjective experiential perspective with the traditional objectified view of the life cycle.

References

- Biggs, S., & Lowenstein, A. (2013). *Generational Intelligence: a critical approach to age relations*. Londres: Routledge.
- Boswell, S. S. (2015). Effects of Aging and Adult Development Education and Service Learning on Attitude, Anxiety, and Occupational Interest. *Journal of Effective Teaching*, 15(1), 5-19.
- Cadar, D., Robitaille, A., Clouston, S., Hofer, S. M., Piccinin, A. M., & Muniz-Terrera, G. (2017). An international evaluation of cognitive reserve and memory changes in early old age in 10 European countries. *Neuroepidemiology*, 48(1-2), 9-20.
- Cavanaugh, J. C., & Blanchard-Fields, F. (2018). *Adult development and aging*. United States: Cengage Learning.
- Chonody, J. M. (2015). Addressing ageism in students: A systematic review of the pedagogical intervention literature. *Educational Gerontology*, 41(12), 859-887.
- Greenwald, A. G., & Nosek, B. A. (2006). *Health of the Implicit Association Test at age 3*. Seattle: Hogrefe Publishing.

- Kahana, E., Slone, M. R., Kahana, B., Langendoerfer, K. B., & Reynolds, C. (2017). Beyond Ageist Attitudes. *The Gerontologist*, gnw190.
- Kogan, L. R., & Schoenfeld-Tacher, R. M. (2017). Participation in an intergenerational service learning course and implicit biases. *Educational Gerontology*, 1-9.
- Luo, B., Zhou, K., Jin, E. J., Newman, A., & Liang, J. (2013). Ageism among college students: A comparative study between US and China. *Journal of Cross-Cultural Gerontology*, 28(1), 49-63.
- McCarthy, J., & Heraty, N. (2017). *Ageist Attitudes*. In The Palgrave Handbook of Age Diversity and Work (pp. 399-422), London: Palgrave Macmillan.
- Miles, J. (2012). Book Review: *Generational Intelligence: A Critical Approach to Age Relations*.
- O'Hora, K. A., & Roberto, K. A. (2018). Navigating emotions and relationship dynamics: family life review as a clinical tool for older adults during a relocation transition into an assisted living facility. *Aging & Mental Health*, 1-7.
- Panagakos, C. (2015). Reconsidering adulthood: Relative constructions of adult identity during the transition to adulthood. *Advances in Life Course Research*, 23, 1-13.
- Pettigrew, T. F. (1998). Intergroup contact theory. *Annual Review of Psychology*, 49(1), 6585.
- Pettigrew, T. F., Tropp, L. R. & Christ, O. (2011). Recent advances in intergroup contact theory. *International Journal of Intercultural Relations*, 35(3), 271-280.
- Randall, W., & Kenyon, G. (2001). *Ordinary wisdom. Biographical aging and the journey of life*. Westport, CT: Praeger.
- Requena, C., Swift, H., Naegele, L. & Bosems, W. (2018). "Educational Methods using Intergenerational Interaction to Fight Ageism". Chapter 23 of: L. Ayalon & C. Tesch-Roemer (eds.) *Contemporary Perspectives on Ageism*, Springer Nature in Press.
- Ritchie, S. J., Tucker-Drob, E. M., Cox, S. R., Corley, J., Dykiert, D., ... & Deary, I. J. (2016). Predictors of ageing-related decline across multiple cognitive functions. *Intelligence*, 59, 115-126.
- Robinson, J. T., & Murphy-Nugen, A. B. (2018). It makes you keep trying: life review writing for older adults. *Journal of Gerontological Social Work*, (just-accepted).
- Salthouse, T.A. (2016). Little relation of adult age with cognition after controlling general influences. *Developmental Psychology*, 52(10), 1545-1554.
- Sheilds, L., Molzahn, A., Bruce, A., Makaroff, K. S., Stajduhar, K., Beuthin, R., & Shermak, S. (2015). Contrasting stories of life-threatening illness. *International Journal of Nursing Studies*, 52(1), 207-215.
- Sneed, J. R., Whitbourne, S. K., & Huang, S. (2012). The relationship between identity, intimacy, and midlife well-being: Findings from the Rochester Adult Longitudinal Study. *Psychology and Aging*, 27(2), 318.
- Villar, F., & Triadó, C. (2006). *El estudio del ciclo vital a partir de historias de vida: una propuesta práctica*. Barcelona: Publicacions de la Universitat de Barcelona.

Increasing Peer Review Quality in Online Learning Systems

Luckner, Naemi; Purgathofer, Peter; Fitzpatrick, Geraldine

Human Computer Interaction Group, Institute of Visual Computing and Human-Centered Technology, Wien.

Abstract

Lecturers face an on-going struggle to keep up-to-date with their students' learning progress in large university courses. This hurts especially when it comes to identifying and supporting the diverse needs of each individual student. One way to approach this challenge is to introduce peer reviewing as a means to provide students with individual feedback throughout the semester. However, the quality of feedback written by peers can vary immensely and some students intentionally avoid putting work into writing reviews. We addressed these issues by calculating a Review Karma (RK), a value indicating how helpful students are in giving feedback to their colleagues and in helping them improve. While this approach shows much promise, especially in identifying different groups of students and enhancing their learning experience, we also identified trends that negatively impact the way students approach reviewing and provide their honest opinions of their colleagues work. The main contributions of this paper are the design of and lessons learned from the introduction of the RK and its initial evaluation via a survey.

Keywords: *Peer Review; Review Quality; Peer Feedback; Peer Evaluation*

1. Introduction

Peer review is a widely established process to give and receive personalised feedback. For peer review to work well, reviewing has to be taken seriously and the feedback needs to be constructive and helpful. This, however, proves to be challenging to get across to students of large university courses, many of whom see reviewing as a chore to quickly get out of the way for ‘more important’ work. We are faced with the challenge to improve the overall review quality, combat negligent review practices and get students to value reviewing as an important activity in their course work.

Since 2013, we have been exploring the use of double blind peer reviewing in large university courses (>500 participants). Using an in-house system [blinded ref], we facilitated approximately 45.000 peer reviews per semester in two courses between 2013 and 2017. In these courses, an essential part of students' course work consists of writing peer reviews. These reviews are highly structured, usually consisting of a set of questions that are specific to the elaboration and cannot be answered with simple one-word replies.

To combat negligent reviewing practices, we introduced a number of measures over the years including better justifying reviewing to the students by explaining the value for everybody, giving students the opportunity to send anonymous feedback to the review author, and increasing the weight of individual review quality in the final grade. This paper discusses yet another measure we introduced in order to bring students to strive for a higher standard in writing their reviews, a measure we refer to as *Review Karma* (RK).

In the following we first discuss related work regarding RK, feedback quality and motivation; we then explain how RK is calculated and used in our online learning system, followed by a description of our efforts to evaluate RK. Finally, we discuss how the introduction of RK directly influenced [blinded name]'s learning design and draw conclusions on how future iterations could work to circumvent its shortcomings.

2. Related Work

In a time of MOOCs, depending on expert reviews is not sustainable given the number of participating students. The resulting drive towards systems based on peer reviewing and evaluation has generated a sizeable body of work on peer feedback and reviewing.

It has been found that peer reviewing in a learning context helps to generate new ideas and insights (Nagel & Kotzé 2010) and eliminates problems with given solutions earlier than in normal evaluation cycles (Garousi 2010), but that its impact is directly affected by quality, reliability and validity (Gielen et al. 2010). Peer reviews are also often biased towards a higher score in comparison to expert reviews (Papadopoulos et al. 2012), (Lu et al. 2015), which might distort a student's perspective on the quality of their work.

The students' attitude towards peer reviewing is discussed in a number of papers. Some describe a positive view on peer review (Bauer et al. 2009) or seeing it as generally useful (Basnet et al. 2010), others report students finding it hardly helpful and are complaining about a lack of effort from their peers (Lu et al. 2015), (Nagel & Kotzé 2010), or receiving mostly offensive feedback from their colleagues (Wolfe 2004). Further issues mentioned in related research show some of the reservations students have against reviewing, e.g. that reviewing is teachers' work that makes students uncomfortable (Basnet et al. 2010), that some criteria were hard to judge (Bauer et al. 2009), that reviewing took time away from other work (Basnet et al. 2010), and that reviewing in groups showed instances of social loafing (Turner et al. 2011).

There is some discussion on how to motivate students to write good reviews by catering to intrinsic and extrinsic motivation. Extrinsic motivation can be applied to keep students engaged in the reviewing process (Turner et al. 2011), e.g. an influence on grades (Joyner 2016) or open access to assignment solutions (Neubaum et al. 2014). Some work focussed on feedback quality and its influencing factors. A number of papers discuss different influences of qualitative (e.g. text-based) and quantitative (e.g. numeric or categorized) feedback in reviewing (Hicks et al. 2016), (Kulkarni et al. 2015a), (Kulkarni et al. 2015b).

There is a lot of work geared at optimising the peer review process, be it organisational issues in large courses (e.g. Papadopoulos et al. 2012), quality enhancement (e.g. Hicks et al. 2016) or student motivation (e.g. Turner et al. 2011). However, seeing that peer reviews become increasingly more important in today's educational landscape, we need ways to ensure a certain quality over the whole duration of a course, find ways to correctly identify helpful, average, meaningless or offensive reviews as is also tried in reviews in the context of e-commerce (Kim et al. 2006), and to adequately react to a rise or drop of review quality. Towards this goal, we are looking into using learning analytics in the form of a RK, which are in turn directly influencing our overall learning design.

3. Review Karma

Review karma is a term we introduced to describe a value designed to indicate the overall quality of reviews a student (see Luckner & Purgathofer 2015). In our system RK is calculated for each student and lecture, so that RK can reflect the varying interest of students in the respective lectures' subjects, influencing their motivation, willingness or capacity to provide good reviews.

RK is based on relevant information about a student's reviewing ability. It is calculated from feedback reviewees give to reviewers by choosing one of four feedback categories, and from lecture staff flagging especially good or bad reviews. Reviewer skills are hence

judged by other students and lecture staff alike, as is done in other reputation systems where reputation is 'a claim about a target made by a third party' (Farmer & Glass 2010).

Our calculation merges the quality of a student's reviews and their overall participation in the review process to produce a robust metric that represents a student's RK. The calculation results in a relative ranking of students in regard to their reviewing ability.

$$\begin{aligned} p_s &= \text{set of all positive feedback a student } s \text{ has received in a lecture} \\ n_s &= \text{set of all negative feedback a student } s \text{ has received in a lecture} \\ P &= \{p_1, p_2, p_3, \dots\}, \quad N = \{n_1, n_2, n_3, \dots\} \end{aligned}$$

$$\text{Review karma } r(s) = \frac{\sum p_{si} * w(p_{si})}{\sum p_{si} * w(p_{si}) + \sum n_{si} * w(n_{si})} * \frac{|p_s| + |n_s|}{|P| + |N|}$$

The first multiplier calculates the relative value of positive feedback received for reviews of a student s . It is defined by calculating the percentage of weighted positive feedback in relation to the total weighted feedback, the sum of weighted positive and weighted negative feedback. The weights w assigned to types of feedback were initially chosen based on existing karma algorithms such as used in Movshovitz-Attias et al. (2013). We iteratively analysed the results of the calculation, looking for outliers that were not classified fittingly. Now, feedback is weighted according to optimized values that reflect reliability and significance of the source it came from. The second part of the RK calculation introduces how much the student s was involved in the review process of the lecture as of yet. The result of this formula is a value that gives a relative ranking of student feedback quality. Finally, experienced evaluators were consulted to sense check the results of the formula, resulting in a last adjustment of the weights used for the RK calculation. The evaluators were shown a segment of students' data the algorithm had ordered into the same category along with all information used to calculate the RK. They were asked to indicate, which category they would place these students in, which was then compared with RK results.

4. Survey

Students from two lectures were invited to participate in a survey and offered points towards their final grade. 146 students completed the survey. It was evaluated based on the qualitative content analysis method described by Meyring (2003). The online survey consisted of 15 open-ended questions. The focus was to collect opinions and experiences with peer reviewing and the task system used in the lecture [blinded ref] and to grasp the impact and effect of the RK or measures used to calculate RK. Results of this survey will be discussed in the next paragraphs.

Reading reviews led to different learning outcomes. Additional to new insights concerning

the lecture content, students also learned about giving helpful feedback and gained motivation from well-written reviews. Badly written reviews, however, had a negative influence on the motivation and led to a feeling of frustration. Only 11.2% of the students indicated that they did not learn anything from reviews they received.

Writing reviews was also mostly perceived as a positive influence on their learning (80.4%) but some people felt their work being actively interrupted by the review system (6.3%) and saw no use in putting any effort into reviewing. Students observed being negatively affected by repeatedly having to review bad work of their colleagues. Seeing bad work handed in by their peers also seemed to devalue their own effort. Most students (77.6%) were able to draw from reviews they received as best practice examples. Especially students with no prior experience in peer reviewing noticed feedback skill improvements. Students with previous knowledge experienced loss of timidity, learned how to write less offensive feedback and be constructive. Others mentioned becoming more motivated to write good reviews over time, especially when receiving 'helpful' as feedback for a critical review. For some students, writing reviews was more fruitful for their own learning than receiving reviews, and it helped them improve their own work by better understanding the requirements or by gaining insight from their peers' perspectives. By proposing changes and critiquing their peers' work they also found similar aspects lacking in their own work.

Students commented on the RK and how it affected their ability to give feedback. While RK was seen as a motivation to improve reviewing skills, others thought it a way to punish critical reviews. Regarding the feedback they received for their reviews, many students expressed scepticism that their peers could differentiate between a good but critical review and a badly written or spiteful review. Some students also mentioned that they felt bad when giving deserved negative feedback to reviews as that could have a negative effect on reviewers' grades. Such influences on the review feedback behaviour create problems since meaningful calculation of RK is dependent on honest reviewee feedback.

5. Discussion

As indicated by the survey results, students experience reviewing and being reviewed overall as a positive impact on their learning, especially when they accept reviewing as an essential part of their work in the course. This positively perceived impact stems from writing reviews to high quality work and receiving well-written reviews to their own.

Students mentioned two distinct advantages of writing reviews: being enabled to double-checking their own work and seeing different solutions to a task broadens their horizon, as also observed by Nagel and Kotzé (2010). By getting students in the habit of critiquing other people's work, they also reflect on their own work and learning. Some students even

went so far as to value writing reviews over receiving reviews, saying they learned more from analysing their peers' work than getting feedback on their own work.

While RK is a value calculated from a large amount of data emanating from the system, most of this data is a direct reflection on how reviews are received by the reviewers' peers and the lecture staff. Answers to the survey, however, show that this social component of the RK introduces a dilemma for students writing reviews: students hesitate to write critical reviews because they fear it being negatively perceived and hence down-voted with negative review feedback. However, the survey also shows that students long to receive critical feedback on their work because it is perceived as more helpful. This shows a conflict between their own experience, that receiving a critical review helps them more, and their behaviour, which is based on the notion that writing a critical review will get them negative review feedback that in turn influences their grade. It leaves us in a difficult spot between fostering critical reviews and basing their grades on reviews they write and the feedback they get from their peers. While we are not aware of this particular dilemma being discussed in literature as of yet, there are some comments about the need to deal with offensive feedback in Wolfe (2004). Lu et al. (2015) raised the issue of unhelpful feedback being particularly bad for at-risk learners, underlining the importance of this dilemma.

Reading well-written reviews that prompted students to revise their works was often seen as educational beyond the suggested changes to and enhancements of the original work. Such reviews acted as samples of how to write helpful feedback, directly impacting the peer learning process. Some students started to emulate best practices they found in reviews they received, describing those practices as a positive learning outcome, which confirms Lu et al.'s (2015) notion that feedback gets better if reviewers put in more work. While students did not hesitate to give good review feedback to reviews they liked, they struggled to indicate which reviews they found unhelpful or meaningless. Students mentioned having a bad conscience when negatively evaluating their peers' reviews and would rather choose 'average' as review feedback than truthfully evaluating these reviews negatively. It follows that students are troubled voicing their real opinion about their peers' work as they get the feeling that they would create trouble for their peers or influence their grades, supporting Basnet et al.'s (2010) observation that students do not like the idea of marking their peers.

Since we learned that students emulate best practices from reviews they received, it stands to reason that receiving more well-written reviews might even help write better reviews. Hence, we introduced targeted allocation, as also suggested by Kulkarni et al. (2015). Students with high RK are now assigned the work of students with low RK for reviewing. If receiving well-written reviews increases the quality of the reviews a student writes, we hypothesise that an underlying self-enhancing system could be put at work here. Targeted allocation of reviews can be risky from an ethical viewpoint, as students with high and average RK would receive fewer reviews from students with good RK. However, our basic

assumption is that targeted allocation would raise the review quality throughout the course, which in turn would benefit everybody. Assuming this is a viable model, we only need to create a critical mass of good reviews in order to bring the system into a state of positive self-enhancement. In this sense, we see the initial detraction of high-quality reviews from average students as an investment that ultimately benefits everybody.

Another change in the design is to put a higher value on reviewing by increasing its influence on the final grade. This correlates with the results of the survey showing that review writing has a large impact on students' learning progress, as is supported by Joyner et al. (2016). Such a measure can enhance the perceived importance and incite students to spend more time and effort in writing reviews. An extension of this would be to make RK of reviewers visible to reviewees, helping students to contextualise reviews they receive.

6. Conclusion and Future Research

Especially in large classes, it is hard to keep an overview of individual students' work, and to intervene when needed, so that we do not leave struggling students behind. RK is one of the possible tools to support the lecture team in this. We are still striving to iron out the kinks in the current RK implementation, and the evaluation of our design changes is pending. Our experience as well as the students' observations are pointing towards some interesting challenges for future design iterations such as how to make reading reviews more interesting; how to raise the overall review quality; how to get students to provide honest review feedback instead of defaulting to 'average' for meaningless or offensive reviews; or how to foster a climate that supports writing critical and helpful feedback that does not inadvertently trigger a trend of writing solely positive reviews in fear of a review feedback backlash. These and further questions will be the focus of our future work in the hope of building a sustainable reviewing environment to support students in their learning.

References

- Basnet, B., Brodie, L., & Worden, J. (2010). Peer assessment of assignment. In *Frontiers in Education Conference (FIE)*, 2010 IEEE (p. T1G-1-T1G-2).
- Bauer, C., Figl, K., Derntl, M., Beran, P. P., & Kabicher, S. (2009). The Student View on Online Peer Reviews. *Proceedings of the 14th Annual ACM SIGCSE Conference on Innovation and Technology in Computer Science Education.*, 41(3), 26-30.
- Farmer, R., & Glass, B. (2010). *Building Web Reputation Systems* (1st ed.). USA: *Yahoo! Press*.
- Garousi, V. (2010). Applying peer reviews in software engineering education: An experiment and lessons learned. *IEEE Transactions on Education*, 53(2), 182-193.

- Gielen, S., Peeters, E., Dochy, F., Onghena, P., & Struyven, K. (2010). Improving the effectiveness of peer feedback for learning. *Learning and Instruction*, 20(4), 304–315.
- Hicks, C. M., Pandey, V., Fraser, C. A., & Klemmer, S. (2016). Framing Feedback: Choosing Review Environment Features that Support High Quality Peer Assessment (pp. 458–469). Presented at the Proceedings of the 2016 *CHI Conference on Human Factors in Computing Systems*, ACM Press.
- Joyner, D. A., Smiley, A., Bruckman, A., Goel, A., Ashby, W., Irish, L., ... Sheahen, D. (2016). Graders as Meta-Reviewers: Simultaneously Scaling and Improving Expert Evaluation for Large Online Classrooms (pp. 399–408). Presented at the Proceedings of the Third (2016) *ACM Conference on Learning @ Scale*, ACM Press.
- Kim, S.-M., Pantel, P., Chklovski, T., & Pennacchiotti, M. (2006). Automatically assessing review helpfulness. In Proceedings of the 2006 *Conference on empirical methods in natural language processing* (pp. 423–430). Association for Computational Linguistics.
- Kulkarni, C. E., Bernstein, M. S., & Klemmer, S. R. (2015). PeerStudio: Rapid Peer Feedback Emphasizes Revision and Improves Performance (pp. 75–84). Presented at the Proceedings of the Second (2015) *ACM Conference on Learning @ Scale*.
- Kulkarni, C., Wei, K. P., Le, H., Chia, D., Papadopoulos, K., Cheng, J., ... Klemmer, S. R. (2015). Peer and self assessment in massive online classes. In *Design Thinking Research* (pp. 131–168). Springer.
- Lu, Y., Warren, J., Jermaine, C., Chaudhuri, S., & Rixner, S. (2015). Grading the Graders: Motivating Peer Graders in a MOOC. Proceedings of the *24th International Conference on World Wide Web*. 680–690.
- Luckner, N., & Purgathofer, P. (2015). Exploring the Use of Peer Review in Large University Courses. *Interaction Design and Architecture(s) Journal*, (25), 21–38.
- Mayring, P.: Qualitative Inhaltsanalyse. *Grundlagen u. Techniken*. Weinheim: Beltz (2003)
- Movshovitz-Attias, D., Movshovitz-Attias, Y., Steenkiste, P., & Faloutsos, C. (2013). Analysis of the reputation system and user contributions on a question answering website: Stackoverflow. In *Advances in Social Networks Analysis and Mining*, 2013 (pp. 886–893).
- Nagel, L., & Kotzé, T. G. (2010). Supersizing e-learning : What a CoI survey reveals about teaching presence in a large online class. *The Internet and Higher Education*, 13(1–2), 45–51.
- Neubauer, G., Wichmann, A., Eimler, S. C., & Krämer, N. C. (2014). Investigating Incentives for Students to Provide Peer Feedback in a Semi-Open Online Course: An Experimental Study (pp. 1–7). *ACM Press*.
- Turner, S., Pérez-Quiñones, M. A., Edwards, S., & Chase, J. (2011a). Student Attitudes and Motivation for Peer Review in CS2. In Proceedings of the *42Nd ACM Technical Symposium on Computer Science Education* (pp. 347–352).
- Papadopoulos, P. M., Lagkas, T. D., & Demetriadis, S. N. (2012). How to improve the peer review method: Free-selection vs. assigned-pair protocol evaluated in a computer networking course. *Computers and Education*, 59(2), 182–195.
- Wolfe, W. J. (2004). Online Student Peer Reviews. In Proceedings of the *5th Conference on Information Technology Education* (pp. 33–37). New York, NY, USA: ACM.

Giving Permission to Play in Higher Education

Walsh, Andrew

Teaching Fellow Computing and Library Services, University of Huddersfield, United Kingdom

Abstract

Playing in public, including within education, is a political act, one that is loaded with potential disapproval by others, and hence becomes difficult for potential players to do. Even so, play has many potential benefits within Higher Education. This paper describes some of the benefits to play and describes the social difficulty of playing through the lens of Goffman's frames. It goes onto describe some ways in which playful learning can be introduced to increase the social acceptability and impact of play within Higher Education. These are steps towards constructing a playful frame in which students and staff can view Higher Education. No absolute guidelines could be produced, as both play and acceptability of it are socially constructed and are so completely contextual, but an overall approach is suggested to increase the understanding, acceptability, and effectiveness of play.

Keywords: Play; game based learning; Goffman.

1. Introduction

Playing in public, or in particular, being *seen* to play in public, is a political act for adults (Koh, 2014; De Koven, 2014, p. 160). Outside socially mandated acceptable modes and arenas of play (such as playing for a sports team, belonging to an amateur dramatics society, etc.), play tends to be seen as socially unacceptable for adults, reducing the amount of play they undertake, particularly free or imaginative play (Van Leet & Feeney, 2015).

Nevertheless, play has clear benefits in Higher Education for lecturers, researchers, and students. The meaning of play is outlined for the purposes of this paper, along with some key benefits of play. Using the idea of frames of social interaction (Goffman, 1986) as a lens through which to study play in adult education, we will suggest ways in which a playful frame may be encouraged within Higher Education to give students permission to play within their time at University.

2. The Nature and Benefits of Play in HE

Play is both a personally and socially constructed idea. Whether something is play can depend on the person and people involved, and the time and context in which an activity is taking place. As Glen and Knapp (1987, p. 52) say, ‘...*any sequence to be considered playful as long as the interactants perceive it to be such and signal their understanding accordingly*’, so as long as participants decide to frame an activity as play to each other, then it can validly be seen as play. Accordingly, definitions of play vary and are often best described by lists of attributes that might describe the activity of play.

‘Summing up the formal characteristic of play, we might call it a free activity standing quite consciously outside ‘ordinary’ life as being ‘not serious’ but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings that tend to surround themselves with secrecy and to stress the difference from the common world by disguise or other means.’ (Huizinga, 1955)

So according to Huizinga, who strongly influenced the field of play research, play is an activity that somehow steps outside of normal life (while still, of course, allowing normal life to impinge if necessary), where different rules can apply than in the “real” world. It is “pointless”, in that we do not play to gain any benefit outside the act of play itself, even though benefits may occur. It tends to be a social activity, with players often choosing to signal a separation of the playing group from the outside world. Huizinga also described some different arena in which people play, and one of his terms, the “magic circle” is often

used as a short-cut to describe that idea of stepping out of normal life into a different world constructed through play.

The nature of being able to improvise, to change the rules to suit the players, can serve as the distinction between two different types of play. Caillois called these *Paidia* and *Ludus* (Caillois, R. and Barash, M. , 2001), which *Paidia* being a free, imaginative play form, and *Ludus* being highly structured and inflexibly rule based. So a child's "make believe" game would be primarily *Paidia*, and a crossword puzzle primarily *Ludus*. Often when we think of "games", these are highly *Ludic* in nature, with "play" as highly *Paidic*. In reality, all games and play activities lie on this spectrum, and even highly structured games can be a vehicle for delivering play (or *Paidic* play forms), if we allow them to do so.

Play has multiple benefits in Higher Education (Walsh & Clementson, 2017), but we will focus on just four in this paper. Improved group and team working skills, deeper and more critical interaction with subject material, encouragement of increased creativity, and because play is often fun.

Improving group and team working skills is often a key reason for bringing play into organisations, which may be echoed in the Higher Education environment. Play tends to be a social activity, and depends on negotiating implicit and explicit rules amongst the players. It can be seen as an opportunity to practice and improve these team working abilities valued in many work roles that graduates will find themselves, and playful activities have been found to have value themselves, for these reasons, in the workplace (Statler et al, 2009; Owler et al, 2010). This aspect of play also feeds into student retention, increasing a sense of belonging to a group that has repeatedly been seen as valuable in retaining students (Gerrard & Billington, 2014; Morrow & Ackermann, 2012), though play and playfulness are not normally studied as a factor in retention.

For education in particular, the stepping into the "magic circle" of play, has great benefit for deeper and more critical interaction with subject material. Play allows learners to make mistakes, often repeatedly, within being penalised. This is relatively unusual in education, which can be dominated by learning "to the test", with value placed on knowledge only as far as it can be used to pass onto the next level of study. Play can allow the sort of experimentation with skills and knowledge that encourages the sort of practicing and playing in liminal spaces that leads to transformational learning through the deeper understanding of threshold concepts (Meyer et al, 2010) within a subject area. This is reinforced by the ability to see the world through the lens of ourselves as players, which may be different to our normal personas. We have a "diminished consciousness of self" (Brown & Vaughan, 2010) when playing, which lets us inhabit different characters to our own, allowing more critical perspectives to be designed into learning experiences.

Creativity, an attribute greatly valued by 21st Century employers, is something that is often synonymous with play in education. Again, the “magic circle”, allows us to fail without penalty, with the Paidic aspects of play and games naturally encouraging creative practice. The entire business of universities can be seen as creating new knowledge, and so creativity should be seen as a keystone of a successful Higher Education institution. Playing has repeatedly been seen as a promotor of creativity in education and the workplace (Chang et al, 2013; West et al, 2016; West et al, 2013) and encouraging playfulness (through play), is also seen as strongly related to creativity (Lieberman, 1977).

Fun is often seen as the major reason for introducing play in the workplace, and in adult education, but is often ignored by the academic literature, though it is a major driver for introducing play elsewhere in play writings (e.g. De Koven, 2014). Fun can be seen as frivolous, a distraction from the serious work of education, even though there is evidence that fun, and other positive emotions, improve memory retention (Judde & Rickard, 2010) and learning (Hromek & Roffey, 2009).

3. Goffman’s frames

This paper will use Goffman’s (1986) idea of sociological frames as a way of looking at how we might enable play in Higher Education, and so achieve some of the benefits outlined above. Goffman (1971, p. 28) describes how individuals tend to play a part in any situation, asking them to ‘believe that the character they see, actually possesses the attributes he appears to possess’. He talks a great deal about play, including listing nine things that must be sustained to “*transform serious, real action into something playful*” (Goffman, 1986, p. 41). Most importantly, he describes how keys, or keying (conventions by which an activity is perceived by participants) allow a group to decide whether or not a certain activity is play. The “frame” in which we see an activity is controlled by the internal and external prompts that affect how we react to it.

For instance, if we walk into a lecture theatre with fixed tiered seating, and see someone at the front with slides ready, we are likely to see it through a frame akin to a Victorian, didactic mode of teaching. We expect to sit still and silent for a set amount of time and be fed information from the expert at the front. Creativity and conversation will seem alien to the frame, clashing with the behavior that the group would expect from each other *in that situation*. To act differently to the norms of expected behavior in any situation causes “embarrassment” (Goffman, 1967) to both the non-comformer and those around them.

Members of any group naturally signal to each other when they move into a play situation (Glenn et al, 1987), and a combination of this informal signaling and contextual signaling is required to enable a playful frame for learning.

4. Developing a playful frame for HE, or “giving permission to play”

As already stated, public play is a political act. Playing in an educational setting can be seen as acting against the normative *frame* of that social setting. So how can we make it the norm? How can it a playful frame be accepted in Higher Education settings?

Deterling (2017) uses Goffman’s frames to suggest that people need ‘alibis’ to play, to give excuses for behaving differently to how a normative frame might suggest in a particular situation, as well as keyings (see above) that can help move the frame appropriately. He suggests that if we remove the potential for disapproving observers (Audience management); interrupt the ability for players and observers to watch each other (Awareness management); and encouraging participants to distance themselves from the play through parody or mocking the play, even while taking part (Role distancing).

I outline here ways in which we may shift the frame of normal behaviour within a Higher Education setting to one that encourages and enables play. No one way will shift that frame completely, but as each is introduced they may build together an expectation that one “plays” within a course or setting, and it is instead “embarrassing” to not play.

4.1 Induction or Orientation tasks

Ideally from the start of a learner’s time at university, or at least the start of a module, giving cues that play is “normal” and expected will help to enable play within learning throughout a course. The initial days and weeks in a new setting is where the new “frame” of the social expectations are set out, and prior expectations are reinforced or destroyed. Playful and creative activities such as challenge cards, team building games, and group play help to socially construct the idea that Higher Education is a place to play and experiment with ideas, rather than to sit back and receive “facts” from an expert.

4.2 Environmental invitations to play

Lecture theatres immediately signal passive, didactic learning to most of us. But we can build into the environment invitations and expectations of play. In any teaching room, we can use objects on tables such as Lego or modelling clay, pens and paper (to encourage thinking with your hands), and bubbles or fidget toys (as distractions as concentration aid). In classrooms without fixed seating, we can move tables into different configurations (or remove them entirely), encouraging activity, groupwork, and active modes of participation. We can even move outside the normal classroom, using Psychogeographic ideas to prompt new thoughts and ideas in reaction to the environment. Walls should be a place to positively reinforce playful activity, rather than a depository of negative instructions (“Do not...” signage). In short, the expectations students may have around classroom behaviour

can be altered by changing the classroom environment, and building a new behavioural expectation or frame.

4.3 Structural invitations to play

The formal structures of Higher Education are often inimical to play. Not only in how much of it is described (“lecturers” and “lectures”, for example), but in set learning objectives for modules and courses, and in related assessment tools to test those outcomes. We can, however, soften the impact on those structures on the social and behavioural expectations of students and so enable an environment that welcomes and encourages play.

It is important to have detailed learning objectives at the start of courses to inform planning and content, but to encourage play, these should not be allowed to prevent serendipitous and emergent learning happening. It is normally seen as best practice to display learning objectives to students in each teaching session, particularly at the start of a class. This locks students into a set of expectations that makes play less acceptable. Only make learning objectives explicit at the start of modules or courses, along with any assignment or assessment briefs in order to enable play. Assessment itself should be as flexible as possible, introduce creative exercises that promote critical thinking about topics, rather than examinations that may promote a rigidity of learning.

4.4 Pedagogical invitations to play

Of course, one of the most explicit invitations to play is through designing playful learning experiences. Learning games can be used to allow self-discovery of facts and processes, simulations used to practice skills, and creative exercises to apply and knowledge all encourage a playful approach to the classroom. This could also sit well with the “flipped learning” approach, where students may engage with factual material between timetabled sessions, then carry out more interactive, playful activities within the classroom itself.

4.5 Allowing people not to play

It is important to recognize that people can choose not to “play”, while still carrying out activities that are inherently designed to enable play. They can still benefit from these activities and approach, just not to as great an extent as someone who embraces play. Once play becomes compulsory, it is no longer play, so the focus must be on encouraging and enabling play, not forcing it.

5. Conclusion

Although play can be a valuable approach to learning and Higher Education, it often fails to sit comfortably within that setting. Using Goffman’s idea of frames we can see that the

standard learner expectations of how to act in a Higher Education setting is socially constructed and based on a mixture of prior social experiences and “keyings” from their social environment. We can use the ideas of keys, or social prompts, to change the frame in which learners view their expected behavior.

Approaches that influence how learners view that environment from the start, as well as throughout, a course can introduce play in a way that would be difficult or impossible as “one off” or occasional activities, as we need to build a playful frame for Higher Education for play to be seen as acceptable to learners. Playful cues, or keys, can usefully be introduced in induction or orientation activities, within the physical teaching environment, through structural changes, and through pedagogical invitations to play. These various and mutually reinforcing invitations to play can be used to build this frame, which work together to shift the frame and make play socially acceptable.

References

- Brown, S. L., & Vaughan, C. C. (2010). *Play: how it shapes the brain, opens the imagination, and invigorates the soul*. New York: Avery
- Chang, C., Hsu, C., & Chen, I. (2013). The relationship between the playfulness climate in the classroom and student creativity. *Quality & Quantity*, 47(3), 1493-1510
- Caillois, R. and Barash, M. (2001) *Man, play, and games*. Urbana: University of Illinois Press.
- De Koven, B (2014). *A playful path*. Halifax, Canada: ETC Press.
- Deterling, S. (2017). Alibis for adult play: A Goffmanian account of escaping embarrassment in adult play. *Games and Culture*, Online first, pp. 1-20. <https://doi.org/10.1177/1555412017721086>
- Gerrard, S., & Billington, J. (2014). The perceived benefits of belonging to an extracurricular group within a pre-registration nursing course. *Nurse Education in Practice*, 14(3), pp. 253-258. <http://dx.doi.org/10.1016/j.nepr.2013.11.002>
- Glenn, P. Knapp, M. (1987). The interactive framing of play in adult conversations. *Communication Quarterly*, 35 (1), pp. 48-66.
- Goffman, E. (1967). *Interaction ritual; essays in face-to-face behavior*. United States: Doubleday.
- Goffman, E. (1971). *The presentation of self in everyday life*. London: Pelican Books.
- Goffman, E. (1986). *Frame analysis: An essay on the organization of experience* (Northeastern University Press ed.). Boston: Northeastern University Press.

- Hromek, R., & Roffey, S. (2009). Promoting social and emotional learning with games: "it's fun and we learn things". *Simulation & Gaming*, 40(5), pp. 626-644. <http://dx.doi.org/10.1177/1046878109333793>
- Huizinga, J. (1955). *Homo Ludens: A study of the play element in culture*. Boston: Beacon Press.
- Judde, S., & Rickard, N. (2010). The effect of post-learning presentation of music on long-term word-list retention. *Neurobiology of Learning and Memory*, 94(1), pp. 13-20. <http://dx.doi.org/10.1016/j.nlm.2010.03.002>
- Koh, A (2014). The political power of play. *Hybrid Pedagogy*. Retrieved from: <http://www.digitalpedagogylab.com/hybridped/political-power-of-play/>
- Lieberman, J. (1977). *Playfulness: Its relationship to imagination and creativity*. New York: Academic Press, Inc.
- Meyer, J., Land, R., & Baillie, C. (2010). *Threshold concepts and transformational learning*. Rotterdam: Sense Publishers.
- Morrow, J. A., & Ackermann, M. E. (2012). Intention to persist and retention of first-year students: The importance of motivation and sense of belonging. *College Student Journal*, 46(3), 483-491.
- Owler, K., Morrison, R., & Plester, B. (2010). Does fun work? The complexity of promoting fun at work. *Journal of Management & Organization*, 16(3), pp. 338-352. <http://dx.doi.org/10.5172/jmo.16.3.338>
- Statler, M., Roos, J., & Victor, B. (2009). Ain't misbehavin': Taking play seriously in organizations. *Journal of Change Management*, 9(1), pp. 87-107. <http://dx.doi.org/10.1080/14697010902727252>
- Van Vleet, M. & Feeney, B. (2015). Play behavior and Playfulness in Adulthood. *Social and Personality Psychology Compass*. 9(11), pp. 630-643. <http://dx.doi.org/10.1111/spc3.12205>
- Walsh, Andrew and Clementson, Jonny (2017) Reasons to play in Higher Education. In: *The Power of Play - Voices from the Play Community*. CounterPlay, Aarhus, Denmark, pp. 181-187.
- West, S. E., Hoff, E., Carlsson, I., Department of Psychology, Lunds universitet, Lund University, & Institutionen för psykologi. (2016). Play and productivity: Enhancing the creative climate at workplace meetings with play cues. *American Journal of Play*, 9(1), pp. 71-85.
- West, S., Hoff, E., & Carlsson, I. (2013). Playing at work: Professionals' conceptions of the functions of play on organizational creativity. *The International Journal of Creativity and Problem Solving*, 23(2), pp. 5-23.

Statistics anxiety in university students in assessment situations

Frias-Navarro, Dolores^a; Monterde-i-Bort, Hector^a; Navarro-Gonzalez, Nuria^a; Molina-Palomero Olaya^a; Pascual-Soler, Marcos^b; Perezgonzalez, Jose^c and Longobardi, Claudio.^d

^aDepartment of Methodology of the Behavioural Sciences, University of Valencia, Spain, ^b

^bDepartment of Methodology, ESIC Business & Marketing School, Spain, ^cBusiness School, Massey University, New Zealand, ^dDepartment of Psychology, University of Turin, Italy

Abstract

Many students have feelings of state anxiety when taking exams, and these feelings probably affect their performance. Statistics courses have been identified as producing the most anxiety. The purpose of our study is to measure statistics anxiety throughout an academic course (pre-test and three assessments) in order to observe its change and analyze the relationship between statistics anxiety and academic achievement. The sample is composed of 30 Psychology students taking a course in research designs and statistics (26.7% men and 73.3% women) with a mean age of 20.31 years (SD = 3.76). The results show that the students begin with a high level of statistics anxiety that gradually declines as the course progresses and they study the course materials. Moreover, the final achievement in the subject maintains an inverse relationship with the level of statistics anxiety. The recommendation is to present the detailed contents of the teaching guide on the first day of the course in order to reduce students' anxiety and uncertainty when beginning a statistics course. Financial support: Project UV-INV-AE17-698616. University of Valencia. Spain.

Keywords: *statistics anxiety; academic achievement; trait anxiety.*

1. Introduction

Statistics anxiety is a specific area of research due to students' difficulties in learning statistics and mathematics contents in any educational cycle (Badenes-Ribera, Frias-Navarro, Monterde-i-Bort, & Pascual-Soler, 2015; Chernoff, & Sriraman, 2014; Monterde-i-Bort, Frias-Navarro, & Pascual-Llobell, 2010; Onwuegbuzie & Wilson, 2003). These difficulties do not necessarily arise from poor academic training or low abilities. Instead, some of the other intervening factors are students' erroneous perceptions about statistics, about their lack of mathematic abilities, or about the horror stories they have heard for years about the difficulty of the subject, all of which can produce anxiety. The results of the studies by Onwuegbuzie and Wilson (2003) and Onwuegbuzie (2004) indicate that 80% of students express anxiety about statistics, and this may be the reason many of them delay taking the subject and decide not to take the exam until the end of their academic training.

An exam situation is a challenging, complex process for the individual, who must approach it as a situation of stress requiring the use of cognitive and behavioral strategies to administer the external and/or internal demands of this type of situation, based on his/her own resources (Folkman & Lazarus, 1985). Each individual has a coping style that s/he employs in situations of stress. In addition, in a given stressful situation, such as an exam, the individual must use specific coping responses linked to certain thoughts and behaviors (Parker & Endler, 1992). Our study measures the anxiety when facing a research methodology exam, specifically the assessment of the contents of a research designs course that includes information on statistics and statistical hypothesis testing.

Exams present four phases of anxiety that involve different coping responses: during the preparation or study of the topics the days preceding the exam to prevent the threat of the exam situation (anticipatory threat); confronting the stressor the day of the exam (threat of confrontation); the uncertainty when waiting for the results (threat of waiting for results); and facing the results (threat of the future) (Carver & Scheier, 1994; Folkman & Lazarus, 1985).

The phase of perception of anticipatory threat ('anticipatory anxiety') involves anxiety about the proximity or imminence of the assessment situation. It is a moment when the individual worries about the demands of the material and his/her possibilities, and thinks about how to prepare and regulate the adverse emotions and feelings linked to the future evaluation. Uncertainty about the results is high in this phase. The confrontation phase ('anxiety about confrontation') develops when the individual faces the stressor (the exam). It is the moment when the highest level of anxiety is experienced, especially its emotional component. The phase of waiting for the results ('anxiety about waiting') is the post-exam phase when the grades are still not known. During this phase, there is no longer anxiety about the content or nature of the exam, but there can be nervousness about the results. In

the phase of facing the results ('anxiety about facing the results'), the grade earned is already known, and there is no uncertainty; now the worries are about the impact the grade can have on the individual's life.

Our study measured 'anticipatory statistics anxiety' (with 3 items) and 'statistics anxiety about confrontation' (1 item), conceptualized as state anxiety. In addition, the individual's level of 'trait anxiety' or general anxiety (1 item) is measured. It should be kept in mind that the three constructs mentioned were measured at different time points during the academic course: 1) in the first class at the beginning of the academic course when instructions are given that will guide the norms of the subject and 2) in evaluation situations (evaluation 1 and evaluation 2) and final exam of the subject. In this second area, the individuals must respond to trait, anticipatory, and confrontation anxiety before beginning the exam.

The two objectives of our research are:

1) To study the change throughout a quarter (training period that ends with a final exam) in the students' levels of trait anxiety and statistics state anxiety in the research designs subject in the methodology area of the Psychology degree, by means of a repeated-measures longitudinal study with four measurement points: first day of class (beginning of September), in the first evaluation period (middle of October), in the second evaluation period (middle of November), and on the final exam.

3) The relationships will be analyzed between the students' performance on the final exam in the statistics and designs subject and the variables of students' state and statistics trait anxiety the day they take this final exam.

2. Method

2.1. Participants

The sample of participants is composed of 30 Psychology students (8 men, 26.7% and 22 women, 73.3%) who receive training in research methodology, with a mean age of 20.31 years (SD = 3.76).

2.2. Instruments

Sociodemographic variables of sex and age.

Brief scale of the level of statistics anxiety (ESBREVEANSI) of Frias-Navarro & Monterde-i-Bort, 2017). The scale is composed of 6 items. On the one hand, the scale has 4 items that measure the level of anticipatory anxiety. The items refer to the perceived anxiety when studying for a methodology exam, when thinking about the day of the

methodology exam, when thinking about the methodology exam a day before the exam, and the moment before beginning the exam or evaluation of the methodology contents. Responses are given on a *Likert*-type scale ranging from ‘not anxious’ (1) to ‘very anxious’ (10). The internal consistency values measured with Cronbach’s alpha are excellent at the four measurement times by adding together the four items that measure anticipatory anxiety. On the first day of class: alpha = .891, 95% CI = .809, .943; at the first evaluation: alpha = .968, 95% CI = .944, .983; at the second evaluation: alpha = .975, 95% CI = .956, .987; on the final exam: alpha = .945, 95% CI = .905, .971. On the other hand, another item that measures trait anxiety (“in general, my level of anxiety in my daily life is...”) is added to the ESBREVEANSI scale; this item is presented first on the questionnaire as item 1, followed by the four anticipatory anxiety items mentioned above. Trait anxiety is also rated on a *Likert*-type response scale with the format described above.

Measurement of the performance on the statistics and research design contents. The variable used to measure the academic achievement on the statistics and research design contents was the grade obtained on the final exam in the subject. The exam is a written test with 35 questions resolved individually during a 90-minute period. The responses are given by hand using a paper and pencil procedure with no computer support. The exam contents include the analysis of different research designs (between-groups ANOVA, within-groups ANOVA, block designs, mixed designs, and ANCOVA), interpreting and writing up the results of statistical tests, and interpreting outcomes of SPSS-type statistical programs. The students have to recognize which statistical test is the most appropriate in each research scenario, consult statistical tables to find the critical value, calculate and/or interpret descriptive statistics, tables, graphs, and the value of the statistical test, and make statistical decisions according to the p value of probability obtained and the a priori alpha level established. In addition, the students have to make assessments about the concepts of the null hypothesis, alternative hypothesis, statistical power, confidence level, effect size, confidence interval, type of study methodology, validity of the results, and control of bias, along with summarizing and reporting the results following APA style. The grade can range from 0 to 10, and errors are penalized.

2.3. Procedure

The administration of the different measurement instruments took place during class time, and they were completed individually in a self-administered format. Participation was voluntary. A first evaluation was carried out on the first day of the 2017/18 academic year (beginning of September) before the presentation of the teaching guide for the research designs subject. Later, three measurements were performed (a month and a half after the beginning of the class, two and a half months later, and at the final exam). The final exam represents 70% of the student’s final grade, and the grades on evaluations 1 and 2 make up

15% of the final grade. The total percentage of the student's grade is completed with the elaboration of a research report type article using APA style.

3. Results

3.1. Longitudinal analysis of trait anxiety and statistics anxiety

Item 1. Regarding the level of general trait anxiety presented by the students (Item 1), there are no statistically significant differences between the means of the four time points studied ($F(3, 27) = .615, p = .586, \eta^2_p = .061$, Huynh-Feldt epsilon = .87). Trait anxiety does not change significantly throughout the quarter, and its mean value is around 4.9 on a scale from 1 to 10. See table 1 (with means and standard deviations) and Figure 1 (only with the average scores).

Item 2. Regarding the students' level of anxiety when studying for the methodology exam, it can be observed that overall there are statistically significant differences between the means of the four time points studied ($F(3, 27) = 3.84, p = .013, \eta^2_p = .117$, Huynh-Feldt epsilon = .97). See table 1 and Figure 1. However, the analysis of the pairwise comparisons of means using the Bonferroni test did not detect statistically significant differences. The results show that, in descriptive terms, on the first day of class the students manifest a higher level of anxiety (mean = 6.53), and the tendency of the means is to gradually decline as instruction is received on the design and hypothesis testing contents. The students' uncertainty before studying the material may be able to explain the higher level of anxiety on the first day of class.

Item 3. Regarding the students' level of anxiety when they think about the methodology exam the day before it, there are statistically significant differences among the means of the four time points studied ($F(3, 27) = 3.56, p = .024, \eta^2_p = .109$, Huynh-Feldt epsilon = .85). See table 1 and Figure 1. The results show that, in descriptive terms, on the first day of class the students express a higher level of anxiety (mean = 6.93), and the tendency of the means is to decline as students receive instruction in the research design and hypothesis testing contents. Again, it is likely that students' uncertainty before studying the material would explain the higher level of anxiety on the first day of class.

Table 1. Results of the longitudinal analysis of trait anxiety and statistics anxiety.

Items	First day of class		First evaluation		Second evaluation		Final exam		<i>p</i>	η^2
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
1. Trait anxiety	4.97	1.99	4.93	2.12	4.93	1.98	4.63	2.03	.586	.061
2. Study for the exam	6.53	2.16	6.07	2.26	5.87	2.22	5.60	2.01	.013	.117
3. The day of the exam	6.93	2.24	6.30	2.42	6.340	2.38	6.00	2.33	.024	.109
4. Before the exam	7.4	2.19	6.67	2.43	6.83	2.46	6.53	2.46	.124	.189
5. At that moment	4.2	1.95	6.33	2.54	6.73	2.48	6.93	2.50	<.001	.400

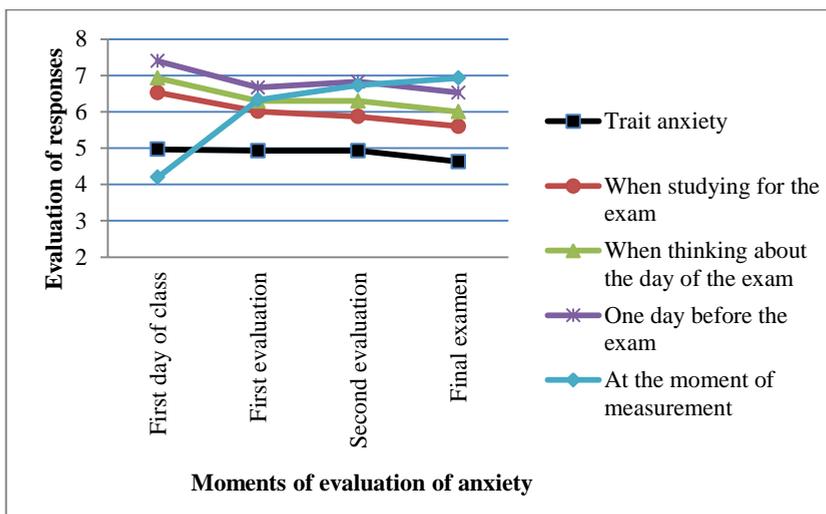


Figure 1. Graphic representation of the results of the longitudinal analysis (the response is measured from 1 to 10).

Item 4. Regarding the students' level of anxiety when they think about the methodology exam the day before it is held, statistically significant differences can be observed among the means of the four time points studied ($F(3, 27) = 3.240, p = .030, \eta^2_p = .101$, Huynh-Feldt epsilon = .92). See table 1 and Figure 1. However, again the pairwise analysis of differences in means using the Bonferroni procedure does not detect statistically significant

differences. However, in descriptive terms, the first day of class is when the students have the highest level of statistics anxiety (mean = 7.4), which declines to 6.53 on the day of the final exam.

Item 5. In the case of reporting the students' levels of anxiety at the precise moment when they are measured (Item 5) (that is, during the class on the first day of the course, or before beginning the two evaluations and at the final exam), the results show that, in descriptive terms, state anxiety increases as the moment of the final exam on the statistical contents draws near. The results of the repeated-measures ANOVA indicate that there are statistically significant differences among the mean anxiety scores at the four evaluation moments ($F(3, 27) = 19.37, p < .001, \eta^2_p = .400$, Huynh-Feldt epsilon = .71). See table 1 and Figure 1. The pairwise analysis of differences in means using the Bonferroni test indicates that the level of anxiety reported at the moment of attending the first methodology class is statistically inferior to the level of anxiety reported at the moments of the first evaluation test ($p = .001$), the second evaluation test ($p < .001$), and the final exam in the subject ($p < .001$). Regarding the other comparisons, no statistically significant differences are detected. Therefore, there is a tendency to increase state anxiety related to statistics throughout the academic course, but there is only a statistically significant difference between the first day of class of the course, when its level is lower (mean = 4.2), compared to later evaluation moments, when mean values of around 6.7 are reached.

3.2. Final achievement and trait anxiety and state statistics anxiety

The results indicate that the grade on the final exam is significantly related to the students' anxiety when they study for the exam (Item 2) ($-.401, p = .028$) and when they think about the exam one day before it, (Item 4) ($-.401, p = .040$). The relationships are not statistically significant for trait anxiety (Item 1) ($-.101, p = .594$) when they think about the day of the exam (Item 3) ($-.327, p = 0.078$) and when they express the state anxiety they have at the exact moment before beginning the test (Item 5) ($-.104, p = .584$).

4. Discussion

The results of our study provide four especially relevant conclusions: 1) the level of statistics anxiety of the students during the first day of class in the statistics and design class, where the contents, evaluation, and program are presented, reaches its highest levels; 2) state-type statistics anxiety gradually declines as the course progresses and knowledge is gained about the contents of the subject; 3) students' trait anxiety remains constant throughout the course; and 4) the students' achievement maintains an inverse relationship with statistics anxiety when they are studying the material and when they think about the

exam the day before it is held. The students with the best performance on the exam have less statistics anxiety.

In our study, during the academic year, there is no type of psychological intervention carried out to reduce students' statistics anxiety. This reduction in anxiety is probably due to the personal mastery of the course contents that gradually takes place. Thus, it would be interesting to find out whether the profile obtained occurs in subject matters or topics that are not from the methodology area, in order to verify whether the effect is maintained and the findings can be generalized. If the students show a high level of anxiety on the first day of class (regardless of the subject matter), then the results of our study would help to give professors guidelines to try to mitigate this first-day anxiety. One of the practical implications of our results for higher education teaching is that the presentation of the subject matter on the first day of class is a key moment to reduce students' anxiety about the training they are going to receive throughout the course.

The main limitations of our study are linked to the sample of participants because probabilistic sampling was not used, and to the sample size. Therefore, our results are exploratory and oriented toward a future study with a larger sample size. It would also have been interesting to analyze the progression of the grades and anxiety over time. We will try to overcome these limitations in our next study, which will be planned based on the data obtained and extended to course contents from different research methodology areas. In addition, it would be interesting to verify whether, in another type of training such as medicine or veterinary sciences where students also receive statistics instruction, an anxiety profile similar to the one obtained in this study is found. The results of our study open up various paths for future research that could provide recommendations for professors related to students' anxiety about studying the contents of different courses, in an effort to improve their students' final performance. Financial support: Project UV-INV-AE17-698616. University of Valencia. Spain.

References

- Badenes-Ribera, L., Frias-Navarro, D., Monderde-i-Bort, H., & Pascual-Soler, M. (2015). Interpretation of the p value: A national survey study in academic psychologists from Spain. *Psicothema*, 27, 290-295.
- Carver, C. S., & Scheider, M. F. (1994). Situational coping and coping dispositions in a stressful transaction. *Journal of Personality and Social Psychology*, 66, 184-195.
- Chernoff, E. J., & Sriraman, B. (Eds) (2014). *Probabilistic thinking: Presenting plural perspective-advances in mathematics education*. Dordrecht, Netherlands: Springer Science + Business Media.

- Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology*, 48, 150-170.
- Frías-Navarro, D. & Monterde-i-Bort, H. (2017). *Escala breve del nivel de ansiedad estadística-5 (ESBREVEANSI)*. University of Valencia. Spain. Available: <https://www.uv.es/friasnav/unidinves.html>
- Monterde-i-Bort, H. Frías-Navarro, D.; Pascual Llobell, J. (2010). Uses and abuses of statistical significance test and other statistical resources: A comparative study. *European Journal of Psychology of Education*, 25, 429-447.
- Onwuegbuzie, A. J. (2004). Academic procrastination and statistics anxiety. *Assessment & Evaluation in Higher Education*, 29, 3-19.
- Onwuegbuzie, A. J., & Wilson, V. A. (2003). Statistics Anxiety: nature, etiology, antecedents, effects, and treatments-a comprehensive review of the literature. *Teaching in Higher Education*, 8, 195-209.
- Parker, J. D. A. & Endler, N. S. (1992). Coping with coping assessment: A critical review. *European Journal of Personality*, 6, 321-344.

UPCT-Bloobusters: Teaching Science and Technology through Movie Scenes and related Experiments

Rodríguez, José-Víctor^a; Castro-Rodríguez, Enrique^b; Sánchez-Pérez Juan-Francisco^b
and Serrano-Martínez, José-Luis^c

^aDepartment of Information Technologies and Communications, Universidad Politécnica de Cartagena, Spain, ^bDepartment of Applied Physics, Universidad Politécnica de Cartagena, Spain ^cDepartment of Mining, Geological and Cartographic Engineering, Universidad Politécnica de Cartagena, Spain.

Abstract

In order to change the preconceptions of youth towards science and technology subjects (which, usually, are perceived as difficult or boring), new educational methods aimed at motivating and engaging students in learning are becoming more and more necessary. In this sense, an educational project called 'UPCT-Bloobusters' through which a group of professors of the Universidad Politécnica de Cartagena (UPCT), Spain, use science fiction movie scenes—as well as experiments—within the lecture room to teach both physics and engineering technology is hereby presented. The methodology of the project is properly described and the results of a survey carried out among the students of a course in which such methodology has been used are shown. In view of this survey, it can be concluded that the project has been more than welcome by the students while at the same time has favored the learning of a great deal of physics and technology concepts.

Keywords: *Teaching of science; Educational innovation; Science fiction.*

1. Introduction

How to change the preconceptions of students towards science and technology subjects (which, usually, are perceived as difficult or boring) is always a challenge for science educators. In this sense, the use of science fiction movies can be a powerful resource within the lecture room to help students motivate and engage in their learning of different science disciplines (Franknoi, 2002; Rose, 2003; Barnett et al., 2006; Bixler, 2007; Frieden & Elliot, 2007; Blasco et al., 2010; Blasco et al., 2011). Specifically, when it comes to teaching physics or engineering, the use of science fiction movie scenes can represent an interesting complementary methodology to illustrate how (or how not) the laws of physics of our universe behave, while at the same time having fun (Asimov, 1968; Everitt & Patterson, 1999; Chandler, 2002; Daley, 2004; Dark, 2005; Berne & Schummer, 2005). Furthermore, it should be noted that, through science fiction movies, students not familiarized with scientific fields can be stimulated so that new scientific and technological vocations may be awakened (Smith, 2009).

In this work, the educational project called 'UPCT-Bloopbusters' through which a group of professors of the Universidad Politécnica de Cartagena (UPCT), Spain, use science fiction movie scenes within the classroom to teach both physics and engineering technology is hereby presented. This methodology has also been used/shown by such professors in different events such as Science and Technology Week celebrations or film festivals. Moreover, UPCT-Bloopbusters is an initiative from the Unit of Scientific Culture and Innovation of the UPCT which counts on the collaboration of the Fundación Española para la Ciencia y la Tecnología (FECYT) – Ministerio de Economía, Industria y Competitividad (MINECO), Spain.

2. Methodology

It is well known that, although science fiction movies are great for stimulating the mind and enjoying fantastic worlds, usually, fundamental errors are made within such movies regarding true science. Therefore, following the same philosophy already published throughout different books (Cavelos, 1999; Wolverson & Stern, 2002; Kakalios, 2005; Rogers, 2007; Weiner, 2007), in the UPCT-Bloopbusters project, firstly, science fiction movie scenes —related to specific physical or technological matters to be taught— are shown in the classroom. Then, the students are invited to detect the errors that they think were made in the scene from a physics and technology point of view. Next, after an enriching debate, the professor clears up the students' questions not only by explaining the bases of the errors made along the movie scenes but also —different from other similar and inspiring educational projects (Palacios, 2007)— by performing attractive experiments by which the true physics underlying such errors is properly demonstrated. Finally, a series of

problems related to the issues previously learnt are proposed to the students, who should solve them and discuss the solution.

This way, just to name a few examples, the impossibility of sound propagation along the vacuum of interstellar space is learnt through *Star Wars* battleship scenes in which noisy explosions are mistakenly heard (this fact is demonstrated with an alarm clock ringing inside a vacuum pump — Fig. 1), the fundamentals of radioactivity are properly taught through the scene from *Indiana Jones and the Crystal Skull* in which our hero incredibly survives a nuclear explosion inside a fridge, or the acceleration of gravity is discussed through a *Spiderman* scene in which the superhero catches the villain even when both are suffering the same free fall.



Figure 1. Vacuum pump used to demonstrate the impossibility of sound propagation in vacuum.

3. Results

A series of questions were asked to the students of a course (population: 54) in which the methodology of the professors from the UPCT-Bloopbusters project were used (course 2016/17, UPCT, Spain), in order to know their opinion about it. In this sense, the results of the three more relevant questions of the questionnaire are shown in Figs. 2 to 4 (where 5 represents the maximum level of satisfaction and DK/NR means Don't know/No reply). As can be observed, the methodology based on science fiction movie scenes as well as experiments was highly appreciated among the students. A huge majority (51 out of 54)

indicated that liked such way of teaching and the same amount affirmed that had learnt some new concepts with it, among which the following stand out: physics in general, propagation of sound, or the influence of the moon on Earth. In this sense, it should be mentioned that, since 51 out of 54 said that they had learnt some new concepts, the fact that 10 answered with a DK/NR to the question about what they had learnt (Fig. 4) could be explained by noting that all these responses were NR (not DK) and such fact points to the possibility of some kind of laziness from those students when it came to answer the only question that required writing rather than selecting a number or just the options ‘yes’ or ‘no’.

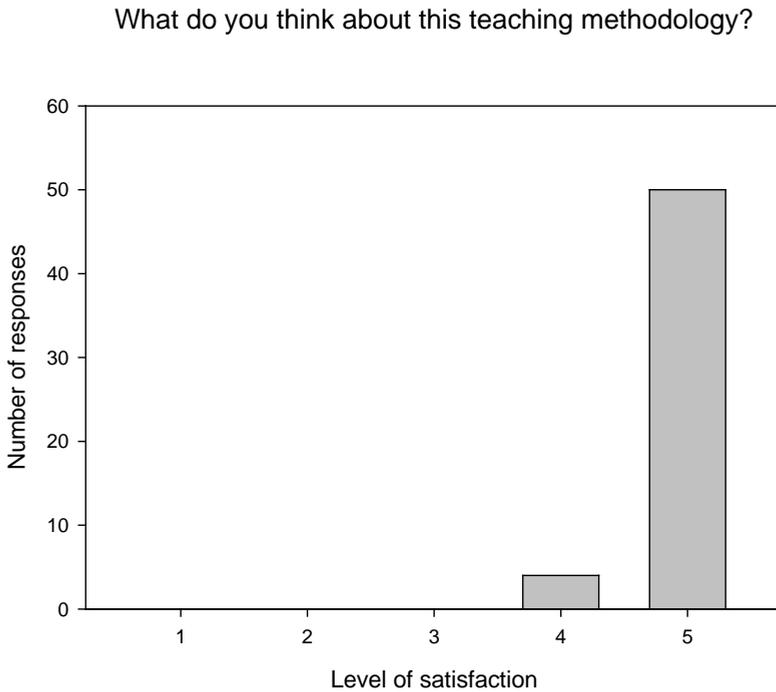


Figure 2. First question of the questionnaire.

Did you learn something new?

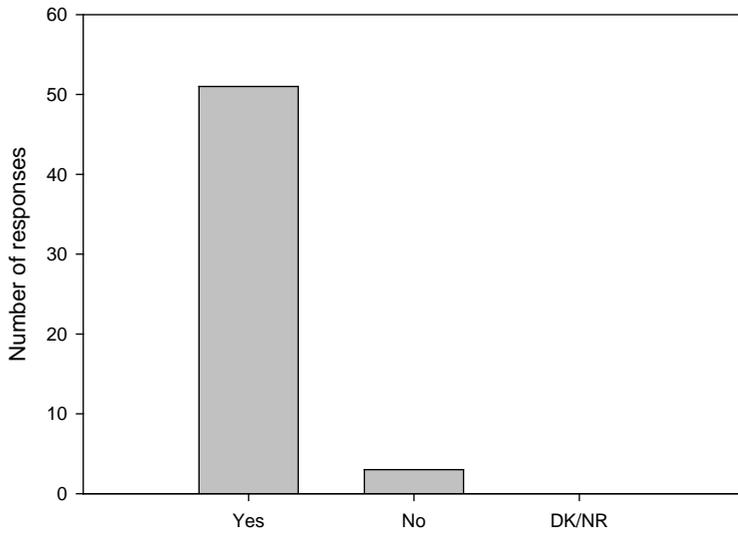


Figure 3. Second question of the questionnaire.

If the answer is yes, what did you learn?

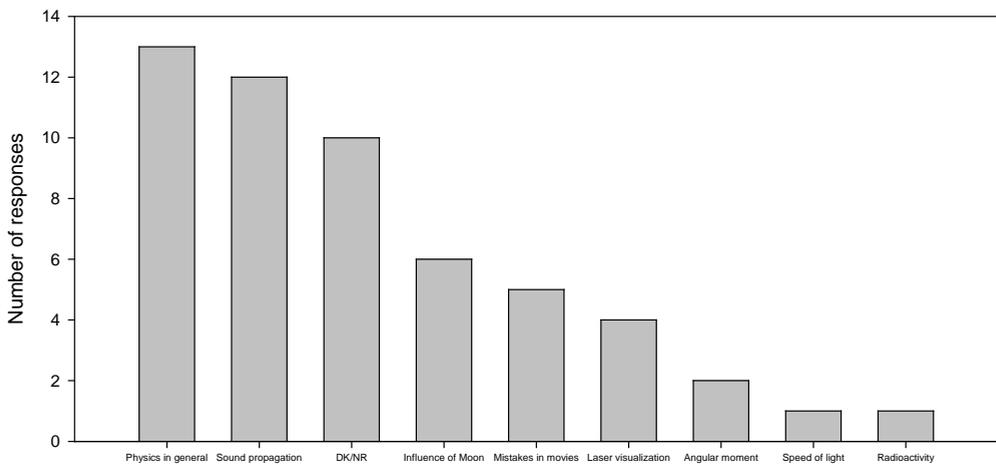


Figure 4. Third question of the questionnaire.

4. Conclusions

The educational project called 'UPCT-Bloobusters' through which a group of professors of the UPCT, Spain, use science fiction movie scenes as well as different experiments within the lecture room to teach both physics and engineering technology has been presented. The results of a survey carried out among the students of a course in which such methodology was given show that the project was more than welcome while at the same time favored the learning of a great deal of physics and technology concepts.

References

- Asimov, I. (1968). Try science fiction as a teaching aid, *The Physics Teacher*. 6, 416.
- Barnett, M., Wagner, H., Gatling, A., Anderson J., Houle, M., & Kafka, A. (2006). The Impact of Science Fiction Film on Student Understanding of Science. *J Sci Educ Technol*. 15, 179.
- Berne, R. W. & Schummer, J. (2005). Teaching Societal and Ethical Implications of Nanotechnology to Engineering Students Through Science Fiction. *Bulletin of Science, Technology & Society*. 25 (6), 459-468.
- Bixler, A. (2007). Teaching Evolution with the Aid of Science Fiction. *The American Biology Teacher*. 69. 337-340.
- Blasco, P.G., Mònaco, C.F., De Benedetto, M.A., Moreto, G., & Levites, M.R. (2010). Teaching Through Movies in a Multicultural Scenario: Overcoming Cultural Barriers Through Emotions and Reflection. *Family Medicine*. 42(1), 22-4.
- Blasco, P. , Blasco, M. , Levites, M. , Moreto, G. & Tysinger, J. (2011). Educating through Movies: How Hollywood Fosters Reflection. *Creative Education*, 2, 174-180.
- Cavelos, J. (1999). *The science of Star Wars*. New York: St. Martin's Press.
- Chandler M. D. (2002). Start Using "Hollywood Physics" in Your Classroom! *The Physics Teacher*, 40, 420.
- Daley, B. (2004). A Project-Based Approach: Students Describe the Physics in Movies. *The Physics Teacher*, 42, 41.
- Dark, M. L. (2005). Using Science Fiction Movies in Introductory Physics. *The Physics Teacher*, 43, 463.
- Everitt, L. R. and Patterson, E. T. (1999). Electromagnetism in the movies. *The Physics Teacher*, 37, 511.
- Fraknoi, A. (2002). Teaching Astronomy with Science Fiction: A Resource Guide. *Astronomy Education Review*, 1(2).

- Frieden, J. A. & Elliott, D. W. (2007). Teach with movies: using the storytelling power of movies to motivate students. *Teacher Librarian*, 34 (3), 61.
- Kakalios, J. (2005). *The physics of superheroes*. New York: Gotham Books.
- Palacios, S. L. (2007). El Cine y la Literatura de Ciencia Ficción como Herramientas Didácticas en la Enseñanza de la Física: Una Experiencia en el Aula. *Rev. Eureka. Enseñ. Divul. Cien.*, 4(1), 106-122.
- Rogers, T. (2007). *Insultingly Stupid Movie Physics: Hollywood's Best Mistakes, Goofs and Flat-Out Destructions of the Basic Laws of the Universe*. Sourcebooks Hysteria.
- Rose, C. (2003). How to teach biology using the movie science of cloning people, resurrecting the dead, and combining flies and humans. *Public Understand. Sci.* 12, 289–296.
- Smith, D. A. (2009). Reaching Nonscience Students Through Science Fiction. *The Physics Teacher*, 47, 302.
- Weiner, A. (2007). *Don't Try This at Home! The Physics of Hollywood Movies*. Kaplan, Inc.: New York.
- Wolverton, M. & Stern, R. (2002). *The science of Superman*. New York: i Books.

Acquisition of general competences using project-based learning

Laport, Francisco; Dapena, Adriana; Castro, Paula M. and Vazquez-Araujo, Francisco J.

Computer Engineering Department, Universidade da Coruña, Spain.

Abstract

During years, professors of higher education focused on the outcome of the assimilation of information through learning (i.e., in the acquisition of knowledge). In a European context, the Bologna Process has accelerated and spread the process of defining explicit learning outcomes for higher education programs, including those in terms of general competences and transferable skills.

Our teaching experience in engineering degrees have shown that these students have difficulties for understanding the math basics of some disciplines. For greater effectiveness in knowledge acquisition, we consider as an essential issue the inclusion of laboratory activities based on computer simulations performed using software. For acquiring those general competences and transferable skills, our proposal also includes several projects in which our students must develop skills such as communication, teamwork or problem solving. We have observed that such projects allow students the development of their creativity, an improvement in oral and written communication, and also an optimal training for the B.S. degree project work and even for their future professional life.

Keywords: *Bologna Process; competences; engineering degrees; project-based learning; transferable skills.*

1. Introduction

The "Developing future skills in higher education" report, elaborated by the European Commission, distinguishes between knowledge, skills, and competences. *Knowledge* is defined as the outcome of the assimilation of information through learning. *Skill* means the ability to apply knowledge and use know-how for completing tasks and solving problems (which can be cognitive or practical). This report also classifies the main skills relevant for higher education students in three groups: the first one, cognitive skills (analytical, critical, reflective, creative thinking); the second group, methodological skills (time management, problem-solving, decision-making, learning strategies, planning, and digital skills), and finally, social skills (interpersonal communication, teamwork, conflict management and negotiation, intercultural understanding). *Competence* means the proven ability to use knowledge, skills, and personal, social and/or methodological abilities, in work or study situations for professional and personal development. The EACEA/Eurydice (2014) considers that in a competence-centered curricula the role of the higher education is "to develop the skills and competences of graduates necessary to find a job". However, this objective is not a simple task.

The Engineering Subject Centre (2005) recommended different teaching styles for developing skills and general competences, for example, role-play, research exercises and study cases. However, it does not discuss curriculum-wide teaching strategies which could include examples or practical exercises. Chadha (2006) presents a model of curriculum development which can be adapted to fit a teaching framework for the development of skills at undergraduate level. Some recent papers (see Sonseca et al (2015) and Rutten et al. (2012)) show how to design courses for acquiring general competences and main skills. The contribution of this paper is the design of such a course throughout our experience in engineering degree courses.

We have observed that the students of the Bachelor of Science degree in Computer Engineering and Computer Science have difficulties with the understanding of math basics used in several disciplines. We are critical about the traditional model based on theoretical lectures in which definitions and exercises are explained from a theoretical point of view. According to our background, we can say that the combination of both visual learning with conceptual learning is much more effective than that only using non-visual learning strategies. Therefore, we propose a change in the learning process towards Project-Based Learning (PBL) (Thomas (2000)) using technology-based tools. For such a purpose, and from an engineering and applied perspective, in recent years we have developed different laboratory activities based on computer simulations performed using software tools such as Matlab/Simulink or similar. These activities have been designed not only focusing on writing code for a specific task, but also on testing the students' comprehension about the

materials previously covered by means of traditional theoretical lectures. We also propose different projects oriented to exploit the “rich world” of signal processing moving away from the idea of tasks strictly based on doing code.

In this paper, we will show a set of projects designed according to the idea that students can be able to achieve the specific competences established for a course in Digital Information Processing, but also transferable skills and general competences associated to higher education. Notice that both theoretical and laboratory activities are related to the acquisition of knowledge and specific competences, while projects are clearly designed to acquire those general competences.

This paper is organized as follows. In section 2, we show general ideas for two theoretical lessons. Section 3 includes the experimental activities, and Section 3 describes our proposals for the projects afore mentioned. Finally, Section 4 is devoted to some conclusion remarks.

2. Theoretical Lessons

Digital information processing is referred to gather, manipulate, store, retrieve, and classify recorded information. In computing, this information processing includes the use of algorithms for data transforming and/or manipulating. These concepts are studied throughout several courses of the Bachelor of Science degree in Computer Engineering and Computer Science.

In this section we will show two lessons used in the subject *Digital Information Processing* corresponding to the third year of this degree. Each lesson lasts two hours fully devoted to theoretical concepts and plus an additional hour for solving problems.

2.1 Lesson 1: Signal Transforms

The content of this lesson begins with the explanation of one-dimensional transforms and their properties. Transform theory has played a key role in many data processing areas for many years, and it continues to be a hot topic of great interest in both theoretical and applied works.

Although only some of these transforms are explained in detail throughout those theoretical lectures, we emphasize the Fourier transform because of its wide range of applications. Therefore, this lesson will be organized as follows,

- 1) Introduction to the Fourier transform.
- 2) The discrete Fourier transform.
- 3) Properties of the discrete Fourier transform.
- 4) Other transforms: Discrete Cosine transform and Hadamard transform.

2.2 Lesson 2: Signal Classification

The material of this lesson is mainly oriented to the introduction in machine learning as well as its possible applications to the field of digital information and signal processing. It is important to say that there is another course of this degree devoted to delve into these concepts.

Both machine learning and data mining have become in recent years very relevant disciplines in the computation area. Moreover, their good performance for Big Data analysis and knowledge extraction promises a great future for both paradigms. We focus on a lesson devoted to the fundamental aspects of machine learning and to the math basics of simple classification algorithms. Our proposal also includes the applicability of statistical concepts for the extraction of significant features of the signals.

Therefore, this theoretical lesson will be organized as follows,

- 1) Introduction to Machine Learning.
- 2) Supervised versus unsupervised learning.
- 3) Feature extraction and dimensionality reduction, which is known as Principal component analysis (PCA).
- 4) Simple classifiers: k-Nearest Neighbors (KNN), Linear Discriminant Analysis (LDA), and so on.

3. Laboratory Activities

We have observed that our students of the Bachelor of Science degree in Computer Engineering and Computer Science usually consider the laboratory lectures as activities where writing code is the objective task. However, we are interested in the interpretation of results as a means of applying theory to practice. For this reason, we provide material as a guide for the practical activities to be done by students.

Each laboratory activity is scheduled to two hours. In each session our students must answer a simple questionnaire designed to determine their knowledge acquisition.

3.1 Laboratory Activity 1: Filtering

In this activity we propose that the students develop software using Octave or Matlab to observe the effect of different filters. Our objective is the understanding of the relationship between time and frequency-domain using simple examples.

For this purpose, we provide a tutorial with a general scheme of filtering in the frequency-domain. Figure 1 shows a summary of this scheme for guiding the student work, and is given by the following steps,

- 1) Generate a sine signal.
- 2) Transform the signal to the frequency-domain.
- 3) Generate low-pass filters with different cut frequency.
- 4) Filter signals using these low-pass filters.
- 5) Apply the inverse Fourier transform for signal recovering.

For each step, we provide code snippets and examples. Then, the student uses this code to generate the sum of sine signals and filters them using low- and high-pass filters. As an example, we propose the filtering of recorded music to simulate quality of AM and FM. Finally, the visual representation and the audition of both the original and the recovered signals allow students the observation of the influence of each filter.

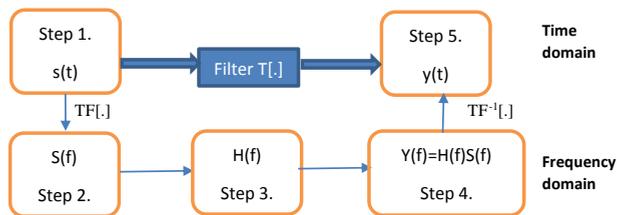


Figure 1: Summary of the tutorial about Fourier transform.

3.2 Laboratory Activity 2: Signal Classification

Following the same approach as done in Lesson 1, the objective of this practical exercise is again not only to write some code, but an adequate analysis of results. After that, the student should be able to understand the importance of extracting interpretable knowledge from previously incomprehensible data and of recognizing the huge variety of problems and real situations for its use. For this reason, we provide material as a guide for the student in these practical sessions.

For this purpose, we give a tutorial with the necessary steps to classify simple data using supervised algorithms. Figure 2 summarizes the main sections appeared in that tutorial. In it, each step is presented and explained together with a code snippet, as follows,

- 1) Given two patterns, randomly vary frequency and/or amplitude to generate 200 training sine signals for each pattern.
- 2) Extract statistics from the generated signals (mean, standard deviation, maximum value, minimum value, etc.) as features for their classification.
- 3) Create and train several classifiers with the selected features (LDA, Quadratic Discriminant Analysis or QDA, Support Vector Machine or SVM). These classifiers are given as functions of Octave or Matlab.
- 4) Generate a minimum number of 200 test signals of each class.

5) Classify these signals using the previously obtained classifiers.

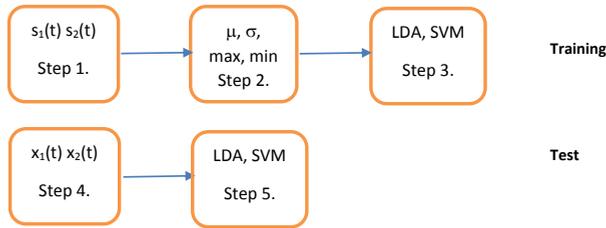


Figure 2: Summary of the tutorial about signal classification.

Following the tutorial, the student can be able to classify the signals considering two or more features. Finally, our students must evaluate the performance of each classifier using well-known metrics. For a better understanding, we also ask them to propose some experiments whose performance be bad, medium or high in terms of classification results.

4. Proposed projects

We consider that the courses for all the education levels, but especially in higher education, must be designed in order to guarantee that students achieve some important cognitive, methodological, and social skills. For this reason, we have proposed several projects with the following characteristics,

- The project is done by groups of three students, which allows us to obtain social skills like interpersonal communication, teamwork, conflict management, or negotiation.
- The professor provides the project idea while the student creates the framework (defines final objectives, selects software, etc.) which develops cognitive skills, such as creative thinking, and methodological skills, such as time management, problem-solving, decision-making, learning strategies, planning or digital skills.
- The students must present to the audience the projects following the rules for the B.S. degree final work by means a written document and an oral defense. One student of each group defends the oral work. The other two students and the professor form a tribunal that evaluates this defense using the rubrics in Table 1, where we define eight items of evaluation. The first two items are related to the content of the presentation/report; the third of them is devoted to determine the presentation/report's quality from the students' critical reasoning; the fourth one evaluates the additional resources used throughout the presentation/report; the fifth item controls the presentation time; the next two items describe how the student

communicates the topic to the audience and finally, the last item tests the student's knowledge achievement by means of their answers to tribunal's questions. For writing communications skills, additionally to the first common four items, we include the report correction in terms of written language. Both rubrics for the evaluation of oral and written communication skills define a range between 1 and 4 of acquisition of these skills, corresponding respectively to poor and excellent levels. As a result, the highest qualifications are respectively 32 and 20 points. Table 2 defines the values range that determines the achievement level of those skills.

This type of evaluation provides the acquisition of cognitive skills, and it is also a good training for future oral communications in their academic or professional life.

- The professor initially recommends several printed references, although the student must look for information using other sources, especially the digital ones. This is strongly connected to the methodological skills.

Thus, we present the following projects to the students.

4.1. Project 1: Photo Retouching

The general idea is the design of an application for photo retouching using 2D filtering (smoothing, enhancing, etc.). In this project, the student must look for information about 2D transforms, which is an extension of the lesson devoted to signal transforms, as explained in Subsection 2.1. We will recommend the book of González et al. (2002), for example.

4.2. Project 2: Image Compression

The idea is the design of software for image compression. The students must investigate about the utilization of 2D transforms in JPEG and MPEG. It is especially interesting to compare DCT and Hadamard transforms. It is also necessary to understand the theoretical concepts of *quantization* and *coding*. The recommended book could be the same as before.

4.3. Project 3: Detection of Pathologies

The ElectroEncephaloGraphy (EEG) signals can be used to detect certain pathologies in sick patients. The idea of this project is the creation of a machine learning algorithm to classify data of real patients. The student should look for information about preprocessing techniques and signal analysis in EEG, which is also connected to the lesson devoted to signal transform (see Subsection 2.1). Moreover, the search of algorithms convenient for EEG classification is also mandatory, which is related to the introduction of machine learning done in the corresponding lesson proposed in Subsection 2.2. For this task, we recommend the book of Cohen (2014) and the data set provided in Andrzejak et al. (2001).

Table 1: Rubric for oral and written communication skills.

	<i>Low (1p.)</i>	<i>Medium (2p.)</i>	<i>High (3p.)</i>	<i>Excellent (4p.)</i>
<i>Content (Both)</i>	<i>Incomplete</i>	<i>Complete, badly motivated and concluded; technically poor</i>	<i>Complete, correctly motivated and concluded; technically poor</i>	<i>Complete, correctly motivated and concluded; technically good</i>
<i>Organization, structure (Both)</i>	<i>Disorganized and illogically sequenced</i>	<i>Only partially organized and sequenced</i>	<i>Mostly organized and sequenced</i>	<i>Organized and logically sequenced</i>
<i>Critical reasoning (Both)</i>	<i>None</i>	<i>Limited</i>	<i>Well done but incomplete</i>	<i>Well done emphasizing relevant aspects</i>
<i>Additional resources (Both)</i>	<i>Not included</i>	<i>Limited, irrelevant</i>	<i>Mostly effective and relevant</i>	<i>Effective, high quality resources</i>
<i>Time (Oral)</i>	<i>Not adjusted</i>	<i>Adjusted but incorrectly distributed</i>	<i>Adjusted and correctly distributed</i>	<i>Adjusted and correctly distributed, even dynamically</i>
<i>Corporal language (Oral)</i>	<i>No visual contact; wrong gestures</i>	<i>Partial visual contact; right gestures</i>	<i>Mostly visual contact; right gestures</i>	<i>Correct</i>
<i>Expression (Oral)</i>	<i>Poor vocabulary, not clear; wrong tone</i>	<i>Mostly poor vocabulary, clear; wrong tone</i>	<i>Mostly rich vocabulary, clear; mostly correct tone</i>	<i>Rich vocabulary, clear; right tone</i>
<i>Interaction (Oral)</i>	<i>None</i>	<i>Answers with some doubts</i>	<i>Mostly answers without doubts</i>	<i>Correct answers even creating debate</i>
<i>Language (Written)</i>	<i>Poor vocabulary; grammatical errors and misspellings</i>	<i>Mostly poor vocabulary, some grammatical errors and misspellings</i>	<i>Mostly rich vocabulary and correct language</i>	<i>Correct</i>

Table 2: Range for determining acquisition level of oral and written communication skills.

	Low	Medium	High	Excellent
Oral skills	1-10	11-20	21-30	31-32
Written skills	1-6	7-12	13-18	19-20

4.4. Project 4: Creation of Electronic Musical Instruments

Since our students also follow other courses covering Arduino design, we propose the design of a custom sensor-based electronic musical instrument composed of three elements: sensors, an acquisition device, and a synthesis environment. This additive synthesis is directly related to FM and AM modulation that describes a signal as a combination of elementary trigonometric functions (see Subsection 3.1).

5. Conclusions

In this paper we introduced two lessons for a course of Digital Information Processing. Since students suffer from difficulties to solve problems directly associated to theory, but not to understand their real applications, we proposed four projects oriented to develop work general skills, including oral and written communication skills. The impact of this proposal on student evaluation is expected to be in terms of better rates and higher number of students attending the exam. Moreover, for further courses we will incorporate the “*flipped classroom*” methodology using videos for teaching theoretical contents, thus gaining time potentially used for doing problems or practical activities and projects.

Acknowledgments

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References

- Andrzejak, R. G., Lehnertz, K., Mormann, F., Rieke, C., David, P., & Elger, C. E (2001). Indications of nonlinear deterministic and finite-dimensional structures in time series of brain electrical activity: Dependence on recording region and brain state. *Physical Review E*, 64(6).

- Chadha, D. (2006). A curriculum model for transferable skills development. *Engineering Education*, 1(1), pp. 16-24.
- Cohen, M. X. (2014). *Analyzing neural time series data: theory and practice*. MIT Press.
- EACEA/Eurydice (2014). *Modernisation of Higher Education in Europe: Access, Retention and Employability 2014*. Eurydice Report. Luxemburg Publications Office. http://eacea.ec.europa.eu/education/eurydice/documents/thematic_reports/165EN.pdf.
- Engineering Subject Centre (2005). *Engineering Subject Centre guide: Supporting key skills in engineering*. UK: The Higher Education Academy Engineering Subject Centre.
- González, R. C., Woods, R. E. (2002). *Digital Image Processing*. Prentice Hall-International Edition.
- Rutten N., van Joolingen W. R., van der Veen J. T. (2012). The learning effects of computer simulations in science education. *Computers & Education*, 58(1), pp. 136-153.
- Thomas, J. W. (2000). *A review of research on project-based learning*. San Rafael, CA: Autodesk Foundation, 13, 1-45.

A framework for the evaluation of educational development programs in higher education in Chile

Beatriz Moya^a, Héctor Turra^a, and Denise Chalmers^b

^aCenter for Teaching Development and Innovation, Universidad Católica de Temuco, Chile. ^bOffice of the Deputy Vice Chancellor Education, University of Western Australia, Australia

Abstract

This paper outlines the experience of evaluating the impact of educational development in Chilean higher education drawing on the example of the Universidad Católica de Temuco. The aim is to demonstrate the importance of implementing a robust and flexible evaluation and impact framework to identify the effectiveness of education development programs.

The rationale and processes that informed the development of the evaluation and impact framework are described and then illustrated with one example, the Faculty Learning Communities (FLC) program. The example shows how the overall framework is contextualised in a specific program, drawing on indicators and outcomes to demonstrate its flexibility and robustness.

The rich evidence gathered has been used to inform the educational developers on the effectiveness of their work, and the faculty participants on their knowledge and practice. Just as importantly, it has informed the institution about the impact of the programs and student engagement. The evaluation framework provides a Chilean example informed by international best practice.

Keywords: *educational development; evaluation; Chile; higher education*

Introduction

A developing trend in Higher Education Institutions is to seek measures of impact. This is seen in the assessment of research, such as the extensive research assessment reviews carried out in The UK and Australia, but is becoming apparent in educational development. Yet there is no consensus about what constitutes quality (Harvey & Mason, 1995), or the nature of impact (Land, 2004). However, a strong argument has been made that ‘impact’ needs to be understood as ‘evidencing value’ (Bamber & Stefani, 2016), integrating measurement and experience when defining the object of evaluation and the methodology.

A related issue is the use of institutional level performance indicators of effectiveness and impact. The significance of educational development work risks becoming invisible because broad level indicators may not provide evidence of institutional enhancement. Bamber and Stefani (2016) suggest the use of a situated and nuanced approach. Educational development itself is an example of the interplay between individuals and their environments (Knight, Tait & York, 2007; cited in Hoessler, Godden & Hoessler, 2015).

The task of measuring the effectiveness and impact of educational development has long been recognised (Kreber & Brook, 2001; Kirkpatrick, 1998; Chalmers et al., 2012; Stes et al., 2007), though traditional approaches to the evaluation of the diversity and flexibility of educational development have been considered weak. Hoessler et al. (2015) have argued for a holistic approach that embraces analyses that are messy, however, it is unlikely to meet the corporate needs of institutional reporting.

Chilean higher education context

The Chilean Ministry of Education has provided funds to improve higher education institutions’ capacity to implement curricular reform. One of its main strategies was the creation of centres with a focus on Teaching, Innovation and Technology (CINDA, 2009).

In 2007, The Universidad Católica de Temuco (UCT) became pioneer with the establishment of the Teaching Development and Innovation Center - Centro de Desarrollo e Innovación de la Docencia, (CeDID) (Pey & Chauriye, 2011). UCT is located in the south of Chile and serves one of the poorest regions of Chile, including a significant Mapuche population.

In common with the few centres that were also established at this time, CeDID’s functions were to support the development of the new educational curriculum model and train faculty members in student-centred teaching strategies (Universidad Católica de Temuco, 2007).

Rationale for developing an evaluation and impact framework

The Chilean Higher Education Presidential Advisory Committee (Reich, et al., 2011) established a need for measurable targets. However, as a new Centre, a comprehensive framework to evaluate the impact of these programs had yet to be established. CeDID's measures used between 2007-2010 were centred on numbers of staff and students participating, satisfaction ratings of students and staff, and other largely anecdotal sources (Chalmers et.al., 2012; Kreber & Brooke, 2001)

The need for a robust evaluation framework for educational development programs was recognised, but the lack of Chilean examples led CeDID to develop a framework informed by international best practice.

By 2013, CeDID there were five Faculty Learning Communities (FLC) with the common purpose of transforming the teaching and learning process. Each FLC used a different approach and this diversity presented challenges to identifying meaningful ways to evaluate impact. The traditional quantitative performance indicators were insufficiently nuanced to capture the qualitative changes taking place.

The development of the CeDID evaluation framework began formally by the end of 2013, building on the work of an Australian project (Chalmers et al., 2012) which had already established the theoretical underpinnings of a framework. Over a period of four years, CeDID extended Chalmers' work (Chalmers & Gardiner, 2015) to ensure that it applied to all CeDID's educational development activities and disciplines (Turra & Moya, 2016).

Faculty Learning Communities (FLC)

FLCs are self-regulated groups (Cox, 2013), which build knowledge through shared reflection (Buysee et al., 2003). They create collective work groups to improve teaching and learning (Thompson et al., 2004).

At UCT, FLC processes start by analysing the situational factors of their courses (Fink, 2003), searching for, implementing, and evaluating new suitable teaching and learning strategies. In collaboration with CeDID consultants, faculty members developed teaching practices and resources and trialled these with their students.

As the implementation concludes, FLCs demonstrate their concern about evaluating the implementation of the teaching initiatives through research, which aligns with one of the goals of FLCs identified by Arthur (2016), such as the production of knowledge, in this case, oriented towards the teaching and learning enhancement in university settings.

CEDID extended its educational development evaluation framework over the following four years to ensure that it could be flexibly applied to all of its programs, and particularly those located in the disciplines (Turra & Moya, 2016).

CeDID's methodology to develop its evaluation and impact framework

The flexible yet robust evaluation framework approaches the diverse needs of:

- Faculty to make judgments about their teaching;
- CeDID to evidence the impact of their programs;
- The University to inform its attainment of its planned goals; and finally
- The Ministry of Education on the effectiveness and impact of the funded programs

The CeDID Evaluation Framework drew on Guskey's five-level model, which identifies where educational development programs can demonstrate impact (Chalmers & Gardiner, 2015). These are 1) Teachers' reaction to the development program; 2) Conceptual changes in teachers' thinking; 3) Behavioural changes in the way teachers use the knowledge, skills and techniques learners; 4) Changes in organisational culture, practices, and support and; 5) Changes in student learning, engagement, perception, study approaches.

There are four types of quality indicators for each level. These indicators have been designed to evaluate the effectiveness of a specific programs' practices and processes. These also identify any changes or outcomes (Chalmers & Gardiner, 2015). Together, they provide a "comprehensive picture of the quality of teaching and learning activities" (Chalmers & Gardiner, 2015).

The different types of indicators (input, process, output, and outcome) (Chalmers, 2008) and sources of evidence (Chalmers & Hunt, 2016) were organised into CeDID's evaluation matrix. This matrix also guides data analysis and evaluation, and frame the outcomes and mechanisms (Bamber & Stefani, 2016).

The logic and principles used to develop the overall framework have been applied to the FLC program to demonstrate how it can be used to accommodate the specific goals and contexts of different programs. (Contact Author 1 for full details of the CeDID evaluation framework matrix of indicators of quality and impact).

Impact evaluation of the Faculty Learning Communities (FLC) program

The evaluation framework for the FLC identified that changes in Faculty reaction and changes in practice were critical areas to evaluate and so finding meaningful indicators of these was important to identify.

Change in Faculty reaction

Input, process, output, and results indicators were identified, including suitable instruments and data that would need to be collected (see Table 1).

Table 1: Indicators and instruments to evaluate Faculty Reaction

	INPUT	PROCESS	OUTPUT	RESULT
Faculty Reaction	Number of FLCs. Number of faculty in FLCs. Number of faculty with a student-centred approach before course transformation (ATI). Number of teachers with SLAs before course transformation	Course transformation protocol. Analysis of course situational factors. Syllabi analysis. Satisfaction in formation process (workshops, certificate program). Course transformation/innovation dissemination initiatives	Number of FLCs. Number of faculty in FLCs. Number of faculty with a student-centred approach after course transformation. Number of teachers with SLAs after course transformation.	Deep learning oriented redesigned syllabi. Faculty satisfaction in workshop program. Teacher satisfaction with SLAs in transformed courses.

The information collected in this category helps the institution and individuals understand how faculty responds to the different transformation initiatives. The number of people involved in learning communities serves as a general indicator for UCT authorities and MECESUP to account for the efficient use of the resources.

Indicators such as the results from the Approaches to Teaching Inventory (ATI) and the procedural ones contribute to the improvement of the programs (FLCs and certificate program). As an example, to assess disposition to student focused-teaching, FLC faculty completed the validated ATI (Trigwell & Prosser, 2004). This instrument served as a diagnostic tool (input) that allowed CeDID's professionals to analyze possible difficulties.

The results showed that the teachers' approaches were skewed towards the Information Transfer / Teacher-focused approach. This data was necessary for the consultants and the teachers themselves to be aware of when approaching the course re-design process.

Working with teachers who assume students learn by "being told about things" (Boore & Deeny, 2012, p.127) provide the consultants with courses of action that need to be undertaken. Examples of these are the reflection of the teaching practice, analysis of beliefs towards teaching, and mediation towards a student-centred approach to teaching.

The value of using the ATI extended beyond its initial use in informing the professional and curriculum development programs. When re-administered, it helped consultants identify whether there have been changes to the teaching approaches.

Change in Faculty practice

Changing teacher-centred practices to student-centred teaching has proven to be difficult to achieve. Teachers may change their understanding to being more student-centred, however, changing their teaching practices is not an automatic progression (Chalmers & Gardiner,

2015). Evaluation frameworks, therefore, need to include indicators that will identify and track changes in teaching practices (see Table 2 below).

Table 2: Indicators and instruments to evaluate changes in faculty practice

	INPUT	PROCESS	OUTPUT	RESULT
Change in practice	Academic performance survey results for faculty members in FLCs before course transformation. Approaches to Teaching before course transformation (ATI Trigwell & Prosser, 2004).	Course transformation Protocol. FLC Protocol.	Academic performance survey results for faculty members in FLCs after course transformation. Approaches to Teaching after course transformation (ATI Trigwell & Prosser, 2004).	Transfer of innovation to other courses. New innovation grants of faculty involved in course transformation for escalation. Presentations/ conferences sent by faculty in FLCs about pedagogical innovation.

The Academic Performance survey is an instrument applied to students at the end of every semester and has a focus on faculty performance. Although this is students' perception, it is an indicative record of past teaching performance and provides a general sense of common teaching, before and after course transformation. Similarly, the ATI results show whether faculty implement student-centred learning strategies.

The indicators target the dissemination of the innovation through academic work and how the current programs impact on courses outside the scope of FLCs. Faculty Learning Communities have been a critical educational development strategy for building faculty teaching capacity and curriculum transformation at UCT. The monitoring of these indicators has allowed the identification of an incipient FLC practice cycle. In this sequence, the results obtained by the first FLCs have been instrumental in generating interest in other teacher groups. Also, experienced FLCs have obtained access to institutional funding, thus facilitating the permanence and scaling of the initiatives.

Conclusion

In this paper, we have described the rationale and processes of developing an evaluation and impact framework on the effectiveness of education development programs that inform participants, institutions and the sector, contextualised in one Chilean university and illustrated using one example of a complex educational development program. The example shows how the overall evaluation framework can be flexibly and robustly contextualised through identifying specific indicators and outcomes.

References

Arthur, L. (2016). Communities of practice in higher education: professional learning in an academic career. *International Journal for Academic Development*, 21(3), 230-241.

- Bamber, V., & Anderson, S. (2012). Evaluating learning and teaching: institutional needs and individual practices. *International Journal for Academic Development*. 17(1), 5-18. <https://doi.org/10.1080/1360144X.2011.586459>
- Bamber, V., & Stefani, L. (2016). Taking up the challenge of evidencing value in educational development: from theory to practice. *International Journal for Academic Development*. 21(3), 242-254. <https://doi.org/10.1080/1360144X.2015.1100112>
- Boore, J. & Deeny, P. (2012). *Nursing education: Planning and delivering the curriculum* (1st ed.). Los Angeles: Sage.
- Buysee, V., Sparkman, K., & Wesley, P. (2003). Communities of practice: connecting what we know with what we do. *Exceptional children*. 69(3). 263-277. Retrieved from <http://journals.sagepub.com/doi/abs/10.1177/001440290306900301>
- Centro de Desarrollo e Innovación de la Docencia. (2012). *Proyecto FIAC1101*. Retrieved October 3, 2017, from http://www.CeDID.uct.cl/img/info8/resumen%20fiac1101_3_20140830215352.pdf
- Centro de Desarrollo de Innovación de la Docencia. (2014). *Proyecto PM UCT1402*. Retrieved October 3, 2017, from [http://www.CeDID.uct.cl/img/info8/resumen_pm1402_\(1\)_1_20150611145055.pdf](http://www.CeDID.uct.cl/img/info8/resumen_pm1402_(1)_1_20150611145055.pdf)
- CINDA, (2009). *Diseño curricular basado en competencias y aseguramiento de la calidad en la educación superior*. Retrieved from <https://www.cinda.cl/download/libros/39.pdf>
- Chalmers, D. (2008). *Indicators of university teaching and learning quality*. ALTC: Sydney. <http://www.catl.uwa.edu.au/publications/national-tqi/reports>.
- Chalmers, D., Stoney, S., Goody, A., Goerke, V. & Gardiner, D. (2012). *Identification and implementation of indicators and measures of effectiveness of teaching preparation programs for academics in higher education (Ref: SP10-1840)*. Final Report. <http://www.olt.gov.au/>
- Chalmers, D. & Gardiner, D. (2015). The measurement and impact of university teacher training programs. *Educar*, (1)51, 1-28. <http://dx.doi.org/10.5565/rev/educar.655>.
- Chalmers D., & Hunt, L. (2016). Evaluating teaching. *HERSDA Review of Higher Education*, 3, 25-55. <http://herdsa.org.au/herdsa-review-higher-education-vol-3/25-55>
- Cox, M. (2013). The impact of communities of practice in support of early-career academics. *International Journal for Academic Development*. 18(1), 18-30. <https://doi.org/10.1080/1360144X.2011.599600>
- Fink, D. (2003). *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. San Francisco, CA: Jossey-Bass.
- Harvey, L., and Mason, S. (1995), *The Role of Professional Bodies in Higher Education Quality Monitoring*. Birmingham, QHE.
- Hoessler, C., Godden, L. & Hoessler, B. (2015). Widening our evaluative lenses of formal, facilitated, and spontaneous academic development. *International Journal for Academic Development*, 20(3). 224-207. doi: [10.1080/1360144X.2015.1048515](https://doi.org/10.1080/1360144X.2015.1048515).
- Kirkpatrick, D. L. (1998). *Evaluating training programs: The four levels* (2nd ed.). San Francisco, CA: Berrett-Koehler

- Kreber, C. & Brook, P. (2001). Impact evaluation of educational development programmes. *International Journal for Academic Development*, 6(2), 96–108.
<https://doi.org/10.1080/13601440110090749>
- Land, R. (2004). *Educational development: discourse, identity and practice*. McGraw-Hill Education.
- Ministerio de Educación de Chile. (2007). Resolución exenta n 01454. Retrieved on September 13th 2017 from
http://www.mecesup.cl/usuarios/MECESUP/File/antiores/2006/REX_1454_adjudicaFIAC2006.pdf.
- Pey, R., & Chauriye, S. (2011). *El proceso de innovación curricular de las universidades del consejo de rectores*. Retrieved on September 13th 2017 from http://sct-chile.consejodirectores.cl/documentos_WEB/Innovacion_Curricular/I.Innovacion_Academica.pdf
- Reich, R., Machuca, F., López, D., Prieto, J., Music, J., Rodríguez-Ponce, E., & Yutronic, J. (2011). Bases y desafíos de la aplicación de convenios de desempeño en la educación superior de Chile. *Ingeniare*. 19(1). 8-18. <http://dx.doi.org/10.4067/S0718-50062016000300009>
- Stes, A., Clement, M. & Van Petegem, P. (2007). The effectiveness of a faculty training programme: Long-term and institutional impact. *International Journal for Academic Development*, 12(2), 99–109. Retrieved from
<http://www.tandfonline.com/doi/abs/10.1080/13601440701604898>
- Thompson, S., Gregg, L., & Niska, J. (2004). Professional learning communities, leadership, and student learning. *Research in Middle Level Education*. 28(1). 1-15. Retrieved from <https://files.eric.ed.gov/fulltext/EJ807417.pdf>
- Trigwell, K., & Prosser, M. (2004). Development and Use of the Approaches to Teaching Inventory. *Educational Psychology Review*, 16(4), 409-424. doi:10.1007/s10648-004-0007-9
- Turra, H. & Moya, B. (2016). *Evaluación de impacto de innovaciones pedagógicas en la formación de ingenieros*. Paper presented at Congreso Sociedad Chilena de Educación en Ingeniería, Pucón, Chile.
- Universidad Católica de Temuco. (2007). *Modelo educativo UC Temuco*. Retrieved on September 13th 2017 from <https://uct.cl/archivos/modeloeducativo.pdf>
- Veneros, D. (2012). *Unidades de mejoramiento docente logros y desafíos*. Retrieved on September 13th 2017 from
http://www.mecesup.cl/usuarios/MECESUP/File/2012/seminarios/denise/2PresentacionDianaVeneros_SeminarioDeniseChalmers_3-9-12.pdf.
- Wenger, E., McDermott, R. A., & Snyder, W. (2010). *Cultivating communities of practice: a guide to managing knowledge*. Boston, MA: Harvard Business School Press.

Implementation of game methods in the preparation of management personnel

Vinichenko, Mikhail V.; Melnichuk, Alexander V. and Makushkin, Sergey A.

Department of Personnel Management and Personnel Policy, Russian State Social University, Russia.

Abstract

The search for increasing the effectiveness of training leads to the use of innovative technologies, which include gaming. The purpose of this article was to identify the extent and nature of the introduction of gaming methods in the educational process of the Russian State Social University. The paper used a comparative analysis of students and teachers assessment of management training using the gaming of the educational process. The empirical basis was the results of a sociological survey conducted using the Google Forms online service. 48 teachers and 178 students took part in the sociological survey. As a result, it was possible to establish that the introduction of gaming in the university is controversial. Despite the understanding of the usefulness of gaming by university employees, only 29% of teachers constantly use gaming methods. Students are dissatisfied with this, noting that gaming techniques are either fragmented (54%) or not used at all (37%). Students with a desire to participate in classes with gaming methods, especially in an integrated business game. Achievement of students' success at the class increases their social status. The study showed that the potential for gaming is not fully used.

Keywords: *Gaming methods; efficiency; educational process; motivation.*

1. Introduction

In the last decade, the dynamics of the development of society is increasingly growing. This affects all sectors of the economy and education, including. At school with students, gaming technologies are increasingly being used in accordance with the age of schoolchildren. Teachers, taking into account the peculiarities of child psychology, effectively and fairly professionally apply gaming methods in the course of training. The situation is somewhat different in the sphere of higher education. Students of the Y and Z generation, who have grown up on the wide application of computer games, social networks (Zdravkova, 2016), technologies and innovative models in all spheres of life (Landers & Armstrong, 2017) come to universities. The pedagogical staff, especially the scientists of the older generation (generation X), often build their training courses, relying on the classical forms of conducting classes, and rarely using gaming methods. As a result, there is a contradiction between the need for students to obtain information, professional knowledge, competencies in the form in which they are accustomed, which is more accessible and better absorbed and the ability, the desire of the faculty to gamble the learning process.

The problem of gaming is the concern of theoreticians and practitioners around the world. This refers to business, government structures, representatives of the education sector (Alvarez et al, 2017, Miguel et al, 2017, Rogach et al, 2017). Age and gender specificities of gaming are studied (Marti-Parreno et al, 2016), security and confidentiality (Baxter et al, 2016), cognitive learning (Lumsden et al, 2016). Game methods are considered when forming a youth policy (Vinichenko et al, 2017).

The main result of the study of Spanish scientists at the University of Valencia was that the use of Information and Communication Technologies (ICT) and classroom gaming in the classroom improved the motivation and training of students, especially those who were less motivated (Serrano and Fajardo, 2017). American scientists for this offer to use regular online assignments (Moore & Pearson, 2017). Another group of researchers suggests using game methods in making managerial decisions (Wittenbaum et al, 2004).

As the study of the Spanish scientists Polytechnic University of Valencia shows, the use of smartphones in physics training has generated satisfaction and interest among students (Sans et al., 2015).

Using the Dutch experience of gaming training of students with the help of the business game Logistic Support Game (LSG), it was possible to enhance the joint activity of trainees with the distribution of roles for the development of competencies, interaction and autonomy (Martinetti et al., 2017).

German scientists proposed the integration of gaming management systems and training to create gaming techniques (Bartel et al., 2017). Russian researchers have revealed the advisability of using gaming techniques in developing a reserve pool (Kirillov, et al., 2017).

In general, the use of gaming methods increases the effectiveness of education.

2. Methodology

To improve the effectiveness of training managers in the Russian State Social University (RSSU) was chosen course for the gaming of the educational process. In January 2016, a program was developed in which the gaming process was divided into three phases, identifying at the end of each stage the nature and extent of the introduction of gaming methods into the educational process. The first stage of 2016-2017, the second phase of 2018-2019, the third phase of 2020-2021.

The first stage began with the study of the Russian and international experience of gaming training. May 18, 2016, the Moscow Scientific and Practical Conference was held: "Geomification: business and society", which examined and summarized the latest achievements in gaming and defined the tasks for the application of gaming methods in the training of management personnel. The whole faculty of the Russian State Social University was involved in the process of gaming. Each teacher developed and applied his own version of gaming methods in conducting lectures and practical exercises. The main organizer of gaming was the faculty of management. Representatives of the business partners of the ANCOR personnel holding and the group of companies HeadHunter were involved in the management system to transfer experience of gaming. They conducted master classes and demonstrated in practice gaming methods of teaching.

In the interest of assessing the effectiveness of work at the first stage, a methodology was developed to identify the extent and nature of the introduction of gaming methods in the process of training managerial staff and the satisfaction of students and teachers with the gaming of the educational process. Complexly applied methods of typological, historical-genetic, comparative analysis. The empirical basis was the results of a sociological survey conducted among students and teachers of the Russian State Social University in January 2018. The survey was conducted using the Google Forms online service. The collected data were processed using mathematical statistics. Then, a comparative analysis of the assessment of students 'and teachers' training of managerial personnel on specified indicators was made based on the gaming of the educational process. 48 teachers and 178 students took part in the sociological survey.

The aim of the study was to identify the extent and nature of the introduction of gaming methods in the educational process through the assessment (satisfaction) of students and teachers of the gaming process in the university.

3. Results

The importance of gaming technology for obtaining knowledge and professional competencies was noted by 37.5% of teachers, 27% were of secondary importance and 15% were not singled out among other technologies. The opinions of students on this issue generally coincided with the assessment of teachers. The importance of gaming technology is also put on the first place - 43% of students, a secondary role was noted by 29% and 13.5% of students named equal in relation to other technologies in the matter of obtaining professional competencies.

Constraints to the introduction of gaming technology for teachers are a large amount of time to prepare for the lesson (52%), a large training load (46%) and lack of motivation for the teacher to conduct classes with elements of the game (23%).

A special place was occupied by the answers to the question: "How often are gaming technologies used during the lesson?" Most teachers sometimes use gaming technology (62.5%). Only 29% of teachers use gaming technology on a continuous basis. This is dissatisfied with the students. 54% of respondents noted that only gaming techniques were used fragmentarily, and 37% of students were disappointed that the classes were generally conducted without the use of gaming technologies.

21% of teachers believe that the achievements (successes) received by students in classes using gaming methods increase the social status of students; 37.5% noted the indirect nature of such influence, and 21% of respondents expressed the opinion that they do not influence the social status of students at all. The students themselves gave more votes in favor of indirect influence (41%) and increasing their social status from success in gaming sessions (30%). 11% of students noted that such activities have no effect on their social status or have little effect.

Almost half of the teachers believe that practical training with the elements of the game is the most interesting for students (46%). On the second place were lectures with the game methodology (25%). Students were also more interested in practical exercises with elements of the game (54%) and lecture classes with gaming techniques (21%).

The assessment of the technologies used by teachers and students did not coincide. Teachers often use case studies (71%), brainstorming (59%) and complex business games

(48%) most often in class. Students would like to see complex business games (62%), case studies (45.5%) and brainstorming (42%).

4. Discussion

The importance of the influence of gaming technology on the quality of obtaining knowledge and professional competencies was highly appreciated by 37.5% of teachers and 43% of students. The rest of the teachers give them or a secondary role or do not give them any significant significance at all. This indicates a weak awareness of teachers about the possibilities of such forms of conducting classes, little experience in the use of gaming methods, low motivation and the lack of a desire for continuous development of pedagogical skills.

The nature of the impact of achievements (successes) in games with gaming technology on social status was higher by students (30%), (teachers - 21%). Students really felt the growth of their authority after a successful performance in such occupations. This should be used by teachers and more actively use this resource to improve the quality of classes. The effect of the "winner" in the classes and after their graduation is sometimes not clear, but a prolonged nature.

The greatest interest among teachers and students is caused by employment with the use of gaming technologies, and priority is given to practical exercises using gaming techniques. In these classes, students are most deeply involved in the process of obtaining knowledge, and the competences obtained are firmly and easily accessible.

The opinion of students and teachers on the frequency of the use of gaming methods did not coincide. Teachers believe that they pay much attention to the use of gaming technology in the classroom - 29% - constantly, 63% sometimes they use it and 5% never. Students have confirmed only that gaming methods are sometimes used by teachers (54%). Only 4% of students agree that gaming technology is often used in the classroom and 36.5% of students said that they have never been used. This suggests that not all gaming technologies are perceived by students as such. The understanding of gaming technology among teachers and students is different. The differences in the vision of this process for the generation X and for the youths of the Y and Z generations are affected. In this regard, it is advisable for teachers to more deeply study the needs and forms of information perception among modern students.

In gaining knowledge and professional competencies, students give priority to complex business games, case studies and brainstorming. These classes were highly appreciated in view of the fact that they develop a set of professional competencies, a systematic approach

to the development of the profession is being formed. Teachers are more focused on creating content for distance learning, so the case study is highlighted.

Positive assessment of students and teachers received a practical lesson with a division into two opposing teams and a group of experts. On it students in a game form receive soft skills and hard skills. However, sometimes after the session, there is an element of conflict and discontent among the losers of the contest participants and group leaders, dissatisfaction with the assessment of experts.

5. Conclusion

The introduction of gaming in the university is controversial. With an understanding of the usefulness of gaming, only 29% of teachers constantly use gaming methods in class. The deterrent effect is influenced by such factors as a large amount of time to prepare for a lesson with gaming technology, a large training load and a lack of motivation for the teacher to use gaming methods in class. Students with a desire to participate in classes with gaming methods, as they are more deeply absorbed in the material, professional competencies are acquired, and the achievement of success in the class increases the social status of students. The most popular among them is the complex business game. However, the potential for gaming is not fully used.

To improve the effectiveness of the educational process, it is necessary:

1. Actively study and develop the theory and methodology of the gaming process of the educational process, participate in international conferences on gaming.
2. To improve the motivation of teachers and students to intensify the preparation, conduct and participation in classes using gaming methods.
3. To propagate the best practice of gaming of classes by conducting master classes, demonstration classes involving business partners and colleagues from other universities.
4. To introduce advanced gaming technologies into the educational process using electronic means, distance learning.

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References

- Alvarez, S., Nikendei, C., & Schultz, J.-H. (2017). Development of a didactical training concept for peer tutors in gross anatomy. *Anatomical sciences education*, 10(5), 495-502.
- Baxter, R.J., Holderness, D.K., & Wood, D.A. (2016). Applying basic gamification techniques to it compliance training: evidence from the lab and field. *Journal of information systems*. 30(3), 119-133. DOI: 10.2308/isys-51341.
- Bartel, Alexander, Hagel, Georg, & Wolff, Christian (2017). Effective integration of gamification and learning management systems for creating gamified learning arrangements. *3rd International Conference on Higher Education Advance. HEAd`17*, Polytechnic University of Valencia, Valencia, Spain. <http://dx.doi.org/10.4995/HEAd17.2017.5349>.
- Kirillov, A.V., Ushakov, D.S., Vinichenko, M.V., Makuchkin, S.A., & Melnichuk, A.V. (2017). Career opportunities for the management's personnel reserve. *Eurasian journal of analytical chemistry*, 12(5b), 723-733.
- Landers, R.N., & Armstrong, M.B. (2017). Enhancing instructional outcomes with gamification: An empirical test of the technology-enhanced training effectiveness model. *Computers in human behavior*, 71, 499-507. DOI: 10.1016/j.chb.2015.07.031.
- Lumsden, J., Edwards, E.A., Lawrence, N.S., Coyle, D., & Munafo, M.R. (2016). Gamification of cognitive assessment and cognitive training: a systematic review of applications and efficacy. *JMIR SERIOUS GAMES*. 4(2), e11. DOI: 10.2196/games.5888.
- Marti-Parreno, J., Segui-Mas, D., & Segui-Mas, E. (2016). Teachers` attitude towards and actual use of gamification. *2nd International Conference on Higher Education Advance. HEAd`16*, 21-23 June 2016, Valencia, Spain, *Social and Behavioral Science*, 228, 682-688.
- Martinetti, Alberto, Parada Puig Jorge Eduardo, Oude Alink, Charlotte, Thalen, Jos & van Dongen, L.A.M. (2017). Gamification in teaching maintenance engineering: a Dutch experience in the rolling stock management leaning. *3rd International Conference on Higher Education Advance. HEAd`17*, Polytechnic University of Valencia, Valencia, Spain. DOI: <http://dx.doi.org/10.4995/HEAd17.2017.5332>.
- Miguel, S.E., Sorolla, G.R., Gato, M.E.P., & Guillem, J.M.A. (2017). Gamification in business training. *DIRECCION Y ORGANIZATION*, 62, 35-40.
- Moore, K.A., & Pearson, B.J. (2017). Soft skills in an online class. *Horttechnology*, 27(5), 583-585.

- Rogach, O.V., Frolova, E.V., & Ryabova, T. M. (2017). Academic Competition: Rating Race. *European Journal of Contemporary Education*, 6(2), 297-307. DOI: 10.13187/ejced.2017.2.297.
- Sans, J. A., Manjón, F. J., Cuenca-Gotor, V., Giménez-Valentín, M. H., Salinas, I., Barreiro, J. J., Monsoriu, J. A. & Gomez-Tejedor, J. A. (2015). Smartphone: a new device for teaching Physics. *1st International Conference on Higher Education Advances, HEAd'15*. Polytechnic University of Valencia, Valencia, Spain. DOI: <http://dx.doi.org/10.4995/HEAd15.2015.332>.
- Serrano, J. Javier & Fajardo, Felix (2017). The ICT and gamification: tools for improving motivation and learning at universities. *3rd International Conference on Higher Education Advance. HEAd'17*, Polytechnic University of Valencia, Valencia, Spain. DOI: <http://dx.doi.org/10.4995/HEAd17.2017.5286>.
- Vinichenko, M.V., Karácsony, P., Demcheko, T.S., Ilina, I.Y., & Makuchkin, S.A. (2017). Improvement of youth personnel policy: *Social inspection. Eurasian Journal of Analytical Chemistry*, 7b(12), 1069–1077.
- Wittenbaum, G.M., Hollingshead, A.B., Paulus, P.B., Hirokawa, R.Y., Ancona, D.G., Peterson, R.S., Jehn, K.A., & Yoon, K. (2004). The functional perspective as a lens for understanding groups. *Small Group Research*, 35(1), 17-43.
- Zdravkova, K. (2016). Reinforcing social media based learning, knowledge acquisition and learning evaluation. *2nd International Conference on Higher Education Advance. HEAd'16*, 21-23 June 2016, Valencia, Spain, *Social and Behavioral Science*, 228, 16-23.

The Personality of a University Teacher from the Perspective of Academic Culture

Sirotová, Mariana ^a; Frýdková, Eva ^b

^a Department of Pedagogy, University of St. Cyril and Methodius in Trnava, Philosophical Faculty, Slovak Republic, ^b Department of Pedagogy, University of St. Cyril and Methodius in Trnava, Philosophical Faculty, Slovak Republic

Abstract

This submission deals with the personality of a university teacher as a member of an academic environment and a bearer of academic culture. The work also includes the results of a quantitative survey executed via questionnaire presenting the FF UCM (Philosophical Faculty of St. Cyril and Methodius University in Trnava) students' views of university teachers and their perception of the teachers in the educational process of the university. The analysis of the opinions confirms that students not only perceive the personal qualities of a teacher, but also evaluate his/her educational activity.

Keywords: *academic culture; academic atmosphere; university teacher; university student; survey of students' opinions and attitudes.*

University education develops and changes in the same way as the society itself. Therefore, the role and position of a university teacher from the perspective of his/her educational activity, scientific research as well as his/her overall influence of the students' personality also changes. The preference of materialism in the life style of people and a lack of respect for the principles of humanism and democracy in society, that bring changes into human behavior, reflect themselves in the university academic culture as well. University teachers should, therefore, be the bearers of positive academic behavior, which is manifested in all of their activities, but in connection with the development of students' personalities mainly in their educational activity. How did the educational activity of a university teacher change compared to the past? The question is not difficult, but despite this we find out by analyzing the literature, that the fundamentals of educational activity haven't changed. What has changed is the environment in which it takes place.

Z. Kolář and co. (2012) describe a university teacher as an expert in a particular scientific discipline, who has a mandate to lead the teaching of university students in his/her field of expertise and at the same time fulfills tasks in the area of science, introduces and defends the results of his/her research work, that leads to preparation of scientific and educational texts. According to D. Linhartová (In. Slavík and co., 2012) the term university teacher encompasses his/her pedagogical activity. The author puts the teacher into a role of an expert who takes part in the students' socialization, in boosting students' responsibility for their education and in the position of a manager she sees him/her as a facilitator of students' education. She also emphasizes the teacher's duty to analyze his/her own activity and its educational impact. It is obvious that educational activity occupies a priority position in the work of a university teacher, through which he/she develops the personality of university students. Therefore, it requires an adequate attention.

When taking into account general psychological findings, that social behavior is also a function of the behavior of others, it is necessary to pay attention to the teacher-student relationship, which is often characterized by dominance. The teacher acts as a guide and leads a student's educational activity and, therefore, he/she is often declared, but also perceived by students, as the superior. In the interest of developing students' personality and improving the quality of the educational process it is necessary to change this incorrect identification into a partner-like relationship, which is mutually enriching. J. Vašutová (1999) states, that a teacher-student relationship should be collegial with just a slight level of superiority. This level might be expressed as a teacher's natural authority. "A teacher should be the bearer of the culture of relationships he/she requires from his/her students, he/she should be a person of principle, but at the same time tolerant, have high expectations of the students as well of his/her own pedagogical performance in the educational process and last but not least a teacher should be friendly and respectful of a student's personality.

The attitudes and relationships of a university teacher are reflected into the attitudes of the students toward the teacher himself” (Sirotová, 2012, p. 127).

In general, culture is defined as a set of habits, relationships, institutions, arts and other features characterizing a society or a social group. The term itself derives from a Latin word *cultura*, which means “to cultivate” (Gažová, 2009). Culture is part of social relationships in a society, relationships and behavior of individuals in a certain social group and it is necessary to cultivate it continually. Each social group is characterized by a certain culture of relationships, which derive from a historical nature of its origin and are modified by the society itself. Materialism, focus on consumption, lack of respect towards humans, which are endemic in society today, all spread into the university environment as well and become reflected in academic culture. Academic culture is formed by the academic atmosphere in the university environment. V. Šucha (2010, p. 69) considers academic atmosphere an abstract category, that cannot be defined, it can't be written down, but either we feel it or we don't. He compares it to human love, which cannot be clearly defined, but a person feels it, when he loses it. “Academic atmosphere in the life of a university is needed in the same way as love is needed in the life of a human”. Although the author states that academic atmosphere cannot be described, he offers its “building blocks”, which are:

- Public discussions, which are the tools of an idea, of its defense, but also a public test of its acceptability and value. Public discussions should be neither personal nor offensive to other participants despite the fact that they are open and often critical. Criticism shouldn't be considered a personal attack as well as a personal attack shouldn't be hidden behind an expert critique. Open, meaningful public discussions help create a positive academic atmosphere.
- Public lectures are activities offering room not only for university teachers and students, but also for scientists and experts from the field as well as the public. An appropriate combination of subjects, careful preparation, promotion and realization of public lectures can help enrich the academic atmosphere of a university in the expert area.
- Openness towards art and culture as a tool of social communication and as a space for social contact and penetration. Organization of art related events could enliven the academic stereotypes and open “the windows into another world”, which is seemingly fundamentally different from the world of education.
- The ethical dimension. V. Šucha (2010, p. 72) emphasizes its importance with the idea: “without ethics and morality a university would be just a shiny apple that is rotten to the core”. He recommends, that every university prepares its own ethical codex and sets up ethical commissions, which would deal with prevention and judgement of contentious cases

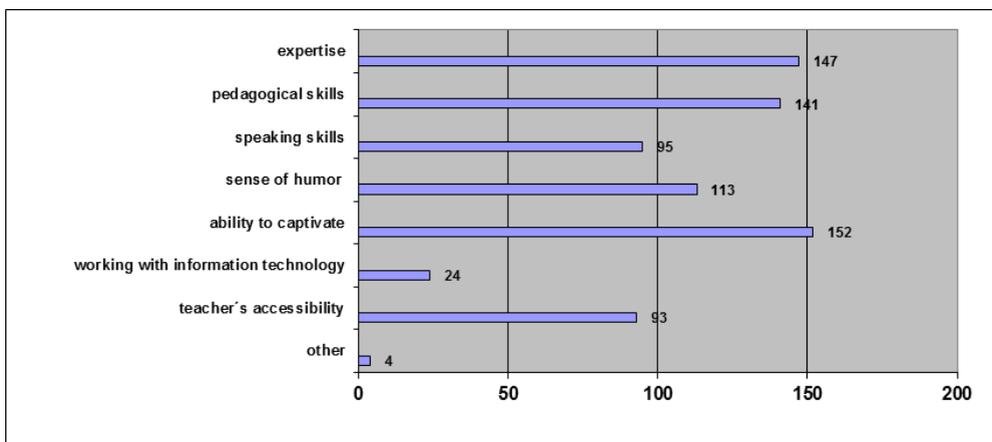
of codex violations. A university should find a way to include morality and ethics into the basic principles of its existence.

The personality of a member of an academic environment dominates in all of the above stated “building blocks”. The members of an academic environment are university teachers, university students, scientific workers and other experts. And, as stated above, the academic culture is formed mainly by the relationships and behavior of the members of an academic environment. University teachers should be the bearers of academic culture, should create a positive academic atmosphere and thus influence the development of students’ personalities as well as the overall development of a university environment and its positive view in society. It is, therefore, necessary to focus on the issues of university teachers’ personality and of its perception by university students.

The theoretical background is followed by a survey focusing on the satisfaction of FF UCM students with various aspects of their study. The survey took place in the year 2017 with the help of a questionnaire created by a commission of quality control at FF UCM and its aim was to find out how satisfied the students were with their choice of school, the process and organization of their study, with accommodation and board, free time, but also with the study subjects, the realization of the teaching and the teachers. In regards to the subject of this work, we only present the results pertaining to university teachers.

So far (at the time of preparation of this article the survey hadn’t been concluded) 193 students of bachelor and master study programs from all years of study and study programs at the FF UCM took part in the survey. The collected student opinions are stated in total sums for the entire sample of survey subjects with selected quotations of verbal comments.

A university teacher is evaluated by students based on basic qualities characterizing his/her personality. It means his/her education, skills, personality traits and character.



The “other” category related mainly to the personality traits of a teacher and his/her character. It, however, also included assessments closely related to the previous criteria. A university teacher is positively assessed when he/she possesses these traits (in order from the most commonly occurring to the less often occurring ones):

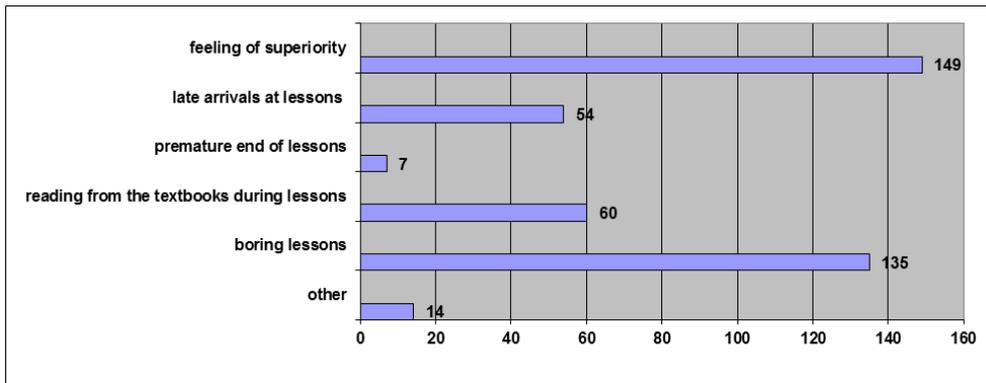
- Humane approach and amiability – it means the love of students expressed in the quality of pedagogical work, in an attempt to get to know them as much as possible and to consider them equal partners. (... “Humanity, respect of students. I’m presenting a case of a real professor of our faculty. Deep respect.” “Humane approach, amiability, immense willingness to help and a perfect knowledge of his field...”, ...”Humanity, but there are some, who lack this quality”...).

- Willingness – an attempt to accommodate the students or to help is one of the most valued qualities among students. It depends, however, how this willingness is interpreted, as it may involve a wide range of possibilities. (...”every time, there is problem, either a technical one or we don’t know something, or anything, we know we can write to him and he always sorts it out.” , ... “She is always willing to give advice even if a student approaches her with a problem not directly connected to her competencies or to the competencies of the department”).

- Pleasant conduct and appearance - are often important factors influencing students’ activity and motivation to work. (... “overall appearance and impression are also very important, ...”it is apparent that he really enjoys the subject he teaches and this enthusiasm transfers onto students”, ... “stylishly dressed” ...).

- An ability to motivate and captivate – according to students a teacher is good, when he/she is able to captivate via his/her knowledge, organization of his/her work, his/her qualities, but also if he/she is able to motivate. (...”some repeat themselves quite often, they are boring, unable to captivate students”..., ...”his preparation for lessons – a teacher should know what he wants to teach the students and his teaching shouldn’t be chaotic” ... , ...”character traits are fine, ability to engage, enliven the lessons, humanity”).

There had also been a few negative phenomena and teachers’ qualities emerging from the students’ statements. Teachers should try to eliminate these in their work.



The “other” category included mainly the phenomena already listed in the graph. However, the most common had been the following:

- Irresponsibility – students negatively view teachers who are not thorough in their work, in preparation for their pedagogical activity or in their realization and those who arrive late for their lessons. (... “not prepared for lessons, boring, prolonging the lessons at the expense of students’ free time (sometimes even the whole break)”, ... “unpunctuality, repeating the same thing over and over (and then being late with the curriculum)”).
- Teacher’s arrogance, inadequate conduct – students often stated their experience with teachers’ arrogance and mockery of students. (... “the way he expresses himself at lessons is shown through elements of haughtiness and ridicule of students”..., ... “arrogant, superior approach to students, he makes us feel it at almost every lesson, ... “self-conceited, he acts in a condescending way toward some students, he belittles them in front of the group,...”.)
- Bias, preferring some students over others – university teachers often don’t realize the consequences of their biased behavior towards some students or obvious preference of some students over others. (... “non-transparency and a change of rules during the semester”, ... “Superficiality, subjective approach to students based on sympathies, unfairness”).
- Inadequate presentation skills – a university teacher should possess adequate verbalization skill and according to students’ statements should be able to present his knowledge not only verbally, but also via technical tools, which are currently considered desirable and necessary. (... “awfully long slides, which we have to transcribe and at the same time take notes of what he talks about – impossible to do two things at once”, Data-video projectors, which are in all the class-rooms, are used by less than half of the teachers.”)

Teachers that behave arrogantly and are unable to captivate students through their expert knowledge or through linguistic or technical tools are not viewed as experts by students. It is, therefore, natural that these negative qualities stated by students cannot lead to a positive influence of students or to the improvement of educational process quality and a teacher's own work.

Based on the students' statements from the questionnaire, we can assert that university teachers are subjected to much demand relating not only to the time needed for preparation for lessons, but also to the qualities of their character, their knowledge and the ability to captivate. This demand undoubtedly influences students' perception of a teacher, but also their overall attitude towards individual study subjects and university study itself. Both the positive and the negative qualities the students mentioned were based on their own experience. According to students a teacher should, first of all, be able to captivate, be an expert in his/her field of study with adequate pedagogical skills, but at the same time also be humane, have a good sense of humor and be willing to help. These qualities seem to have a significant influence on students' attitude toward their university study.

References

- Gažová, V. (2009). *Acta Culturologica - Úvod do kulturológie* (zväzok 17). Bratislava: FF UK.
- Kolář, Z. & kol. (2012). *Výkladový slovník z pedagogiky*. Praha: Grada.
- Sirotová, M. (2012). Rola vysokoškolského učiteľa v procese habituálnej edukácie a jej vplyv na hodnotovú orientáciu študentov. In: *Pedagogica actualis III*. Trnava: UCM. 125-141.
- Slavík, M. & kol. (2012). *Vysokoškolská pedagogika*. Praha: Grada.
- Šucha, V. (2010). *Aby univerzita mala dušu*. Bratislava: VEDA.
- Vašútová, J. (1999). *Vybrané otázky vysokoškolské pedagogiky*. Praha: UK.
- Zákon o vysokých školách 131/2002 Z. z. slovenská republika*

The impact of a teacher's motivational influence on pupils' emotional experience

Sirotová, Mariana^a; Lobotková, Alžbeta^b

^aDepartment of St. Cyril and Methodius in Trnava, Philosophical Faculty, Department of Pedagogy, Slovak Republic, ^bDepartment of St. Cyril and Methodius in Trnava, Philosophical Faculty, Department of Pedagogy, Slovak Republic

Abstract

It is necessary to pay increased attention to the managing of emotions, to motivation and empathy, which requires most of all an individual approach to pupils in the process of teaching. This scientific study focuses on motivating and demotivating reactions of teachers and their impact on positive and negative emotional experiences of pupils during lessons. Our goal was to find out, if there are differences between emotional experiences of pupils taught by teachers, whose motivating had a positive character, and pupils of those teachers, whose motivating had a negative character. We have executed a quantitative research supplemented by a qualitative analysis. The research sample consisted of students of higher secondary education and their teachers from secondary vocational schools in the Trenčín district. Ten teachers and 375 students had been included in the research. We have identified the differences with the help of a method of microteaching analysis with the use of analytical scheme AS9 (author is Miron Zelina) and a modified version of the Questionnaire of Emotional Experience. The questionnaire contains entries focusing on positive and negative experiences. In both variables we have observed a statistically significant difference with students taught by Teacher 10, whose motivating had a negative character.

Keywords: *Microteaching analyses; index of motivation; questionnaire of emotional experience; lesson; teacher; pupils.*

1. Theoretical background

The issue of motivation is one of the most topical and most discussed pedagogical theories and praxes of today. It is the level of motivation and the teacher's activities related to it that influence not only the quality of pupils' results, but also their emotional experience. The statement of M. Nakonečný (2014), that without motivation there are no emotions and without an emotion there is no motivation, makes us conclude that emotions and motivation are closely interconnected. In the sense of the above stated W. McDougall and M.B. Arnold (In Nakonečný, M. 2000) also considered emotions to be an organic component of motivation. Also K.B Madsen (In Nakonečný, M. 2000) introduces two basic concepts of the relation between emotions and motivation. He states that emotions are on one hand a sign of motivation and on the other hand they become the condition for motivation. According to the author these two concepts are not in opposition with respect to the fact that some emotions directly motivate (fear) and that some names for the emotions are at the same time also motivating terms. Motivation is thus a way of achieving a set goal and emotions form the result of a situation that either supports or threatens the achievement of the stated goal.

The issue of emotion was also the research subject of R. Pekrun (1998). He proved that internal positive emotions have a positive influence on motivation, while negative emotions reduce motivation. In other words, to induce pupils' motivation a teacher should utilize their positive activating emotions and minimize the formation of negative ones. N. Eisenberg, et al., (In Schulze, R. - Roberts, R. 2007, p.79-80) supported this notion by stating that pupils with positive emotions, who approach new and different situations eagerly, are more likely to expose themselves to learning opportunities that help them understand the reasons for their emotional experiences and their subdued nuances. In regards to the school environment, it is the class itself, that in given moments influences pupils' experiences the most. Based on the afore-mentioned material, we must stress that the essence and quality of the teacher-pupil relations affects not only pupils' behavior, but also influences the level of educational and motivational impact, while at the same time affects the emotionality of teaching. There were other authors, who were trying to make the connection between motivation and emotions on an empirical level. They included U. Schiefele (1996), A. Erez and A. M. Isen and R. Pekrun (2002).

2. Motivational impact of a teacher on emotional experiences of pupils

Following the theoretical background we have conducted a research with an aim to find out, if there are differences between the degree of emotional experiences of pupils taught by teachers, whose motivating had a positive character and pupils of those teachers, whose motivating had a negative character. In particular we had postulated the following:

H1 We are assuming that there is a statistically significant difference in the degree of emotional experience between the pupils taught by teachers of individual groups.

The research sample was formed by teachers of secondary vocational schools in the Trenčín district (N=10) and the secondary school pupils of the higher secondary education from secondary vocational schools in the Trenčín district (N=375), which is approximately 3% of the total research population. From the total number of respondents 164 were male and 211 female. The Questionnaire of Emotional Experience (DEP36), whose author is J. Kožený, serves as a means for determining the frequency of positive and negative emotional experiences (Kožený, 1993). The original version of the questionnaire has 36 entries, in our case we created a modified version with 30 entries (15 questions for positive experiences and 15 for negative experiences). Pupils answers ranged on the original five level scale starting from never, not even for a moment (1), rarely, only for a moment (2), sometimes I felt like that (3), almost the whole time I felt like that (4), I felt like that the whole time (5). Cronbach's alpha of the questionnaire is 0.724.

Currently, we may encounter a number of models for systematic observation and a subsequent analysis of the educational process. Many models, however, focus on the activity of a teacher, but microteaching analyses enable us to judge the interaction between a teacher and a pupil and not just the result. For this reason we decided, with the help of analytical scheme AS9, whose author is M. Zelina, to observe the level of pupils' motivation induced by a teacher's verbal reactions. Besides motivation, it is also possible to observe to what extent a teacher's style is dictatorial as well as the development of pupils' individual cognitive functions. According to P. Gavora (2012, p. 65) with microteaching analyses an observer makes use of a record sheet directing his observation, where he/she records the occurrence of given phenomena. The record sheet was used to capture pre-recorded interactive units – sentences a teacher said to pupils, his/her thoughts and sentences used during lessons. At the conclusion, after adding up individual interactive units in appropriate rows, a researchers acquires an overall behavior profile of a teacher during his/her lessons. Subsequently, relevant indexes can be calculated. In our case it is the index of motivation ($I_m=A/R$).

2.1. Results

With the use of the microteaching analysis and the analytical scheme AS9 we observed to what extent a teacher induces motivation of pupils by his/her verbal reactions. Two lessons were recorded for each teacher. Altogether 20 lessons of 10 teacher were recorded. Each lesson was attended personally, which means we have executed a direct and complex observation. Subsequently we transcribed the course of events from each lesson and according to the chosen analytical scheme (AS9) we coded and arranged individual interactive units. Based on the number of interactive units in individual areas we calculated

the index of motivation for relevant teachers. The results of the analysis are presented in table 1.

Table 1. The index of motivation values (Im)

	Im		Im
Teacher1	1.82	Teacher 6	1.95
Teacher 2	1.07	Teacher 7	2.40
Teacher 3	1.72	Teacher 8	1.72
Teacher 4	1.55	Teacher 9	2.56
Teacher 5	1.39	Teacher 10	0.83

Source: own source

Only in the case of Teacher 10 the values were below 1.0, which means that his motivating influence had a negative character. Index of motivation for Teacher 10 represents an absence of motivating influence of pupils. Based on a deeper analysis we have discovered that in cases of Teacher 1, Teacher 2 and Teacher 8 their motivating influence also had a negative character, although their values were above 1.0. Teacher 1 used words conveying approval, praise and reward only as his “crutches” (...”good”, “good, correct”, “yes, good”...), which manifested itself in his final index of motivation. Index of motivation for Teacher 2 (1.07) represents more of a negative evaluation, which was manifested through degrading of pupils and disagreeing with their answers. His motivating had a predominantly negative character despite his Im value reaching above 1.0. Teacher 8 used strict instructions and pushed pupils to answer his questions, his use of words like “good”, “yes good”, “yeah” was rather stereotypical. Consequently, his score for category A increased, but it doesn't correspond to his real motivational influence. Despite his attempts to encourage pupils, it had a predominantly negative impact.

Subsequently we studied the intensity of research variables: positive emotional experience (EPP) and negative emotional experience (EPN) for individual teachers. Based on the LSD analysis, we then identified the differences between positive and negative emotional experience for individual research groups. The first group consists of pupils taught by teachers, whose motivating had a positive character compared to the pupils taught by teachers, whose motivating influence had a negative character. Table 2 presents the results of the comparison of individual research groups EPP (positive emotional experience).

Table 2. Comparison of individual research groups (index of motivation) in EPP (positive emotional experience)

Variable	Research group	F	p	
EPP	Ž_UIm3	Ž_UImn1	-1.123	0.717
		Ž_UImn2	-4.990	0.118
		Ž_UImn8	-6.029*	0.029
		Ž_UImn10	2.736	0.433
	Ž_UIm4	Ž_UImn1	4.228	0.148
		Ž_UImn2	0.361	0.905
		Ž_UImn8	-0.678	0.791
		Ž_UImn10	8.087*	0.015
	Ž_UIm5	Ž_UImn1	0.926	0.756
		Ž_UImn2	-2.941	0.339
		Ž_UImn8	-3.979	0.131
		Ž_UImn10	4.785	0.158
Ž_UIm6	Ž_UImn1	7.411*	0.011	
	Ž_UImn2	3.543	0.236	
	Ž_UImn8	2.505	0.321	
	Ž_UImn10	11.269*	0.001	
EPP	Ž_UIm7	Ž_UImn1	3.482	0.233
		Ž_UImn2	-0.385	0.898
		Ž_UImn8	-1.423	0.578
		Ž_UImn10	7.341*	0.028
EPP	Ž_UIm9	Ž_UImn1	-0.551	0.849
		Ž_UImn2	-4.418	0.139
		Ž_UImn8	-5.457*	0.031
		Ž_UImn10	3.308	0.317

Source: own source

*Notes.: EPP- positive emotional experience, Ž_UImx- (x)-number of a teacher, whose motivating had a positive character; Ž_UImn- (x)-number of a teacher, whose motivating had a negative character; F- Fisher Least Significant Analysis; p- the level of statistical significance;

The LSD analysis for the EPP variable revealed the following significant correlations. There was a statistically significant difference between pupils taught by Teacher 3, whose motivating influence had a positive character and pupils taught by Teacher 8, whose motivating had a negative character ($p= 0.029$) and whose pupils scored 6.03 points higher. The difference between pupils taught by Teacher 6 and pupils of Teacher 1 was 7.41 points and between pupils of Teacher 6 and Teacher 10 it was as high as 11.27 points. There was also a statistically significant difference between pupils of Teacher 7, whose motivating had a positive character and pupils of Teacher 10, whose motivational influence was negative ($p= 0.028$). Pupils of Teacher 7 scored 7.34 points higher in comparison with pupils of Teacher 10. The comparison between pupils of Teacher 9 and Teacher 8, whose motivating was negative, also produced a statistically significant difference ($p= 0.031$). In this case pupils of Teacher 8 scored 5.46 points higher compared with pupils of Teacher 9. Comparisons of individual research groups in EPN (negative emotional experience) are presented in Table 3.

Based on the LSD analysis of the EPN variable we found a statistically significant difference between pupils of Teacher 3, whose motivating was positive, and pupils of Teacher 8, whose motivating during lessons had a negative character ($p= 0.000$). In this case, however, the pupils of Teacher 8 had a 9.37 points higher score. In the case of pupils taught by Teacher 4, whose motivating was positive, we found statistically significant differences with pupils of Teacher 1 ($p= 0.027$) and Teacher 10 ($p= 0.025$), whose motivating had a negative character. The score of pupils taught by Teacher 4 was higher than the score of pupils taught by Teacher 1 by 5.42 points and in the case of Teacher 10 the difference was 6.26 points.

Table 3. Comparison of individual research groups (index of motivation) in EPP (negative emotional experience)

Variable	Research group	F	p	
EPN	Ž_UIm3	Ž_UImn1	-3.544	0.172
		Ž_UImn2	-4.743	0.076
		Ž_UImn8	-9.371*	0.000
		Ž_UImn10	-2.707	0.353
	Ž_UIm4	Ž_UImn1	5.423*	0.027
		Ž_UImn2	4.224	0.094
		Ž_UImn8	-0.404	0.850
		Ž_UImn10	6.260*	0.025
	Ž_UIm5	Ž_UImn1	3.587	0.151
		Ž_UImn2	2.389	0.353
		Ž_UImn8	-2.240	0.309
		Ž_UImn10	4.424	0.118
Ž_UIm6	Ž_UImn1	7.202*	0.003	
	Ž_UImn2	6.003*	0.017	
	Ž_UImn8	1.374	0.515	
	Ž_UImn10	8.038*	0.004	
Ž_UIm7	Ž_UImn1	6.722*	0.006	
	Ž_UImn2	5.523*	0.029	
	Ž_UImn8	0.894	0.676	
	Ž_UImn10	7.559*	0.007	
EPN	Ž_UIm9	Ž_UImn1	1.778	0.462
		Ž_UImn2	0.580	0.816
		Ž_UImn8	-4.049	0.056
		Ž_UImn10	2.615	0.344

*Notes: EPN- negative emotional experience, Ž_UImx- (x)-number of a teacher, whose motivating had a positive character; Ž_UImn- (x)-number of a teacher, whose motivating had a negative character; F- Fisher Least Significant Analysis; p- the level of statistical significance.

As was the case in EPP (positive emotional experience), in EPN (negative emotional experience), too, there were no differences between pupils of Teacher 5, whose motivating had a positive character, and pupils of teachers, whose motivating had a negative character.

In case of Teacher 6, whose motivating was positive, we discovered statistically significant differences with pupils of Teacher 1 ($p= 0.003$) and Teacher 10 ($p= 0.004$). Both teachers' motivating influence had a negative character and in both cases pupils of Teacher 6 scored higher. Between pupils of Teacher 6 and Teacher 1 the difference was 7.2 points and between pupils of Teacher 6 and Teacher 10 it was 8.04 points. The results for pupils of Teacher 7, whose motivating was positive, were similar to those taught by Teacher 6. There were statistically significant differences with pupils of Teacher 1 ($p= 0.006$) and Teacher 10 ($p= 0.007$), whose motivating had a negative character. Again in both cases pupils of Teacher 7 had a higher score. The difference was 6.72 points between pupils of Teacher 7 and Teacher 1, and 7.56 points between pupils of Teacher 7 and Teacher 10. In addition, we found a statistically significant difference between pupils of Teacher 7 and Teacher 2 (0.029). Pupils of Teacher 7 scored 5.52 points higher. With both the pupils of Teacher 5 as well as Teacher 9, whose motivating was positive, we found no differences with teachers, whose motivating had a negative character.

2.2. Discussion

The aim of the research study was to find out whether there are differences in the intensity of emotional experience between pupils taught by teachers, whose motivating influence had a positive character and pupils of those teachers, who motivated in a negative way.

Based on R. Pekrun's (1992) findings, as well as findings of other authors (Renninger, K.A – Hidi, S. 2006; Voss, J.F – Schauble, L. 1992), who emphasize that motivation impacts emotional experience and that a teacher's motivating and his/her style influence pupils' mental processing of information, we have set our research hypothesis. We have verified its validity via the questionnaire of emotional experiences and via microteaching analyses. We have found most differences with pupils taught by Teacher 10, whose motivating had a negative character. We have also discovered that in three cases (pupils of Teacher 4, Teacher 6, Teacher 7), whose motivating had a positive character, these pupils achieved higher score in both the positive as well as the negative emotional experience than pupils taught by Teacher 10. However, in two cases (Teacher 3, Teacher 9) pupils of Teacher 8, whose motivating had a negative character, scored higher in positive emotional experience than pupils of Teachers 3 and 9. We believe that this was a result of the fact that pupils felt no anxiety and that despite constant scolding they were in a good mood, they laughed, which also manifested itself in the research findings.

References

- Gavora, P. (2012). *Tvorba výskumného nástroja pre pedagogické bádanie*. Bratislava: SPN

- Nakonečný, M. (2000). *Lidské emoce*. Praha: Academia.
- Nakonečný, M. (2014). *Motivace chování*. Praha: TRITON.
- Pekrun, R. (1998). Schülleremotionen und ihre Förderung: Ein Blinder Fleck der Unterrichtsforschung. *Psychologie in Erziehung und Unterricht*, 44 (3), 230-248.
- Schulze, R., & Roberts, R. et al. (2007). *Emoční inteligence*. Praha: Portál.

Subtitling as a Teaching Tool for English for Specific Purposes' Students

Buil-Beltrán, Paula

Department of English and German Philology, University of Zaragoza, Spain.

Abstract

New technologies have invaded our daily lives, and as a consequence the use of computers and internet inside the classroom is progressively more frequent. At the same time, subtitling as a teaching/learning tool has become more popular. For that purpose, scholars such as Delabastita (1989), Sokoli (2006) or Talaván (2013) have been researching how the adaptation of these subtitling methods will have some influence in the learning/teaching process. Thus, the aim of this paper is to present an interlingual subtitling task in a class for English for Specific Purposes students (from a university degree of architecture), in order to improve their receptive skills (commonly known as listening and reading). Along these lines, this paper will explore the use of Task Based Learning in ESP classes and it will propose a teaching unit for further implementation in a university class of English for the degree of architecture, discussing the advantages and repercussions it may have for the acquisition and improvement of the aforementioned passive skills.

Keywords: *Subtitling; English for Specific Purposes; Task Based Learning; Passive Skills; Architecture.*

1. Introduction

The study of language teaching is something as old as time. There are theories that go back to the 16th Century. These theories prioritized grammar for the acquisition of a new language, however, a great amount of communication teaching can be also found, namely Brumfit & Johnson, 1979, Krashen & Terrell, 1983, Prabhu, 1987, Nunan, 1989. Since the implementation and development of technology, the focus of language research has changed, in order to adapt the studies to new improvements, combining technology with communication language teaching theories. For instance, recent studies have found that the use of video and subtitles, not only as a passive but also as an active tool, may help L2 students to develop better communication skills.

Along these lines, this paper will try to give a new overlook in this latest theory. It will combine a well-known teaching theory, Task Based Learning (TBL) with the introduction of a subtitling task in an English for Specific Purposes (ESP) class. The target students will be university students of the degree of architecture who attend an elective class of ESP with a B1/B2 level according to the Common European Framework of Reference for Languages (Council of Europe, 2001).

Thus, this preliminary study will be divided in three different parts. The first part will deal with TBL approach. The second part will introduce ESP and its main features to understand the needs of the students to which the project will be applied for. Finally, the third section will give a lesson example using subtitling as the main teaching tool and with the aim of further implementation in a real university class. During this last section, the use of subtitling videos inside the classroom will be explored including the justification of the selected corpus and a final part with the activity per se.

2. Task Based Learning Theory

Communicative Language Teaching theory (CLT) can be said to be born during the 80s through the researches made by Littlewood (1981) and Brumfit (1984). It tried to break with the established teaching methods, mainly based on the grammar teaching/learning. It is an open approach, which may be something positive as it has different motivations for language learning, and different kinds of teachers and individual students' needs. Moreover, as it is such an open approach that includes different interpretations which lead, at the same time, to other theories as the one that concerns this paper, TBL.

TBL theory has its origins on Prabhu (1987) studies, where he described second language acquisition methods giving an introduction to this new theory. It was followed by Nunan (1989) and Willis (1996), who took a deeper look in this new methodology. The main goal

of TBL is to present common situations to the students through the use of different tasks (Talaván, 2013).

One of the most important aspects of this theory is the so called *learning by doing*, which means that students learn through interactive tasks instead of using the traditional methods of presentation and practical repetition of linguistic elements. Nowadays, one of the most practical ways of achieving this is through the use of audiovisual media, and it is at this point where the use of new technologies (TIC) plays an important role.

This theory may have a great impact on ESP students, whose main goal is to acquire a reading knowledge that helps them in their future professional careers. This is the reason why, according to Willis (2016:7), the tasks may be based on a text presented in the L2 and the activities performed could be done on the students' mother tongue. It is at this point where a subtitling active task, as the one that will be presented in section 4, may be useful for the students, as its aim will be to work with a text in a foreign language and provide its translation into the student's mother tongue.

3. English for Specific Purposes

Over the last few decades, English has become the language employed in different specialized working areas. This is the reason why, the study of the distinctive features of English has become one of the most successful research fields (Fuentes Olivera & Samaniego Fernández, 2005). Moreover, this has also modified the students profile and their necessities, due to the fact that people in general have more opportunities to travel, either for working or tourism.

In this line, scholars like Català-Hall (2013:1) defined ESP as specific courses designed in order to answer the immediate necessities of the students that need practicing English in specific professional areas. According to Fuentes Olivera & Samaniego Fernández (2005), the term ESP has two different connotations, one for the pedagogical area that is, teaching English in different specialist areas such as economics or architecture, and another one in a more general area, using English in highlighted communicative situations. Both connotations are important in this study, as the main goal of the students will be to improve their English for their future careers.

Dudley-Evans & St. Johns (1998) agreed on a series of aspects that ESP may have, dividing them in absolute and variable characteristics. Some of the ones that concern this study are: 1) ESP is designed to meet specific needs of the learners, 2) ESP is centered on the language appropriate to these activities in terms of grammar, lexis, register, study skills, discourse and genre, 3) ESP may be related to or designed for specific disciplines, and ESP

may use, in specific teaching situations, a different methodology from that of General English (Dudley-Evans & St. Johns, 1998: 4-5).

Finally, it is worth mentioning that there are several types of ESP teaching, such as English for Academic Purposes (EAP) or English for Occupational Purposes (EOP). However, at the present, the most important one is the described above and English for Specific Academic Purposes (ESAP), which can be described as the English employed by university students during their academic researches and the publications that gather their findings (Jordan, 1997). Even so, this study has its main goal in ESP, as the students tested during the research are university students under a degree in architecture.

4. Subtitling as a learning/teaching tool

Nowadays, younger generations, are more used to learn through the use of TICs than through books, Caimi (2003). This is one of the reasons why the use of subtitles, which are defined by Diaz Cintas (2003: 195) as “written text [...] giving an account of the actors’ dialogue and other linguistic information which form part of the visual image (letters, graffiti, and captions) or of the soundtrack”, is a regular tool in the classrooms. Numerous are the researches in the field of the passive use of subtitles inside the classroom since their use seems to have a considerable pedagogical potential.

The use of subtitles in a passive and in an active way, where students have to create their own subtitles, is not really spread yet, as Letorla points out (2012). However, there are successful projects that prove its effectiveness. An example of this is LeViS (Socrates) funded by the European Commission Lifelong Learning Programme (Letorla, 2012). The study presented in this paper is going to propose a teaching unit whose main focus will be the creation of interlingual subtitles, taking into consideration Letorla’s (2012:63) assumptions that “it has been suggested that human beings are able to remember 10% of what they heard, 20% of what they visually perceive, and 80% of what they visually perceive and interact with”.

Finally, it is also important to highlight some of the advantages that Sokoli (2006) proposed for the use of subtitled audiovisual material in class. According to her, this material provides the student with three different learning methods (spoken language, printed text and visual information). It also helps both beginners and experienced learners to acquire general contents and vocabulary, and it could tear down the existing barrier between passive skills.

4.1. A Teaching Unit for further implementation

As has been previously mentioned, this paper is going to provide a teaching unit based on TBL for further implementation on a university class of ESP. In order to do so, a clip has been chosen to achieve the goal of improving the passive skills of the target students. Thus, a justification of its selection is going to be provided and then there will be a brief description of some activities that will be introduced during the class, dividing them in pre-viewing activities, viewing activities and post-viewing activities.

The selected class will be, as it is previously mentioned, a group of ESP students in the University of Zaragoza. Thus, the experimental group during this study will attend a class called “Inglés Específico I”. This is an elective course offered at the degrees of engineering and architecture in order to improve the students’ English skills. This course is divided in several modules, has one-year duration, and is rewarded with 4 ECTS credits. In order to course this subject, the students are required to have a B1 level, in accordance to the Common European Framework of Reference for Languages (Council of Europe, 2001), and the aim is to end up the course with a B2 level. This course has a professional and academic focus on the study and practice of the English language, aimed at the technical field. It is also important to highlight, that having a good level of common English might be useful, but the importance of the course deals with the domain of English as a technical language.

Hence, the corpus selection has been made according to some factors, although the conclusive one has been the students for which the activities will be created for. The clip is called “*Don’t build your home, grow it*” (Joachim, 2010). As the teaching unit is oriented to architecture students, the clip presents an architectural proposal that can be of interest for the selected students. At the same time, it is a short clip, with a length of 2 minutes and 50 seconds, which does not need to be cut for its use in class and may be suitable for a class with a maximum capacity of 30 students. Besides, the website that the video has been taken from (TED talks) offers the possibility of viewing its clips with or without subtitles, and it also gives the opportunity of downloading not only the clip but also the original script. Another important factor has been that it is an authentic video, which means that the speaker uses real language with hesitations and typical spoken language characteristics. Finally, it is also important to mention some of the linguistic characteristics that the video has. The speaker uses different grammatical structures, from present simple or progressive to past forms or conditionals, which makes the dialogue rich and suitable for the selected level (B1/B2). It also has a copious and very specific vocabulary, which may arouse the interest of a student who attends an ESP class.

The teaching unit will be divided in three different parts: pre-viewing, viewing and post-viewing. As Caimi (2013) points out, this type of activities are good in teaching contexts that made used of subtitling tasks, as it helps students to watch and work with the selected

video being aware of the tasks. Thus, during the pre-viewing activities the students will become aware of the video they are going to visualize; during the viewing activities they will have a chance of comprehending the video, reading the script and doing the main task; and finally, during the post-viewing activities, they will be able to show what they have learnt and express themselves with a short activity that may help them to develop the active skill of writing.

Hence, at the beginning of the class, the teacher will give the students just the title of the video they are going to watch, and s/he will encourage them to do a brainstorming to activate their previous English knowledge and discuss what the video may be about. After the brainstorming, the teacher will give them a short question/answer test about what they think the video could be about, helping them to have a better idea of what they are going to watch and activating their comprehension skills.

The second part of the class, or the viewing part, will start after the test. First, the teacher will play the video with audio but without image. During this process, the students will have the original script, with blank spaces to fill out while listening to the audio. During this part, the listening comprehension skill will be activated. Finally, the main task will be introduced. Now that the students have their original script complete, the teacher will play the video a second time; however, this time will be with both, audio and image on. In this part of the class, they will have to translate the video to their mother tongue, working with listening and reading skills.

The post-viewing part will consist of the final subtitling of the video, with their transcript the students will have to adjust the dialogues to the screen using the program *Aegisub* and taking care of the formal aspects of subtitling. To finish, the teacher will give them a question that they will have to answer according to their opinions: Do you think that the introduction of new materials in architecture will benefit architecture progress? Justify your answer.

These activities may help them to develop the four different commonly known skills, starting by a brief speaking debate while doing the brainstorming and ending up with a short composition of what they have learnt. However, the two most important aspects that the students will work with will be listening, as they have to complete the script by themselves, trying to understand every gist of the video, and reading, as they will have to read carefully and understand the text if they want to do a good translation.

5. Conclusion

The aim of this paper was to take a deeper look on TBL theory, in order to apply them to a further study on the use of subtitles as an active tool in a classroom of ESP. This paper

forms part of a wider study on the improvement of passive skills, listening and reading, in a class of ESP, which will be applied next year at the University of Zaragoza. One of the aims of this paper was to prove how previous theories can be adjusted and adapted to the new improvement in technology that has been made in the past few years. I firmly believe that the use of new tools inside the classroom can foster students learning and interest for English language.

Hereof, this paper has given a brief summary of the former theory, trying to apply it to the students that the study will be oriented to. It has shown that it may be useful for further researches on the field of the use of video and subtitles inside the classroom. It has also taken a look on the definition and main characteristics of ESP students, presenting a homogeneous group that will be used in order to prove the main theory of this study. Finally, it has introduced a teaching unit that will function as a guide for further study and implementation.

In the future, the perspectives are good. Every year more researchers are investigating on the use of subtitles inside the class. At this respect, this paper's aim is to be implemented, together with some other teaching units, in a class of ESP students in the University of Zaragoza. Once the study has been applied, conclusions can be draft on how effective this new methodology could be in order to improve, primarily, the students' passive skills. This will help ESP students to develop a better comprehension of documents and oral English, which may help them to develop their future careers.

References

- Brumfit, C. (1984). *Communicative Methodology in Language Teaching: The Roles of Fluency and Accuracy*. Cambridge: Cambridge University Press.
- Brumfit, C., & Johnson, K. (1979). *The Communicative Approach to Language TEaching*. Oxford: Oxford University Press.
- Caimi, A. (2013). Subtitles and language learning. In Y. Gambier, & L. Doorslaer, *Handbook of Translation Studies* (pp. 167-173). Amsterdam: John Benjamins Publishing Company.
- Catalá-Hall, A. (2013, April 16). *Inglés con fines específicos*. Retrieved from Diccionari de lingüística on line: <http://www.ub.edu/diccionarilinguistica>
- Council of Europe. (2001). *Common European Framework of Reference for Languages: Learning, Teaching, Assessment (CEFR)*. Strasbourg: Cambridge University Press.
- Delabastita, D. (1989). Translation and mass-communication: Film and T.V. translation as evidence of cultural dynamics. *Babel* (35), 194-218.

- Díaz Cintas, J. (2003). Audiovisual Translation in the Third Millennium. In G. Anderman, & M. Rogers, *Translation Today: Trends and Perspectives* (pp. 192-204). Clevedon: Multilingual Matters.
- Dudley-Evans, T., & St John, M. (1998). *Developments in English for Specific Purposes. A multidisciplinary approach*. Cambridge: CUP.
- Fuertes Olivera, P., & Samaniego Fernández, E. (2005). El inglés para fines específicos: rasgos distintivos. In P. A. Fuertes Olivera, *Lengua y sociedad: investigaciones recientes en lingüística aplicada* (pp. 247-271). Valladolid: Universidad de Valladolid.
- Joachim, M. (Director). (2010). *Don't build your home, grow it!* [TEDtalks] Retrieved from https://www.ted.com/talks/mitchell_joachim_don_t_build_your_home_grow_it on January 15th, 2017.
- Jordan, R. (1997). *English for Academic Purposes: A Guide and Resource Book for Teachers*. Cambridge: Cambridge University Press.
- Krashen, S., & Terrell, T. (1983). *The Natural Approach: Language Acquisition in the Classroom*. Hayward, California: Alemany Press.
- Letorla, J. (2012). The effect of Subtitling task on vocabulary learning. (A. Pym, & D. Orrego-Carmona, Eds.) *Translation Research Projects* (4), 61-70.
- Littlewood, W. (1981). *Communicative Language Teaching. An Introduction*. New York: Cambridge University Press.
- Nunan, D. (1989). *Designing Tasks for the Communicative Classroom*. Cambridge: Cambridge University Press.
- Prabhu, N. (1987). *Second Language Pedagogy*. Oxford: Oxford University Press.
- Sokoli, S. (2006). Learning via Subtitling (LvS): A tool for the creation of foreign language learning activities based on film subtitling. *MuTra - Audiovisual Translation Scenarios: Conference Proceedings* (pp. 1-8). Copenhagen: EU–High-Level Scientific Conference Series .
- Talaván, N. (2013). *La subtitulación en el aprendizaje de lenguas extranjeras*. Barcelona: Ediciones OCTAEDRO, S.L.
- Willis, J. (1996). A flexible framework for task-based learning. *Challenge and change in language teaching* , 52-62.
- Willis, J. (2016). A flexible framework for task-based learning. *Challenge and change in language teaching* , 52-62.

Self-learning through the *PhysioEx*TM 9.0 simulator as a teaching tool in Veterinary Physiology. The opinion of the students

Soriano-Úbeda, Cristina; García-Vázquez, Francisco Alberto

Group of Veterinary Physiology Teaching Innovation, Department of Physiology, Faculty of Veterinary Science, University of Murcia, Spain; and Institute for Biomedical Research of Murcia (IMIB-Arrixaca), Spain

Abstract

Self-learning has been proposed as an active and plausible methodology to promote the capability of students to reach assigned objectives. During the academic year of 2016-2017, the course of Veterinary Physiology (included in the degree of Veterinary Medicine, University of Murcia, Murcia, Spain) was given using a self-learning method through the computer simulator PhysioExTM 9.0. The practice consisted in solving 6 exercises, performing simulated laboratory actions, knowing the consequences of each of their actions and answering a series of questions that were discussed afterwards with their classmates. The objective of this learning methodology was to teach students to work independently as well as a team member, promoting their skills to solve problems that might appear later in their professional life. After the practice, the students completed a voluntary survey whose results showed a satisfying opinion about using this self-learning methodology, reaching an average score on the proposed statements (a total of 7) between 4.01 and 4.71 on a Likert scale from 1 to 5. Additionally, the students associated the practice with concepts as 'classmates', 'doubts', 'dynamic', 'better', 'help' and 'knowledge'. In conclusion, this activity increased the collaborative learning process of students and enhanced dynamism in class.

Keywords: *autonomous; collaborative; computer; dynamic; practice; teaching methodology.*

1. Introduction

The learning process is a complex play with two main characters: the teacher and the student. The role of the teacher should not be to recite his/her knowledge but instead it should be to show the student how to acquire it (Lujan & DiCarlo, 2006). It is known that learning does not consist of memorizing a set of data but to gain the ability to solve problems by using resources to search, assess and apply that data. It is clear that the active – not the passive – way of processing of information is the best way to prepare students to face their future professional career (Lujan & DiCarlo, 2006). Self-learning may be one of the possible strategies that promotes the capability of the student to enhance a deep understanding of concepts, naturally achieving the assigned objectives.

In Higher Education, especially in Biomedical Sciences, there is a wide variety of teaching methodologies, such as master classes, seminars, tutorials, directed work and laboratory practices (reviewed by García-Vázquez *et al.*, 2018). In some subjects, such as Veterinary Physiology, it is necessary to complement the theoretical lessons with practical sessions and many of them require the use of animals *in vivo* as a working tool. European society does not accept the indiscriminate and/or unjustified use of animals and the legislation limits the use of laboratory animals to teaching and for research purposes (Directive 2010/63/EU of the European Parliament and of the Council of the 22 September 2010 on the protection of animals used for scientific purposes, OJ L 276, 20.10.2010, p. 33-79). Some of these practical sessions have a high cost, involving a high number of animals or requiring previous experience in animal handling and, consequently, problems in terms of security. The use of computer simulators is increasing in pursuance of replacing or reducing the use of animals *in vivo*, organic materials, reagents, etc. (Rawson & Quinlan, 2002; Ruiz *et al.*, 2009; García-Vázquez *et al.*, 2011). Simulation is defined by Society for Simulation in Healthcare as ‘the imitation or representation of an action or a system through another’ and it has become a routine use in Health Sciences’s education at all levels. It offers the students the possibility of self-learning and acquisition, training and improvement of competences in a set of tasks of practical situations. All of these advantages without the risk of harming animals or themselves and at an affordable cost (Gulluoglu & Tingoy, 2009). As so, simulators have been considered in education as an effective and economic strategy (McGaghie *et al.*, 2011). This type of self-learning method can be used as a motivating tool for students, providing them, obviously not without effort, the development of critical thinking, communication and problem solving. The self-learning through simulators in which they have to understand and solve situations in a collaborative way with their peers improves the training of good professional skills to face future situations.

The use of this interactive pedagogical tool promotes the awareness of the contents of Veterinary Physiology, simulating situations that in their day-to-day work would require immediate action, providing them the chance to observe, think and then react - without

having the negative consequences for their actions. However, this type of tools can have disadvantages such as the lack of manipulation of equipment, animals or living samples, which could turn the student into a mere observer in a real situation. Thus, the objective of this study was to promote collaborative self-learning among students of Veterinary Physiology through *PhysioExTM 9.0* simulator and assess the advantages and disadvantages that students find in this methodology of learning.

2. Material and Methods

To implement self-learning among the students of Veterinary Physiology (Veterinary degree) practices with the *PhysioExTM 9.0* simulator (García-Vázquez *et al.*, 2011) were carried out during the 2016-2017 academic course by using the computer classroom of the Faculty of Veterinary Medicine in groups of 18-20 students. Every 2-3 students shared a computer to carry out the practice collaboratively and discuss the results between them.

PhysioExTM 9.0 software consists of 13 modules containing a total of 40 physiology laboratory simulations that can be used to complement and/or replace laboratory practices. The use of *PhysioExTM 9.0* in the practices of the thematic blocks of Respiratory and Renal Systems allowed to complement the theoretical and practical contents previously taught in Physiology. In this type of self-learning sessions the students were autonomous: they could distribute the time dedicated to each exercise as their wish, as well as the repetitions they would perform to each question until total comprehension was achieved. In addition, the software is developed in English, which allows non-native English speakers students to practice and learn the specific terminology in that language.

The practice of self-learning object of study was 3 hours long and consisted of 6 exercises with *PhysioExTM 9.0* software about the Renal System (previously explained in theoretical sessions). To aid in the progress of the practice and its understanding, the students were provided with a detailed protocol consisting of an introduction on the aspects to deal with, the basic concepts that would be handled and how to perform each exercise step by step. Moreover, they were provided with different books of Physiology to search for information in the case of appearing doubts during the practice. During the development of each exercise, the student had to perform the simulated laboratory actions and understand the consequences of each of their actions. At the end of each exercise and in order to followthrough, the students had to answer a series of questions about the exercise. After the questionnaire, they were told the results of their answers: the ones that were correct and in case of being incorrect, what the correct answer was. After each activity, and to prevent students from keeping any doubt, the results obtained were discussed and shared between all the students under professor supervision. Finally, the students were individually evaluated about the comprehension of the subject by performing a test through an

interactive evaluation system: either through the use of voting controls (*TurningPoint*®) or through mobile devices (*Kahoot!*).

In order to obtain the opinion of the students after the practice, a voluntary survey composed by 7 statements (Q1 to Q7) about self-learning teaching methodology was carried out (Table 1). The students had to classify numerically to each sentence, taking into account a Likert scale of 1 to 5, being 1 'strongly disagree' and 5 'strongly agreeing'. In the final part of the survey students were given the opportunity (optional) to highlight up to 3 positive and 3 negative aspects about this self-learning methodology in Veterinary Physiology. Free text comments were automatically categorized (IBM SPSS Text Analytics for Surveys, v.4.0.1.1) based on word repetitions by the students. For the creation of the survey, the application from the University of Murcia was used through the website www.encuestas.um.es.

Table 1. Model of voluntary opinion survey on the self-learning practices using *PhysioEx*TM 9.0 completed by the students.

	Score (Likert scale 1-5)
Q1. I consider appropriate the implementation of self-learning practices in the subject Veterinary Physiology I.	
Q2. I think that self-learning practices is an adequate teaching methodology.	
Q3. I consider that this type of methodology helps each student to follow their own rhythm of learning.	
Q4. Performing the exercises during practice together with other colleagues helps to better understand the contents.	
Q5. I consider the dynamics of this practice adequate through the teaching methodology used.	
Q6. I believe the use of gamification (games in teaching) at the end of the practice to strengthen concepts during this type of methodology (self-learning) is appropriate.	
Q7. Global results. Values the set of the implementation of self-learning practices in the subject Veterinary Physiology I.	
Comments: Please indicate up to 3 positive and 3 negative aspects of this teaching methodology.	

3. Results

Of the 124 students enrolled in Veterinary Physiology during 2016-2017, 67.74% attended the practice (84 students) and 79.76% of them completed the voluntary survey (67 students). All students valued the 7 statements with a high degree of satisfaction, reaching a mean score of and above 4.01 on the Likert scale in all questions. Q4 and Q6 were the

statements with highest score (Q1: 4.04; Q2: 4.04; Q3: 4.09; Q4: 4.64; Q5: 4.01; Q6: 4.71; Q7: 4.19) (Figure 1).

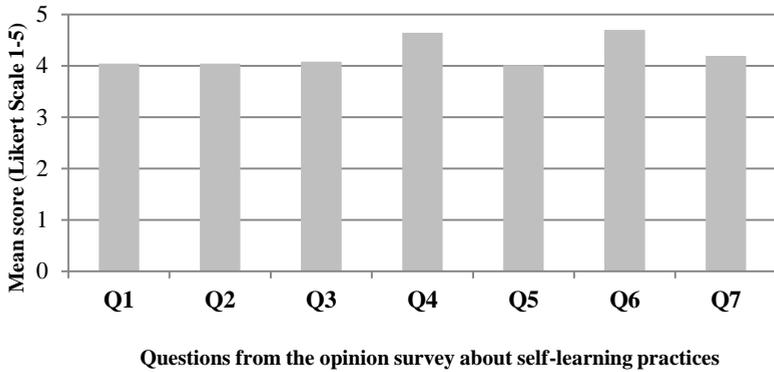
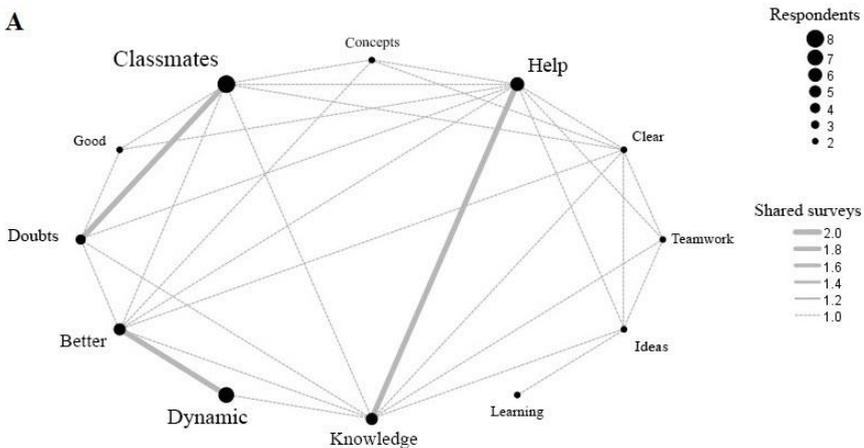


Figure 1. Results obtained from the students on the voluntary opinion survey related to the practice of self-learning using *PhysioEx™ 9.0*.

A 53.74% of the survey respondents (n=37) also indicated at least one positive aspect of self-learning practice, such as: ‘You can test your knowledge and share it with your classmates’, ‘It is a more dynamic practice’, ‘It allows the interaction and collaboration with classmates’, ‘Classmates can help you and we can solve our doubts together’, ‘It improves learning’ and ‘It helps us think’. Positive comments were grouped in 12 categories with at least 2 equal answers (Figure 2A). All positive comments were closely related, especially concepts as ‘classmates’, ‘doubts’, ‘dynamic’, ‘better’ and others as ‘help’ and ‘knowledge’. The 46.26% of the survey respondents (n=31) also indicated some negative aspects, such as: ‘The practice is too long’ and ‘Sometimes the practice becomes a bit tedious’, ‘Not all students follow the same pace of work’, ‘We have to wait until all the classmates finish the exercise to discuss about it’, ‘The language of the software is in English’. Negative comments were grouped in 4 categories with at least 2 equal answers (Figure 2B). Negative comments were closely related, especially concepts as ‘tedious’ and ‘long’.



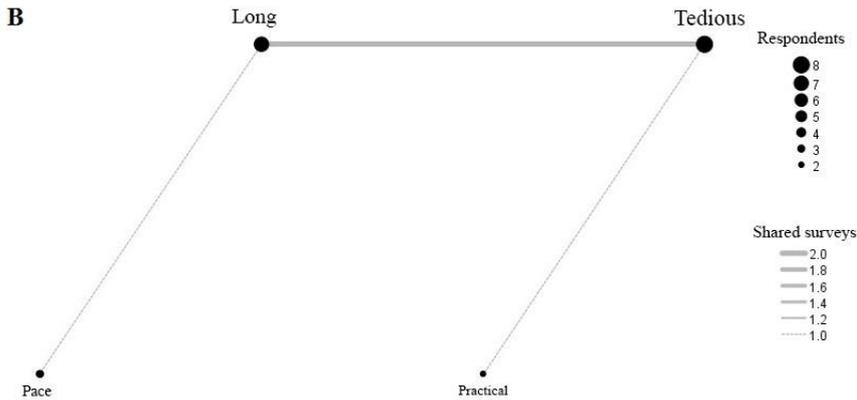


Figure 2. Qualitative analysis of the comments obtained in the voluntary survey made by the students about the self-learning practice with PhysioEx™ 9.0. Number of survey respondents (black circles) and frequency of shared surveys (grey lines) of positive (A) and negative (B) comments.

4. Discussion

The globalization that Higher Education has undergone in recent years has led to a change in traditional teaching methods. The need to implement new active strategies of learning as a motivating element for students has been incorporated into the teaching process. Nowadays the student has become the main axis of his/her learning. The possibility of improvement, self-evaluation, discussion of concepts with the classmates and reflection on their own learning process and results are postulated as powerful learning strategy. During the development of self-learning, the use of simulators can incorporate special teaching and learning mechanism to support individual learners and satisfy their particular necessity of learning. The possibility of quickly knowing the answers and consequences of each action can improve the understanding of complex physiological systems. In this work we have combined the self-learning in a collaborative way with the use of a computer software that simulates real physiology situations.

The use of simulators as an educational tool is becoming noteworthy in Health Sciences teaching and it presents a high acceptance among students and professors (Abraham *et al.*, 2018; Gupta *et al.*, 2018; Sawatsky *et al.*, 2017). Universities and other institutions have incorporated this kind of self-learning and teaching tools to help training health care professionals. However, the effect of the simulators as a valuable tool still needs to be confirmed. In our case, we implemented a new collaborative self-learning methodology in which a computer simulator was used as a working tool in Veterinary Physiology. In

general terms, the students highly appreciated the self-learning methodology through simulator *PhysioExTM 9.0* to complement their theoretical and practical sessions.

From the voluntary opinion survey of the students, a positive relationship between different aspect can be deduced. This practical session in which self-learning was encouraged and the students discussed their doubts with their classmates, seemed dynamic and more effective (probably) than other methodologies of learning, in helping them to acquire knowledge. However, it can be also deduced that the main negative factor that could go against self-learning is that the duration and effort that students have to make in this kind of practical sessions seems excessive to them. These results are comparable with previous studies in which the use of animated models were considered useful and effective tools for teaching, allowing students to preserve virtual images that helped them remember the studied mechanisms (García-Vázquez *et al.*, 2011; Gookin *et al.*, 2010; Wang, 2001). Simulators allow to understand dynamic and complex systems whose understanding would be hindered when using static graphics or texts (O'Day, 2007). Performing self-learning practical sessions help them to think for themselves and solve problems/doubts about the physiological system. The results of the satisfaction voluntary survey showed that the dynamic and immersive system of *PhysioExTM 9.0* improves the comprehension by the students. In general, students consider that self-learning activities help them to understand and remember the contents of the subject. However, they tend to state that the tasks of self-learning are tedious and calls for a lot of time. Although it is understandable that the use of the simulator requires a greater effort by the students to understand and simultaneously integrate the concepts of physiology, it is used within the hours of practices previously established in the teaching program. Another difficulty that students have expressed is the language. It is understandable that the task would be easier if the material was available in their mother tongue, but the reality is that in science most of the available communications are in English, being necessary for student to become familiar with this language.

With this study, we can conclude that self-learning in a collaborative way through the use of computer simulators as *PhysioExTM 9.0* in Veterinary Physiology favored the learning ability of students. It is an adequate tool for teaching purposes, being in general well appreciated by the students. Moreover, this kind of simulator helps the students to achieve the objectives of the subject with a viable (and sometimes the only possible) alternative to the use of animals in the laboratory. They share and discuss their acquired knowledge with their peers, which can increase the dynamism of the learning process. However, continuous improvement of this tool of self-learning is necessary in order to not let it be tedious for students.

References

- Abraham, R.R., Torke, S., Gonsalves, J., Narayanan, S.N., Kamath, M.G., Prakash, J. & Rai, K.S. (2018). Modified directed self-learning sessions in physiology with prereading assignments and Pecha Kucha talks: perceptions of students. *Advances in physiology education*, 42(1), 26-31.
- García-Vázquez, F.A., Coy, P., Matás, C., Romar, R., Ruíz, S., Hernández-Caravaca, I., Marco, M.A. & Gadea, J. (2011). Uso del simulador informático PhysioEX en la asignatura de Fisiología Veterinaria: valoración del alumnado.
- García-Vázquez, F.A., Romar, R., Gadea, J., Matás, C., Coy, P. & Ruiz, S. (2018). Physiology learning for veterinary students: Impact of guided practices on student's opinion and physiological parameters. *Advances in Physiology Education*. In press.
- Gookin, J.L., McWhorter, D., Vaden, S. & Posner, L. (2010). Outcome assessment of a computer-animated model for learning about the regulation of glomerular filtration rate. *Advances in Physiology Education*, 34, 97-105.
- Gupta, A., Singh, S., Khaliq, F., Dhaliwal, U. & Madhu, S.V. (2017). Development and validation of simulated virtual patients to impart early clinical exposure in endocrine physiology. *Advances in physiology education*, 42(1), 15-20.
- Gulluoglu, S.S. & Tingoy, O. (2009). Simulation-based medical education. *ICERI2009 Proceedings*, 3, 4059-4065.
- Lujan, H.L. & DiCarlo, S.E. (2006). Too much teaching, not enough learning: what is the solution? *Advances in Physiology Education*, 30, 17-22.
- McGaghie, W.C., Issenberg, S.B., Cohen, M.E.R., Barsuk, J.H., & Wayne, D.B. (2011). Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. *Academic medicine: journal of the Association of American Medical Colleges*, 86(6), 706.
- O'Day, D.H. (2007). The value of animations in biology teaching: a study of long-term memory retention. *CBE-Life Science Education*, 6, 217-223.
- Rawson, R.E. & Quinlan, K.M. (2002). Evaluation of a computer-based approach to teaching acid/base physiology. *Advances in Physiology Education*, 26, 85-97.
- Ruiz, J.G., Cook, D.A. & Levinson, A.J. (2009). Computer animations in medical education: a critical literature review. *Medical Education*, 43, 838-846.
- Sawatsky, A.P., Ratelle, J.T., Bonnes, S.L., Egginton, J.S. & Beckman, T.J. (2017). Faculty Support for Self-Directed Learning in Internal Medicine Residency: A Qualitative Study Using Grounded Theory. *Academic medicine: journal of the Association of American Medical Colleges*.
- Wang, L. (2001). Computer-simulated pharmacology experiments for undergraduate pharmacy students: experience from an Australian university. *Indian Journal of Pharmacology*, 33, 280-82.

The qualification of e-learning for higher education through the development of affective usability, self-evaluation test and virtual laboratory ¹

Biasi, Valeria and Ciraci, Anna Maria

Department of Education, "Roma Tre" University, Italy

Abstract

This contribution presents some aspects of the Department Interdisciplinary Research Project (PRID) of Roma Tre University. The main aim of the project is to define an innovative e-learning integrated didactic model that can promote the acquisition and development of skills for Lifelong Learning (European Parliament & European Council, 2008). To this end, the implementation of the following essential variables and components of the Integrated Model is a priority: 1) the learners' motivational involvement; 2) the quality of the experience of immersion within a virtual environment; 3) evaluation and self-evaluation practices. Considering the original model successfully experimented in the Degree Course in Education Sciences at "Roma Tre" University (Domenici, 2016) and particularly focused on evaluation and self-evaluation processes, we propose an implementation of so-called affective usability of the e-learning platform by creating relaxing, stimulating and aesthetic online environments, promoting a greater immersive capacity. To this must be added the students' use of advanced ICT programs enabling them to experience scientific demonstrations and experiments in order to acquire a scientific mentality through the use of Context Simulation Tests and Virtual Didactic Laboratories (VDLs). The effectiveness of implementing the FAD e-learning system in acquiring the scientific thinking modality will be empirically assess.

Keywords: *Affective usability; Context Simulation Tests; Motivational involvement and immersion; Scientific thinking; Self-evaluation test; Virtual Didactic Laboratories.*

¹ This article is the result of the joint work of the two authors, in particular the first author wrote paragraphs 1, 3, 5 and the second author wrote the paragraphs 2 and 4.

1. Introduction: determining factors for qualifying e-learning systems for higher education

The international literature on problems concerning the learning process in distance education through e-learning platforms shows a number of determining factors for qualifying this educational modality: variables concerning the learners' motivational involvement; the quality of experience within the virtual environment; familiarity with information and communication technology (ICT); evaluation practices; the characteristics of the learning materials, environments and experiences; and the institutional, organizational and management aspects.

This contribution presents some aspects of the Department Interdisciplinary Research Project (PRID) "*E-learning per l'istruzione superiore: definizione di un modello integrato per la qualificazione degli apprendimenti e delle relazioni educative on line*" ("E-learning for higher education: the definition of an integrated model for qualifying learning and educational relations on line"), still in progress, of the Department of Education of Roma Tre University. The main aim of the project is to define an innovative e-learning integrated didactic model that can promote the acquisition and development of skills established in the *European Qualifications Framework for Lifelong Learning* (European Parliament & European Council, 2008).

To this end, the study and implementation of the following essential variables and components of the *Integrated Model* is a priority: 1) the learners' motivational involvement; 2) the quality of the experience of immersion within a virtual environment; 3) evaluation and self-evaluation practices.

As we know, e-learning evaluation practices require particular attention also in view of their metacognitive functions. In online education, perhaps even more than in traditional classroom education, a key role is played by the capacity for *self-regulation and self-evaluation in one's study* (Trincherò, 2006; Domenici, 2009; and others). In particular, we believe the new forms of self-evaluation of learning acquired through semi-structured tests (Domenici, 2005; Ciraci 2017), especially of the context-simulation types, are better in conditions of good immersion within a virtual learning environment. Such a good immersion is made possible in the case of good interaction between the ICT system and human verbal and non-verbal language, and may be achieved by such things as resorting to relaxing colours and clear non-fragmented icons, thereby avoiding an overload or bombardment of heterogeneous information and favouring guided forms of reading and summarizing of texts under study.

One should also take the user's or student's *average motivational makeup* and his/her *range of cognitive interests* into account in order to calibrate the didactic message to catch his/her

attention and promote *positive emotional involvement* facilitating learning processes themselves (Biasi, 2017; Domenici, 2017).

Hence, we propose the implementation of an original model successfully experimented over the last fifteen years in the Degree Course in Education Sciences at Roma Tre University (Domenici, 2016) and particularly focused on evaluation and self-evaluation processes. This implementation envisages the enhancement of so-called *affective usability* of the e-learning platform by creating *relaxing, stimulating and aesthetic online environments*, and devoting great care to graphic and dynamic aspects thereby stimulating a *greater immersive capacity on the user's part* within the e-learning environment.

To this must be added the students' use of advanced ICT programs enabling them to experience scientific demonstrations and experiments in order to acquire a scientific mentality. It means, ultimately, broadening the use of context simulation tests to arrive at creating real Virtual Didactic Laboratories (VDLs) through which to enhance scientific thinking by stimulating occasional observation, the problematization of a phenomenon, systematic observation, hypothesis generation, the devising of experiments or demonstrations, and data gathering for hypothesis testing.

2. The *FAD* organizational-didactic model of the Degree Course in Education Sciences at Roma Tre University: the outcome of field research

The Departmental Interdisciplinary Research Project (PRID) took off from the outcomes of several empirical studies carried out within the *Degree Course in Education Sciences in FAD (Formation at Distance) modality on an e-learning platform* of Roma Tre University, dedicated to teacher-training, in which the *integrated organizational-didactic model* proposed by Gaetano Domenici (2016) has been successfully tested over the last fifteen years. The distinguishing and innovative feature of this course is the didactic methods which, also thanks to network enhancement, are based not so much on pre-constituted knowledge as on real simulations of events situated in teaching contexts, and on evaluation and self-evaluation tools that facilitate experiential learning to raise awareness of one's own cognitive processes and the capacity to devise problem-solving strategies (Ciraci, 2009). The results of two important Research Projects of National Interest (PRIN) conducted within the aforesaid degree course have shown the crucial importance of variables like evaluation and self-evaluation processes in the qualification of e-learning. A first study (Domenici, 2009) confirmed the existence of a positive correlation between systematic self-evaluation processes of acquired competencies, on one side, and performance (average grades, number of exams and number of credits), on the other. The subsequent research project of national interest (Domenici, 2017) investigated the effects of the skills gained by the teacher-participants on their professional work following a training course based on the

aforesaid *FAD organizational-didactic model*. An analysis of the data gathered by means of course entrance and exit questionnaires given to the teachers of the Experimental Groups (EGs), that is, the teachers undergoing training, shows a clear increase in the use of *theoretical-operational context stimulation tests* (+33%) and of *problems derived and situated by/in real life contexts* (+41.6%) (Table 1), among the considerable number of testing tools normally used by teachers to assess learning, as well as a greater use of *self-evaluation*. These outcomes clearly show a general effect of maturation of didactic and evaluative skills of the EG teachers after their training experience, and point to the capacity to arrange formal learning contexts geared to promoting students' development of those fundamental structures of "self-regulation" represented by the capacity to monitor one's own learning process and thus to self-evaluate and self-correct oneself.

Table 1. Instruments used by the EG teachers to assess learning

Testing instrument	Entry	Exit
1. Laboratory tests	22.9	35.42
2. Traditional type problems	27.1	56.25
3. Summaries	25.0	35.42
4. Objective tests (multiple-choice, true/false, cloze, matching)	52.1	87.50
5. Short essays	18.8	27.08
6. Traditional essays	27.1	35.42
7. Individual research projects	31.3	60.42
8. <i>Theoretical-operational context simulation tests</i>	<i>10.4</i>	<i>43.75</i>
9. Structured questions (series of questions with short answers and subject to predefined constraints)	47.9	75.00
10. Case studies	4.2	22.92
11. <i>Problems derived and situated by/in real life contexts</i>	<i>29.2</i>	<i>70.83</i>
12. Reading comprehension tests	45.8	70.83
13. Other	6.3	20.83

3. Developing user interest and attention by enhancing affective usability

As regards the affective variables, the specialist literature often stresses the role of intrinsic motivation in facilitating learning in the e-learning mode. Zaharias (2009) stressed how non-motivated adults, in particular, drop out of e-learning courses and suggests including an *affective dimension of learning* among the factors facilitating “usability” – that is, which make the adoption and use of new technologies in educational systems (“e-learning usability practice”) possible. He suggests considering this factor a new type of “usability dimension” in programming and evaluating e-learning applications.

These studies integrate the view that motivation has an initial effect particularly on meta-cognition (self-efficacy, self-regulation, etc.). Mammarella, Cornoldi and Pazzaglia (2005) highlighted how several perceptual and attentive processes interact in e-learning and how they affect individual differences (such as with different learning styles with respect to the way information is presented, and so on). It is a fact that discussion forums, chat sessions and other interaction environments go to make up a virtual space where users can also take emotional contents into account as integral parts of their learning process. The results of a comparative study on various interactive contexts show a preference for multimodal systems which manage to integrate forms of communication that are familiar to participants.

Hence, studies on affective and cognitive processes in various educational contexts are of great interest today and they also include e-learning (Magno Caldognetto & Cavicchio, 2008; Fielder & Beier, 2014).

With regard to the overall list of motivations (Biasi, 2017), the ones mainly involved in e-learning processes are: a) “Motivation to knowledge”, which concerns information gathering and the construction of concepts or mental schemas. It includes aspects of ordered knowledge typically referred to convergent and divergent or creative cognitive skills; b) “Motivation to self-assertiveness”, which is expressed in behaviours geared to asserting oneself in order to achieve goals experienced as positive, including educational results in view of such things as career prospects; c) “Motivation to sociality”, which includes attractive relational aspects with the “other than oneself”, experiences of socialness and imitation of others’ behavioural models by identification. It can be activated by situations of social isolation and loneliness. It could also activate recourse to various means of communication (such as a telephone, television, networked computer, e-mail, chat or discussion forum interventions). As regards the role of psychological variables like the promotion of positive valences in didactics (such as emotional involvement and aesthetic experience), there are various contributions in the national and international literature (Metzger, 1965; Bonaiuto, 1972). There is general agreement on the fact that originality, elegance, competence and authenticity in didactic communication have important functions

in arousing motivational commitment, attention, facilitation in understanding and learning, and are also articulated with the educational style and manners of interpersonal relations. Similar features can be explored with regard to the quality of environments and of texts necessary for study (Biasi, Bonaiuto & Cordellieri, 2004).

These components can be appropriately enhanced through multimedia technologies, which manage to broaden the teacher's personal aptitude and can assure greater experiencing of interpersonal contact – something which, at least from a psychological point of view, needs to be strengthened and promoted in e-learning.

4. Context simulation for learning process governance

Adults are generally more disposed to learning what is concretely usable and effective, even indirectly, in real life situations, compared to what is not (Bandura, 1997). Thus, adult students require didactic methods which, thanks to the potential of new technologies, are based not so much on the transmission of pre-constituted knowledge as on the proposal of activities through Virtual Didactic Laboratories (VDLs) in the form of simulations of events situated in working contexts.

As we know, *simulation techniques* are increasingly more important, particularly in decision-making situations. In the didactic-evaluation field, they are expressed in methodologies which reject a passive, dependent and largely receptive role of the student in favour of his/her conscious participation because they contextualize learning situations in real environments like the ones the student has experienced in the past (the actualization of experience), the one s/he is experiencing now or will do so in the future (forecasts and virtuality). The theme of competences, meant as the “ability to apply knowledge, skills and personal, societal and/or methodological capacities in work or study situations and in one's personal and professional development” (European Parliament & European Council, 2008) with a view to learning that is no longer limited to schooling years but extended to one's whole life, has led to a change in direction in the international sphere with regard to the tools for their evaluation (Baker, 2007). In the *FAD organizational-didactic model* (Domenici 2016) the didactic proposal is characterised by the systematic use of structured evaluation and self-evaluation tests with a view to metacognitive control. In particular, in evaluation and self-evaluation processes, *semistructured tests* are used (Domenici, 2005; Ciraci 2017) in the *context simulation* typology which, unlike the tests normally used, make reference to complex uncertain problems such as the ones normally found in everyday life and enabling students to take decisions, observe the consequences and to reflect on wrong or incomplete outcomes, thereby placing students in control of their own learning processes (Domenici, Biasi & Ciraci 2014).

5. Empirical application of the Implemented FAD Prototype-Model (FAD-I): indications for developing scientific thought in higher education

The empirical application of the Implemented FAD Prototype-Model (FAD-I) involves an enrichment of the virtual learning environments by devoting attention to the graphic-pictorial aspects expressing comfort and aesthetic value, a refinement of the appeal of icons, an improvement of accessibility – sometimes in a playful manner, the enhancement of dynamic and cinematic expressiveness, and the availability of guided paths also with the assistance of remote tutors.

Decisions relating to such things as the images used must be made, where possible, in accordance with the *users' main cognitive interests* (e.g. for students of artistic disciplines or of humanities, or even of biomedical or physical-mathematical, juridical or economic fields).

Tutoring, chat and forum sessions must be guaranteed to meet the main needs of the average user. As specified in section 1 of this paper, it is generally a question of motivation to sociality, to self-assertiveness and to knowledge, which are all particularly important in e-learning.

At this point, the Virtual Didactic Laboratories (VDLs) are proposed as disciplinary didactic interventions on themes of interest in the various subjects. The test of empirical application of the implemented FAD model was carried out within the Education Sciences degree course implemented on the e-learning platform of the Department of Education of Roma Tre University.

During the final stage of students' training, thanks to their participation in e-learning classes (lasting 6 months), the students' capacity to apply scientific reasoning in the approach to knowledge was also assessed (involving such things as occasional observation, the problematization of a phenomenon, systematic observation, the formulation of hypotheses, the devising of experiments or demonstrations, the gathering of data for testing these hypotheses, and the analysis of data and their critical interpretation). To assess the strengthening of scientific thinking, structured and semi-structured (problem-solving) tests will be used with context simulation. These tests will be given to both the student group carrying out the virtual laboratory didactic activities in the semester (the experimental group) and also to a control group made up of students not taking part in the above laboratory activities. To empirically assess the effectiveness of implementing the FAD e-learning system, the differences in average scores recorded by the two groups in the context simulation tests will be analysed. We hypothesize a significant increase in acquiring the scientific thinking modality for the experimental group compared to the control group. (Domenici, Biasi & Ciraci 2014).

6. Conclusions

We can conclude that the implementation of: 1) the learners' motivational involvement, 2) the quality of the experience of immersion within a virtual environment, 3) the evaluation and self-evaluation practices, will play a key role for self-regulation of learning and scientific attitude. The students' use of this advanced ICT programs based on Context Simulation Tests and Virtual Didactic Laboratories (VDLs), will enable them to experience scientific demonstrations and experiments in order to acquire a scientific mentality. Moreover, the implementation of these cognitive and motivational aspects will contribute to an increase in efficiency of e-learning system.

References

- Baker, E. (2007). *Moving to the Next Generation System Design: Integrating Cognition, Assessment, and Learning*. Los Angeles, CA: National Center for Research on Evaluation, Standards, and Student Testing (CRESST), University of California.
- Bandura, A. (1997). *Self-Efficacy: The exercise of control*. New York: Freeman.
- Biasi, V., Bonaiuto, P., & Cordellieri P. (2004). La componente estetica nella comunicazione didattica. Opportunità offerte dalle nuove tecnologie. *Tecnologie Didattiche*. 1, 4-13.
- Biasi, V. (2017). *Dinamiche dell'apprendere. Schemi mentali, interessi e questioni didattico-valutative*. Roma: Carocci.
- Bonaiuto, P. (1972). *Indicazioni psicologiche per la didattica delle arti visive. La Biennale di Venezia*, 67/68, 18-42.
- Ciraci A.M. (2009). La formazione universitaria a distanza degli insegnanti: ruolo dell'autovalutazione e ricadute delle competenze acquisite sull'attività professionale. In G. Domenici (a cura di), *Valutazione a autovalutazione per la qualificazione dei processi formativi e-learning* (pp. 93-112). Lecce: Pensa MultiMedia.
- Ciraci, A.M. (2017). Processi valutativi e autovalutativi. Le prove semistrutturate. In G. Domenici (a cura di), *Successo formativo, inclusione e coesione sociale. Strategie innovative. Volume primo: Strategie didattiche integrate per il successo scolastico e l'inclusione* (pp. 270-277). Roma: Armando.
- Domenici, G. (a cura di). (2005). *Le prove semistrutturate di verifica degli apprendimenti*. Torino: UTET.
- Domenici, G. (a cura di). (2009). *Valutazione e auto-valutazione per la qualificazione dei processi formativi e-learning*. Lecce: Pensa Multimedia.

- Domenici, G. (a cura di). (2016). *La formazione on-line a Roma Tre. L'esperienza del Corso di Laurea in Scienze dell'Educazione*. Roma: Armando.
- Domenici, G. (a cura di). (2017). *Successo formativo, Inclusione e Coesione Sociale: Strategie Innovative. Strategie didattiche integrate per il successo scolastico e l'inclusione*. Volume Primo. Roma: Armando.
- Domenici, G., Biasi, V., & Ciraci, A.M. (2014). Formazione e-learning degli insegnanti e pensiero creativo (e-Learning Teacher's Training and Creative Thinking). *Journal of Educational, Cultural and Psychological Studies* 10, 189-218.
- Fielder, K., & Beier, S. (2014). Affect and Cognitive Processes in Educational Contexts. In P.A. Alexander, R. Pekrun, & L. Linnenbrink-Garcia (2014). *International Handbook of Emotions in Education*. London: Routledge.
- Magno Caldognetto E., & Cavicchio F. (a cura di). (2008). *Aspetti emotivi e relazionali nell'E-learning*. Firenze: Firenze University Press.
- Mammarella N., Cornoldi C., & Pazzagli F. (2005). *Psicologia dell'apprendimento multimediale. E-learning e nuove tecnologie*. Bologna: Il Mulino.
- Metzger W. (1965). The influence of aesthetic examples. In G. Kepes (Ed.). *Education of Vision*. New York: Braziller.
- Parlamento Europeo & Consiglio Europeo (2008). *Raccomandazione del Parlamento Europeo e del Consiglio sulla costituzione del Quadro europeo delle qualifiche per l'apprendimento permanente*, Bruxelles (<http://eur-lex.europa.eu/>).
- Trincherò R. (2006). *Valutare l'apprendimento nell'e-learning*. Trento: Erikson.
- Zaharias P. (2009). Usability in the context of e-learning: A framework augmenting "tradition" usability constructs with instructional design and motivation to learn. *International Journal of Technology and Human Interaction (IJHI)*. 5 (4), pp. 37-59.

On the Value of Pedagogical Assets¹

Gabarro, Joaquim and Serna, Maria

Computer Science Department, Universitat Politècnica de Catalunya, Barcelona Tech, Spain.

Abstract

University education is facing new strategical changes that will lead to deep structural changes. Course organization is evolving and the organizational decisions have an economical impact. We propose a method to measure the present value of a pedagogical asset under a return rate. We apply the method to three courses in the Computer Science curricula taught at the Facultat d'Informàtica de Barcelona of the Universitat Politècnica de Catalunya, Barcelona Tech. A large, compulsory, first year course (PRO1), a medium size undergraduate course (ALG) and a small specialized master course (AGT). Our results highlight that the present value gets higher values as a function of the size of the course and it goes in a negative relationship with respect to the level of computer support involved in their teaching.

Keywords: *Pedagogical assets; monetary value; present value; rate of return*

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1. Introduction

In the present Post Great Recession scenario money matters specially. This is of fundamental importance at Universities where higher education is considered (at least partially) a public good. There are many models of lecturing. In one extreme, lecturing may be based on small groups (and classrooms) and personalized attention to the students. On the other extreme, lecturing may have large groups, with strong multimedia and computer support and small or no so small groups for discussion. Both approaches are not disjoint and any mixture is possible. Some times the pedagogical objectives determine the teaching style. When more than one style allows to achieve the pedagogical objective, it is worth to know the expenses due to the different organizations. Roughly, we can associate to each pedagogical style a size and type of faculty staff. A model with small lecturing groups requires a big faculty staff. The different salary levels are a key determinant of the level of incurred expenses. In such environment academic managers working in public universities face an unavoidable dilemma: minimize expenses versus keeping a high quality education level. To quantify this dilemma in the context of computer supported education we propose a micro-economic model based on *pedagogical assets*. Recall that assets like stocks or bonds form the basic capital assets. G. Becker (1993), 1992 Nobel Prize in Economy, studied the human capital. These assets constitute the stock of knowledge, habits, social and personality attributes, including creativity, embodied in the ability to perform labor. Similarly, P. Bourdieu (1986) introduced the social capital and the related assets. Our proposed pedagogical assets are assets based in human and social capitals. They are multi-period assets that change through time.

We argue that changes in the organizational aspects of lecturing, the ratio between live, computer supported and multimedia aspects, have an important economical impact. Courses with strong internet and computer supported content can become cheaper. Deep changes are coming from the USA. R. Sedgewick (2017) show us how live lectures in big auditoriums are becoming old fashioned. As he points out, he gave his last live lecture in September 2015. Live interactions between small groups of students and a lecturer can serve to discuss and enforce particular aspects of the video lecture through practical work. This live interaction can also be used to motivate students and introduce more advanced material. There is a tiny equilibrium between online work and live presence of students and lecturers at the university. Live contacts are fundamental to develop a healthy society but the nature of these contacts need to be reshaped in the course planning. When a course is run for several years, time needs to be included to obtain the multi-year value of the whole course. T. Piketty (2014) relates money and time through the (annual) *rate of return* of the capital. The rate of return varies with the asset: 7%–8% for long run stocks; 3%–4% for real state; even negative -0.25% – -0.1% for deposits. From the rate of return r , the value at year t of an initial inversion of $Q_0 = M$ euros can be computed using composite interest

formula $Q_t = (1 + r)^t M$. From the point of view of year t , looking back in time, the *present value* of Q_t is $Q_t / (1 + r)^t$. We propose to use the sum of the present values of the flow of money expended (expenses minus incomes) Q along the years to measure the actual value of a pedagogical asset. In general, given a flow F of annual expenditures Q_0, \dots, Q_n , with $n > 0$, and a rate of return r , the *net present value* of this flow is: $\text{netPV}(F, r) = Q_0 + \frac{Q_1}{(1+r)} + \dots + \frac{Q_n}{(1+r)^n}$. Observe that usually the rate of return is positive but in the last times this is changing and r can be negative. Observe that, when $-1 < r < 0$, benefits gives you extra money while loses are decreased.

When an entrepreneur buys a capital asset, for instance a loom or a truck, he expects to get some benefit using it, for instance a 5%. This idea was precised by I. Fisher (1930) in the *rate of return over cost*. J.M. Keynes (2007) inspired by it defined the *marginal efficiency*. Let P_S be the supply price defined as “the price which would induce a manufacturer to produce and additional unit of an asset”. Consider the series of annuities Q_1, \dots, Q_n , produced by the asset during its life. The *return* of this asset is the rate of discount r such that: $P_S = \frac{Q_1}{(1+r)} + \dots + \frac{Q_n}{(1+r)^n}$. P_S is an initial investment, i.e., a negative yield $Q_0 = -P_S$. We can describe the asset by the series $F=(Q_0, \dots, Q_n)$. Thus, the *internal rate of return* is the value r , if any, with $\text{netPV}(F, r) = 0$. For a pedagogical asset, we take P_S as the initial investment in preparing the course. When possible we measure the efficiency of this asset by the internal rate of return.

In the remaining of the paper we precise the fundamental parameters that need to be quantified to perform the proposed analysis. We show how to calculate the present value and the internal rate of return of a pedagogical asset. Finally, we perform a monetary study of three pedagogical assets developed at the Informatics School, the Facultat d’Informàtica de Barcelona (FIB) in the Universitat Politècnica de Catalunya, Barcelona Tech (UPC). First, we use a massive first year course on programming (PRO1). Second, a medium size undergraduate course on algorithmics (ALG). Both courses are included in the curricula for the degree in Informatics Engineering. Finally, a small master course (AGT) in the curricula of the Master in Innovation and Research in Informatics. For those courses we provide the present value under different teaching organization and return rates. When possible, we also compute the internal rate of return. The obtained data shows, as expected, higher benefits as the size of the course increases and an opposite relation to the level of computer support involved in the teaching. On the other hand most of the studied scenarios lead to losses. In the scenarios with benefits the internal rate of return is quite high.

2. The Value of Pedagogical Assets

We develop here a model to estimate the monetary expenses and incomes of a pedagogical asset per year. From this flow, we compute the net present value under different return

rates. We also compute, when possible, the internal rate of interest in order to compare the different assets. Lecturing in the EU is based in ECTS system. Each course in the curricula has an assigned number of ECTS, n_{ects} . On the other hand, students enrolling in a course have to pay a fix price per ECTS. So, we have two parameters n_{ects} and p_{ects} . These parameters are exogenous (or external) from the lecturers, they are fixed by UPC. The other parameter is the number of enrolled students N . Therefore, the monetary income at term t , assuming no variation on the exogenous parameters is $I_t(N_t, p_{ects}, n_{ects}) = N_t p_{ects} n_{ects}$. In UPC the p_{ects} varies with the degree. For the Bachelor's Degree, it is set to 39.53 and, for the Master's degree to 65.85.

An asset has associated expenses corresponding to the part of the salary of the lecturing staff running the course. We measure this part estimating on one side the number of working hours on the course of the teaching staff w_t and the average price of an hour of work p_h^t . Thus, the monetary expense at term t is $E_t = (w_t, p_h^t) = w_t p_h^t$. Estimating w_t requires to know the type of course, the teaching methodology, the division on groups, the teacher's experience, and the number of enrolled students. We provide later a separate analysis of w_t for each of the cases of study. For a given course and term, we have to estimate the price of one hour of work, p_h^t . This depends on the the teaching staff's size and composition. It is clear that the salary of a Full Professor (FP) is different from the salary of a Teaching Assistant (TA). We first estimate p_h^c , for each staff category c . Using those values, we estimate p_h^t as the average of the price per hour of the involved staff. In Table 1 we provide a summary of the considered categories and salaries.

Table 1. Teaching staff categories and wages (in euros).

	Annual	P _{hour}
Full Prof.	60498	43.21
Associate Prof.	45671	32.62
Teaching Ass.	7549	15.73

In computing those salaries (and p_h^c), we have taken into account the increases of salary due to years of work. We assume that a FP has over 15 years of experience, an Associated Professor (AP) around 10-12, and no experience for a TA. All positions are full time except TA which have a dedication of 480 hours per year. For full time positions, we estimate that, excluding holidays, an academic year has 40 weeks and that by law the work load is set to 35 hours per week. This gives a total of 1400 hours per year. Then, the price per hour is obtained dividing the annuity by the number of hours of work. The last column in Table 1 gives the obtained values of p_h^c . For a given University or Department it could be possible

to get more precise estimations of p_h^c . However this seems unnecessary at this level of study as an “order of magnitude” is enough for our purposes.

Our final step is to analyze the net present value of a pedagogical asset P . We have to consider now that creating and a course has a price E_0 . This price is determined by the work that the lecturers and administrative staff devote to the preparation. Once the course is running at year t , we asses the asset under interest r , in a period of n years, by $\text{netPV}(P, r) = E_0 + \frac{E_1 - I_1}{(1+r)} + \dots + \frac{E_n - I_n}{(1+r)^n}$. We say that P is making losses under interest r when $\text{netPV}(P, r) > 0$, otherwise P is making benefits. When a pedagogical asset is making benefits, we can take it as an investment and we measure its efficiency of by the internal rate of return, i.e., the value r , if any, verifying $\text{netPV}(P, r) = E_0 + \frac{E_1 - I_1}{(1+r)} + \dots + \frac{E_n - I_n}{(1+r)^t} = 0$.

3. Analyzing some Pedagogical Assets

The Computer Science (CS) Department of the UPC, has been taking care of the first programming course, PRO1, delivered at the FIB along the years. From the beginning a structured approach to programming has been taken. Roughly, the course evolved, along the years, from a formal approach to a hands-on practical view. A big part of the current design is the use of computer support for practical programming. We use *Jutge*, an open educational online programming judge designed for students and instructors, featuring a repository of problems that is well organized by courses, topics and difficulty (Petit et al., 2012). The other two courses that we took in this study are also organized by the CS Department. The *Algorithmics* course (ALG) is a compulsory course for students having a major in Computing placed in the first semester of the third year. The *Algorithmic Game Theory* course (AGT) is an optional subject in a Master degree.

PRO1 has been assigned 7.5 ECTS while ALG and AGT have a load of 6 ECTS. PRO1 and ALG are offered the two semesters and AGT only in the first one. The students on the second semester of PRO1 are a subset of those in the second one, as there is no entrance in the second semester. Following, M. Blesa et al., (2016) we consider only data from the first semester. In contraposition, there is a very small overlap in the students ALG in the two terms, in this case we aggregate the data.

M. Blesa et al., (2016) provided an analysis of the pedagogical efficiency in PRO1 on a period of 5 years. We consider here the same period and take the fundamental parameters for our study w_t and N_t from there. We extract information from ALG and AGT to cover data in a similar period of 5 academic years and estimate the corresponding parameters by gathering information from the teaching staff in the corresponding period. The corresponding data is given in Table 2. As it can be seen from the data, the demand has grown along the years, for both ALG and AGT.

The splitting into groups of PRO1 has been almost uniform along the considered period involving a total of 20 teaching staff. The teaching of AGT involved just one group.

Table 2. Work load (in hours) and number of students.

Period	PRO1		ALG						AGT	
	Fall		Spring			Fall			Fall	
	N_t	W_t	g_t	N_t	W_t	g_t	N_t	W_t	N_t	W_t
t_0		196.00						190.00		250.00
t_1	493	4232.00	2	30	324.50	3	55	463.25	5	390.25
t_2	492	4177.00	3	44	428.6	3	60	479.00	7	394.75
t_3	465	4080.00	2	46	374.90	3	76	529.40	12	406.00
t_4	436	3851.00	3	59	475.85	4	78	595.70	16	415.00
t_5	448	4303.00								

In the case of ALG the subdivision in groups for practical lectures varies from 2 to 4 and this number (g_t) is given in Table 2. The number of involved teaching staff, for ALG, is $1 + g_t$. From those numbers, we can obtain estimations of p_h^t by setting the category pattern of the staff, (n_{FP}, n_{AP}, n_{TA}) . We estimate p_h^t as the average price per hour of the selected composition. For PRO1, we consider three cases. **Case 1** (1,1,18) giving $p_h^t = 17.95$. **Case 2** (1,2,17) giving $p_h^t = 18.79$. **Case 3** (3,17,0) giving $p_h^t = 34.21$. For ALG, the value of p_h^t depends on the number of groups of the term. However, we consider three situations: **Case 1** (1,0, g_t), **Case 2** (1, $g_t/2$, $g_t/2$) and **Case 3** (1, g_t ,0). The values of p_h^t are in the range 21.23 to 24.89 (**Case 1**), 27.98 to 30.52 (**Case 2**) and 34.74 to 36.15 (**Case 3**). For AGT we assume $p_h^t = 43.21$, i.e., a full professor.

Finally, we have to estimate the time needed to start up a course. This involves several tasks by the coordinator: meetings with the previous coordinators, first versions of lecturing materials, docs, slides, setting computer support systems etc. Even if we assume basic knowledge of the topic, the course preparation can involve in some cases, training of the future teachers, especially of the involved TAs. Our estimate for E_0 follows from an appreciation of the coordinators of the corresponding courses at the initial term of our studies. Those values are given in Table 3, together with the values of expenses and incomes, for the considered cases of teaching staff composition.

The net present values are given in Tables 4 and 5, for the different values of r . We take values for r from -0.250 to 0.1 to cover cases from moderate losses to moderate gains. Observe that in many cases the yields $I_t - E_t$ are always

negative. So, no internal rate of return can be computed. We get positive yields for PRO1 (Case 1 and Case 2) and ALG (Case 1).

Table 3. Values of I_t and E_t (in thousands of euros).

	PRO1				ALG				AGT	
	Case 1	Case 2	Case3		Case	Case	Case 3		Case 1	
	I_t	E_t	E_t	E_t	I_t	E_t	E_t	E_t	I_t	E_t
t_0	0.000	3.517	4.945	6.705	0.000	4.729	5.798	6.868	0.000	10.802
t_1	146.162	75.948	106.788	144.779	20.160	18.546	23.307	28.068	0.329	16.862
t_2	145.865	74.960	105.401	142.898	23.480	20.511	26.260	32.008	0.460	17.057
t_3	137.860	73.220	102.953	139.579	24.666	21.295	26.759	32.223	0.790	17.543
t_4	129.263	69.110	97.174	131.745	25.141	23.398	30.437	37.475	1.053	17.932.
t_5	132.820	77.222	108.580	147.208						

Table 4. Values of netPV for PRO1 (in euros).

r	Case 1	Case 2	Case 3
-0.250	-275651.07	-150120.70	4511.92
-0.100	-281454.61	-149572.73	12883.90
-0.010	-313127.21	-163858.00	20016.92
0.000	-317993.35	-166127.90	20945.17
0.001	-323138.26	-168537.89	21904.15
0.100	-382560.86	-196771.14	32091.00

Table 5. Values of netPV for ALG and AGT (in euros).

r	ALG			AGT
	Case 1	Case 2	Case 3	Case 1
-0.250	-125.02	12281.04	24687.10	44946.13
-0.100	-2729.23	15882.73	34494.69	62412.52
-0.010	-4723.55	18756.31	42236.18	75905.50
0.000	-4967.56	19113.93	43195.42	77563.76
0.001	-5216.28	19479.71	44175.71	79255.65
0.100	-7676.99	23162.85	54002.70	96080.90

Cases 1 and 2 for PRO1, due to average low wage, provide a high benefit largely covering the supply price 3517.44. The corresponding internal rate of return is

18.96 and 7.97 respectively, which constitute an incredible internal rate of return. For Case 1 for ALG the internal rate of return is 0.34 which still can be considered high.

5. Conclusions and Open Problems

Universities need to be high quality, but budgets are being cut (or maintained). Nowadays computer supported education is a reality opening new opportunities and challenges. After introducing a computer supported concept, it is possible to practice it “unattended”, provided the adequate tools are created. The role of a lecturer in such topics is closer to “coaching” than to “teaching”. This fact can make university teaching cheaper. However, interaction with people continues to be fundamental in today’s higher education. The correct rate people versus multimedia content is an interesting open problem that depends on the topic.

In this paper we have performed a study of some courses in isolation. It would be of interest to have monetary valuations of Bachelor or Master degrees seen as a unique pedagogical asset. In this context it could be acceptable to make losses in a course if in other courses there are benefits. From our study it can be seen that quite usual teaching staff combinations are giving losses. While, other cases, with quite low wages, provide benefits and internal rates of return from 18.96 to 0.15. In a global view the combination of courses with benefits and losses might provide a more realistic estimation.

References

- Becker, G. (1993). *Human Capital, A Theoretical and Empirical Analysis, with Special Reference to Education*. The University of Chicago Press.
- Blesa, M. J., Duch, A., Gabarró, J., Petit, J., and Serna, M. (2016). Continuous assessment in the evolution of a CS1 course: The pass rate/workload ratio. *CSEDU 2015*, vol. 583 of *Comm. Computer and Information Science*, pages 313–332. Springer.
- Bourdieu, P. (1986). The forms of capital. In Richardson, J., editor, *Handbook of Theory and Research for the Sociology of Education*, pages 241–258. Greenwood.
- Fisher, I. (1930). *Theory of interest as determined by impatience to spend income and opportunity to invest it*. The Macmillan Company.
- Keynes, J. (2007). *The General Theory of Employment, Interest and Money, with an introduction by Paul Krugman*. Palgrave-Macmillan.
- Petit, J., Giménez, O., and Roura, S. (2012). *Jutge.org: an educational programming judge*. *Proc. SIGCSE 2012*, pages 445–450.
- Piketty, T. (2014). *Capital in the Twenty-First Century*. Harvard University Press.
- Sedgewick, R. (2017). *A 21st Century Model for Disseminating Knowledge*. Talk at AofA.

Business French and Translation in the Era of Google Translate: Variations on the Action-based Approach in Language Courses

Mittler, Sylvia and Sonina, Snejina

Centre for French and Linguistics, University of Toronto Scarborough, Canada

Abstract

In this article we outline our practices for the inclusion of electronic translation devices in specialized French language courses and reflect upon the changing landscape of language teaching. We describe how the use of Google Translate can increase students' awareness of linguistic, stylistic, and cultural differences in our culturally and linguistically diverse classrooms. Although we characterize our didactic approach as action-based, we differentiate our use of this approach from its common use in general language courses and point out the usefulness of intellectualizing it based on our use of Google Translate in work-place-oriented courses. Furthermore, we use our experience with action-based approaches and translation devices to answer the following questions: why are students still learning languages; what are the language skills that they are interested in; and what is the role of a language teacher in this new world of quasi-magic linguistic tools.

Keywords: *Technology in language learning; Teaching experiences; Learning for employment; Action-based approach.*

1. Introduction

A few months ago, the French professors in our department received an e-mail entitled “Google Translate” from a colleague in panic. The point of the missive was that we should indicate clearly on our syllabi that students are not allowed to use Google Translate for their French assignments and that such use will be considered plagiarism.

While it is obvious that the use of a translation device for essays would not reflect students’ knowledge of French, the idea of simply banning Google Translate from our teaching practices did not sit well with us. Since we teach *Business French* and *French Translation*, both courses preparing students for using French in their future careers, we agreed that we could not ignore the existence of free translation devices in our changing world. These rapidly improving devices can, we believe, be helpful in professional and everyday life; instead of banning their use in our courses and carrying on as if it were still the twentieth century, we would rather consider how to include them, and more important, how to teach students to use them effectively.

Our conversations on the subject and our experiments with Google Translate in our teaching practices led us to more serious questions. What is the role of a language teacher in a world where everyone has means of translation available at their fingertips? Since the Internet can provide immediate help with translation, what language skills should we emphasize in our teaching? Why would anyone still wish to learn a foreign language when tools for translation and even voice recognition are available?

In this article we will share our observations about students’ goals for learning French, our best practices for the inclusion of language practice and translation devices in our specialized courses, and our reflections about the changing landscape of language teaching.

2. Why study French at all?

A survey conducted in September 2017 among the students of our French program showed that most students want to study French for practical purposes: they are mainly interested in courses dealing with language and culture (In what areas would you like to see new courses offered? – Languages - 63; Culture - 56; Linguistics - 36; Literature - 33, Pedagogy - 23); when choosing their specialization they prefer Languages and Linguistics (What stream would you be most interested in within a French Major? – Languages & Linguistics - 55, Culture & Literature - 24; Pedagogy – 12).

On the UTSC campus, this distribution reflects pragmatic reasons for studying French: in Canada, a major or a minor in the French language added to a resume may mean a better chance of getting a better job. We believe that the distribution of interest we describe is consistent with a general trend toward dropping enrollment in the Humanities. Most

university students study languages not to enjoy literary masterpieces but to acquire a practical tool to improve their chances for a successful career. Courses like *Business French* and *French Translation* are designed specifically to help them in this endeavor.

3. Do we teach content or language?

Although the main focus of *Business French* is supposed to be on the French language, or rather a French language subset used in the work context, the course is perceived as content-based by many students. For most students who major in French all business and finance content is totally new. Not even the students from our Management Program are familiar with all of the concepts discussed in this course for mastering business-related vocabulary and writing practices. However, in order to understand business language it is necessary to understand the meaning of professional terms and expressions. So, in practice, we use much of our class time teaching the basic concepts of entrepreneurship, the stock market, and banking *en français*. Of course, what students need to master is the usage of the French language in a work context, and thus the main object of study is the specialized business vocabulary and the subset of syntactic patterns used in business correspondence. However, since the vocabulary is inseparable from content and writing patterns reflect cultural preferences, the outcome of the course is threefold: students learn a great deal about the world of business and finances, about cultural differences in French and English correspondence, and about specific linguistic patterns characteristic of business French.

After the basics are mastered in *Business French*, *French Translation* courses refine language skills, teaching how to preserve maximum fidelity to original meaning in translation while always retaining linguistic clarity. It is axiomatic that no single, perfect translation exists for anything, but instead variations according to socio-cultural background, style, register, and so on. Students seated behind computers work on informative, non-literary texts and soon learn to think strategically when translating: to approach translation in terms of the sentence and its main syntactic clusters, to identify difficult words or phrases in a sentence before they start, to choose a French adjective with a clear, defined meaning over a synonym that possesses different meanings or even shades of meaning in different contexts, to remember clarity mostly dictates “less is more”, and to always home in on meaning as opposed to its mere linguistic envelope in order to flexibly substitute a French noun for an English verb, or replace English-language military-domain metaphors with culturally appropriate French culinary ones. Practical application of concepts is thus continuous; so is comparison and contrast of Hallidayan language model elements such as register and lexico-grammar in order to learn differing French and English patterns of transitivity, emotive modality, thematic structure and cohesion (Halliday, 2004). Students examine a variety of texts that throw linguistic differences and cultural particularities in their path randomly as they move, say, from a financially-oriented text to

one dealing with information technology, public health, agribusiness or plastics recycling. They can use on-line dictionaries like Linguee, terminology banks like Termium, even grammar correctors, and quickly learn to verify on their own what Google and other services give them by checking for usage *within* French and then re-using Google to translate *back to* English.

To use the vocabulary of Lightbrown (2014), our *Business French* courses are more “meaning-focused” while our *French Translation* courses are more “language-focused” (p.68-9); the latter draw students’ attention to accurate use of the material acquired in the former. In both course types, however, the conceptually and culturally determined objects of study require a different approach to teaching than the approaches used in general language practice courses.

4. How do we teach?

The main approach used in our teaching of both *Business French* and *French Translation* is meaning-driven, which in this case represents a real cross between content-based, project-based, and task-based approaches. These approaches had been used in such courses long before the action-based approach - described as related to all the three by van Lier (2007) - became popular in language teaching and spread to universities. In fact, similar approaches called “work-based learning” or “action learning” have been used since the 1980s in training for business (Lester & Costly, 2010; Trehan & Pedler, 2011), public services (Rigg & Richards, 2006), and community development (Zuber-Skerritt, 2013).

Since 2003, the *Business French* course has been taught with particular attention to student needs, a perspective which is also consistent with the action-based approach. Such attention is a must on our campus, which represents an extreme case of “growing cultural, racial and linguistic diversity” (Gearon et al., 2009, p.3) that has been discussed in North-American didactic literature for decades. However, on top of this, students in *Business French* come from different programs and specializations. The diversity of students’ backgrounds prompted us to divide them into groups according to their specializations and future careers: managers, teachers, health and wellness counselors, etc.. Each group was asked to create an imaginary venture according to their specialization (a small business, a private school, a health and wellness centre, etc.) and then to make presentations and produce business letters according to the chapters of the textbook and the corresponding “problems” of their imaginary ventures.

Initially, textbook chapters and their vocabulary constituted the basis for students’ creativity. However, since textbook prices kept climbing (Berg’s *Parlons affaires* reached \$150) and the on-line materials kept multiplying and improving, we considered teaching a

course without a textbook. Now we had more freedom in arranging subjects according to the logical development stages of the imaginary ventures. The separate tasks became a continuous narrative – a course-long project.

With the continual growth of students' ventures and their knowledge of business terminology, the concept of scaffolding, emphasized in the action-based approach, came into play naturally. Each group would progress from the simple activities of the first class, in which students first learn the main types of ventures, consider the possibility of forming their own imaginary venture, learn some basic principles of business writing, and then collectively compose a short missive to a future consultant, to the more sophisticated tasks of the last class, in which students discuss investment opportunities for the “millions” they have “gained” and write a detailed letter to their investment advisors.

Scaffolding as defined by Lightbrown (2014) – “supporting the communicative efforts of another speaker, especially a language learner, by providing vocabulary or partial sentences that the speaker can ‘build’ on” (p.146) – has always been an essential part of teaching French for business purposes. For example, in the textbook by Besnard and Elkabas (1997), which was used at the very beginning of this century long before action-based didactics, each chapter provided exactly that – vocabulary and partial sentences. It was the instructor's task to relate the “scaffolds” to students in the appropriate time and manner. However, students' creativity often was restricted by their limited knowledge of French vocabulary and grammar. The arrival of translation tools and omnipresent Wi Fi helps to overcome these limitations.

5. How does Google Translate help us to teach more effectively?

Translation tools available on the Internet help to grow the autonomy of the learner, which, as van Lier insists, is the “defining feature” of scaffolding (Lier, 2007, p.62). Nowadays, students can find the information needed to fill in the structures provided through scaffolding quickly and easily. Thus these translation means provide another type of support – a support complementary to teacher-supplied scaffolding. In *Business French* the in-class instruction provides an explanation of concepts all too often unknown or foreign, whether for cultural or syntactic reasons – and then adds thematically organized terminology followed by the partial syntactic frames for business correspondence. Google Translate complements this with the terminology specific to the students' field of specialization and to their particular business “venture”. In the case of practical translation classes, because it is taught and actively learned together as a game of defensive strategy, much as in popular video games, the intensive application of concept to practice results in students' enjoyment, increased familiarity with verification techniques and finally, increased sophistication and accuracy in translating. Even translation students with limited

knowledge of French, once they learn what to look for in a Google translation and how to check it, can find Google Translate a useful scaffolding tool. Faced with a translation model they can correct, refine and improve by themselves, they have fun using their creativity to improve their knowledge. There is nothing that a resourceful student cannot express in French with the help of these matching tools.

Since success comes so easily, students gain confidence and enjoy using French. They appreciate the convenience and usefulness of translation tools, but at the same time they quickly become aware of their conceptual and cultural shortcomings when they review their translations in class with the help of the teacher. Below, we give a few concrete examples of the facilitation of students' learning of **vocabulary, syntactic structures, and cultural particularities**, as carried out in *Business French* and *French Translation* respectively.

In *Business French* facilitation for learning vocabulary consists in pointing out main difficulties and helping with memorization. Natasha Tokowicz, a professor of Psychology and Linguistics, distinguishes three types of difficulties in second language lexical processing: "cognate translations [...], concrete and abstract words, and words that are translation-ambiguous across languages in that they have more than one translation" (2015, p.75). In the case of true cognates, it is important to highlight the gender of the corresponding French word and to advise students to type in a word with an indefinite article in order to get the desired cognate: thus "a business venture" is translated "une entreprise" and students can use this word correctly right away. As for the false cognates, Google Translate has no problem with their correct translation; therefore in class it can be used for a game of cognates – true or false, while in projects and in life it can be used for a quick check of any translation.

The words that Google Translate does not get right consistently are translation-ambiguous. So in this case as well there is a special trick to teach: since translation algorithms use word distribution frequency and set phrases to "guess" the right meaning, it is always safer to type in a complete sentence than a single word in order to get a proper equivalent. For example, Google Translate renders the English word "position" wrongly for business contexts even in short phrases: "an excellent position > une excellente position, an important position > une position importante". However, it gets it right in a complete sentence: "I am interested in this position > Je suis intéressé par ce poste".

In translation courses, not cross-checking Google Translate's rendering of "Experts predict a 10% rise in exports" as "Les experts prédisent une hausse de 10% des exportations" nets a student the correct nouns for "rise" and "exports", but the wrong choice of verb and preposition: "prédisent" is used for crystal-ball-style predictions and should read "prévoient", while "de 10% des exportations" indicates a rise of only 10% of total exports and in the interest of clarity should read "de 10% **dans** les exportations". Google's amusing

literal translation of a sentence in a text on malware, “Forget stealing your credit card number, this malicious software does much more!”, tells the reader to forget stealing his/her own credit card – « Oubliez de voler votre numéro de credit, ce logiciel malveillant fait beaucoup plus! » – because Google can’t identify the evaluative comparison being made between card-theft and the software’s much greater capacity for harm. A meaning-sensitive student, however, will arrive at “Le vol de votre carte de credit n’est rien” or “n’est qu’une bagatelle”, that is, “credit card theft is nothing”, followed by a translation of “compared to”.

To help students with memorization, we recommend different approaches for concrete and abstract words and different on-line tools for practice. For memorizing concrete words, it is a good idea to use “image” in a Google search and then organize the images thematically. For example, pictures of different types of paperclips for the subject “office materials” illustrate the meaning of the French words and draw attention to their morphology (Fig.1).



Figure 1. Google images for types of paperclips.



Figure 2. Sentence and illustration.

Pictures are less effective for abstract words, which need to be accompanied by sentences: in Fig.2 the picture illustrates the sentence, drawing attention to the different meanings of the French word “poste” – “position” if masculine but “post office” if feminine. There is also a way to organize abstract words into semantically-related clusters, or even “word association networks” similar to those studied by Meara (2009, p.59-64); students thus find help with understanding meaning and memorization through association. Translation devices and electronic dictionaries are useful for the tasks of constructing such clusters and finding synonyms and antonyms.

Translation devices render syntactic structures perfectly well. However, they do not always get cultural differences right. By now, Google Translate has learned to differentiate between the informal “tu” and the formal “vous” in French. Once again, the key is to feed the translation device as much context as possible. In a short sentence not marked for any official situation, Google will render “you” as “tu” – “Could you do it? > Pourrais-tu le faire?”; but when we use any word from business vocabulary it will change “tu” to “vous” - “Could you send me a sample? > Pourriez-vous m'envoyer un échantillon?”.

However, Google Translate misses cultural differences in some important business formulas, including formulas of address and farewell. In formal letters, it translates “Dear Mr. Smith” as “Cher Mr Smith” instead of the simple and standard French “Monsieur” used without “cher” or “Smith”. It correctly translates “Sincerely” as “Cordialement”, unlike most anglophone students who use the false (in this situation) cognate “Sincèrement”. But since “Cordialement” is not used in formal letters that require a longer standard *formule de politesse* at the end, cultural differences become more important than standard grammar in the teaching of French for professional use. They loom equally large in translation at any level – perhaps larger than is commonly realized. That said, a solid intellectual understanding of grammatical phenomena is also absolutely necessary in both types of classes we discuss. For example, students need to understand the principal difference between conditional and indicative modes in order to render the English “could” correctly and to choose the proper mode for a letter:

Generally, the use of translation devices helps to improve overall course outcome. We base our finding on the results of 300 translation students over 5 years, as well as 300 in Business French over 15 years. Before Google Translate, students would reach the end of *Business French* with a collection of business letter samples and a good knowledge of the business vocabulary and syntactic patterns that might help them in their future career; in *French Translation* they would be expert in consulting dictionaries and trusty grammar manuals for key vocabulary and syntactic patterns culled from language in general. Further scaffolding aid eluded them in both environments. Nowadays, having used the same samples and patterns with the help of Google in work-like simulations in class and in at-home projects, students finish both types of meaning-centred courses with the confidence that, given resources, they will be perfectly functional in any francophone work environment.

6. Conclusion: why, what, and how to learn with translation devices

Usefulness is the aspect of our courses that students appreciate the most because comments like “One of the first classes that actually taught me useful information required for real life use of the French language” and “More specialized courses like this should be offered at UTSC” are the most frequent in course evaluations. While such remarks confirm practical goals in learning languages with the help of Google Translate, further student comments on overall learning experience and available assistance elucidate two other questions that we asked in the introduction.

The comments from *Business French* indicate a shift in the skills sought in language learning: most students valued the speaking practice and especially the attention to their pronunciation that became a focus of our in-class activities once we delegated most time-

consuming undertakings to the machines. In *Translation Courses*, students appreciated their increased knowledge of usage as well as their ability to discriminate shades of meaning and stylistic differences. Importantly, in both types of courses students deeply appreciated our helping with memorization and increasing their awareness of linguistic, stylistic and cultural differences. For although we use didactics linked to an action-based approach, our courses emphasize intellectual understanding. It is their growth in such understanding, whether in pronunciation or in stylistic choices, that students value the most as their learning outcomes. Therefore, we see our role as language teachers as providing guidance for more conscious mastering of linguistic and cultural phenomena – for the learning that will help students use translation devices effectively.

References

- Rigg, C. & Richards, S. (Eds.). (2006) *Action learning, leadership and organizational development in public services*. London: Routledge.
- Berg, R.-J. (2013) *Parlons affaires!: Initiation au français économique et commercial*. Boston: Thomson Heinle.
- Besnard, C. & Elkabas, C. (1997) *Pratique des affaires*. Toronto : Canadian Scholars' Press.
- Gearon, M., Miller, J. & Kostogriz, A. (Eds.). (2009) *Culturally and Linguistically Diverse Classrooms: New Dilemmas for Teachers*. Bristol ; Buffalo, NY : Multilingual Matters.
- Halliday, M.A.K. & Matthiessen, C. (2004) *An Introduction to Functional Grammar*. London: Arnold.
- Hatim, B. (2009) "Translating text in context", in J. Munday (ed.) *The Routledge Companion to Translation Studies*. Abingdon and New York: Routledge, pp. 36-53.
- Lester, S. & Carol, C. (2010) "Work-based learning at higher education level: value, practice and critique" in *Studies in Higher Education*, Vol. 35 (No. 5), 561-575.
- Lier, L. van. (2007) "Action-based Teaching, Autonomy and Identity" in *Innovation in Language Learning and Teaching*, Vol. 1 (No. 1), 46-65.
- Lightbown, P.M. (2014) *Focus on content-based language teaching*. Oxford : Oxford University Press.
- Littlemore, J. (2009) *Applying Cognitive Linguistics to Second Language Learning and Teaching*. Houndmills, Basingstoke ; New York : Palgrave Macmillan.
- Meara, P. (2009) *Connected words: word associations and second language vocabulary acquisition*. Amsterdam ; Philadelphia : John Benjamins Pub. Co.
- Pym, A. (2010) *Exploring Translation Theories*. Abingdon and New York: Routledge.
- Tokowicz, N. (2015) *Lexical processing and second language acquisition*. New York, NY: Routledge.
- Trehan, Kiran and Pedler, Mike. (2011) "Action learning and its impact" in *Action Learning: Research and Practice*, Vol 8 ,(No 3), 183 – 186.
- Zuber-Skerritt, Ortrun. (2013) *Lifelong Action Learning for Community Development*. [S.l.] : SensePublishers.

LEGO blocks as a gamification tool

Domínguez Vila, Trinidad^a; Alén González, Elisa^a and de Carlos Villamarín, Pablo^a

^aDepartment of Business Management and Marketing, University of Vigo, Spain

Abstract

New teaching methodologies with a more active participation of the students are increasingly present in the educational field. One of the best known is gamification, which refers to learning through play. A tool used in this methodology are the LEGO blocks. In this paper, an analysis of the students' skills developed by LEGO blocks learning is carried out in two dimensions: self-connection and communication with others. A sample composed of Bachelor's Degree in Computer Engineering and a Master's Degree in Teaching students is analyzed, in order to identify common behavioral patterns through a cluster analysis. Conclude that the use of this tool is highly valued by students in terms of the development of the own dynamic as well as the implicit learning that it propose.

Keywords: *LEGO blocks; gamification; game-design; self-connection; connection with others.*

1. Introduction

Various pedagogical movements currently advocate the use of different methodologies that involve more active student participation in the learning process by encompassing elements as relevant in the process as critical thinking or assimilation, understanding and the application of content among others (Bonwell & Eison, 1991, Scannapieco, 1997). Game-based learning or gamification is one of these methodologies. It leads to positive experiences in the learning process (Connolly et al., 2012) while reinforcing and consolidating knowledge through practice. Gamification is based on the use of mechanics, elements and game design techniques to engage users and solve problems (Zichermann & Cunningham, 2011; Werbach & Hunter, 2012). Through it, one may influence the behavior of people, thanks to the fact that it produces and creates experiences, feelings of domination and autonomy (Hamari & Koivisto, 2013).

One of the games used to this end are LEGO blocks. It is associated with creativity, imagination, teamwork, problem solving or rewards among others (Gadomska, 2015). Teachers have already included it in the curricula because its dynamic is very motivating, and it facilitates learning (Buckley, 2015; Erwin, 2000; McNamara et al., 1999). Different methods are used with LEGO blocks, but they all generally work on the idea of unity, coherence and cohesion as a metaphor for the construction of meaning in students. What is more, they act as a bridge of union (Buckley, 2015; Gadomska, 2015). Papert (1980) emphasizes that students learn more effectively when they can manipulate tangible materials that facilitate both physical and mental simulations in problem-solving (Li et al., 2016).

This paper analyzes the use of a LEGO dynamic on the student learning process. It aims to work on communication and teamwork, to later analyze the results grouped into three large blocks: variables linked to self-connection, connection with others and the own dynamic.

2. Lego as a Gamification Tool

According to the methodology, the objectives of LEGO are divergent. The same end is not sought when LEGO is applied in the humanistic field rather than the scientific field. In the latter, it influences engineering design by facilitating student openness in ultimate problem-solving; it interiorizes concepts and scientific terminologies at a greater flow (Bethke & Rogers, 2013). "Engineering is the application of science to problem solving, and design is the creative expression of knowledge" (Li et al., 2016: 144)

We can classify the skills affected by gamification through LEGO into two large groups: self-connection and connections with others. In relation to the former, self-connection, various studies show that the use of Lego creates a facilitating environment. It uses

dynamics to visualize aspects of reflection on practical situations (Osmond & Darlington, 2005). At the same time, it produces an apathetic connection in the development of ideas (Papert & Harel, 1991). This makes it possible to add reflection, which influences critical reflection; but it does so in a creative way that facilitates this process (Gauntlett, 2007, Osmond & Darlington, 2005). Horwarth and Morrison (1999), like Hunt (2006), agree on the results of their studies, in which the use of LEGO provides tacit knowledge and links theory to practice (All & Havens, 1997) by facilitating the chance to split difficult concepts into more understandable parts that can be reconstructed.

Concerning the connection with others, the dynamics with LEGO emphasizes communication, understood as the connection with others, through a supporting medium. However, various handicaps may appear. Anxiety may be present in the social scope of the work among students (Ruch, 2002), at the place where the dynamics are developed, or the teacher may act as a facilitator during the development of the dynamics (Daines et al., 1998). This generates the need to work and delve into conflict resolution and team building. By having to work with their hands, the players explore new ways of constructing more open identity models. This facilitates the use of different communication channels to convey experiences, connecting them with greater flow to other participants (Gauntlett, 2007). Race (2001) advocates the use of LEGO in team building. Once again, however, time constraints were acknowledged as having an impact on the success of the workshop. Therefore, another key element in working with LEGO is inclusion because it is a tool that encompasses individual and collective learning styles about thoughts and learning from diverse points of view (Lawlor & Handley, 1996).

2.1. Development of the LEGO Dynamics

The tools used through LEGO are very broad and varied. This is why we have chosen to select a game focused on improving communication skills and teamwork. The one proposed by Switon is used as a reference for the development of the game (2016: 1).

- Game Purpose: to illustrate the importance of clear communication, and allow the group to explore their communication style and make improvements as necessary.
- Materials and Preparation: 2 matching sets of children's building blocks (e.g. Lego), with 10 blocks and 1 base board in each set. Using one set of blocks, build a random object using the 10 blocks, which must then be duplicated.
- Time: 45-60 minutes
- Group Size: minimum 3 people, up to about 7 (You can have duplicate exercise running in parallel if group is larger, but will need more sets of building blocks).

- Rules: There are 4 roles in this communication skills game.
 - o Person A – director. Person A is given the built-up set of blocks, and is the only person who can see the object. It is the director’s job to give clear instructions to person B, the runner, so that person C can build an exact replica of the model.
 - o Person B – runner. Person B listens to the director’s instructions and runs to a different part of the room to where person C is sitting. The runner then passes on the building instructions, without seeing the building blocks, to Person C, the builder. The runner can make as many trips as required within the time allowed for the exercise.
 - o Person C – builder. Person C listens to the runner’s instructions and builds the object from the set of building blocks. The builder is the only person who can see the object under construction, and building materials.
 - o Person(s) D – observer(s). Person(s) D observe the communication game, and make notes about what works, what doesn’t work, and how people behaved under pressure etc., to pass onto the group later.

A time limit of 15/20 minute is set for exercise. When the time is up, the group is allowed to compare the model and the replica to see how much they match. In general, the replication is very similar to the original. This may cause some discussion. You must allow the group to reflect on what the exercise was like and identify 1 thing they did well, 1 that did not work, and 1 to be improved next time.

The exercise is executed again. One may change or maintain the original roles to see if improvements have been made. Yet we must make sure to build a new "original" model. This simple game of communication skills can be executed several times without losing its learning potential. Teams can add levels of sophistication to their communication, make use of aids such as diagrams, codes, standard procedures and active listening techniques.

In general, elements such as language and bidirectional communication, learning, retentive capacity, strategy design, motivation and self-confidence, as well as order of command or efficiency in the use of resources are all worked on at the same time.

3. Sample and Results

The aforementioned dynamic was applied to students in the last year of their Bachelor's Degree in Computer Engineering and those enrolled in a Master's Degree in Teaching throughout the 2016/2017 course. A sample of 61 surveys was obtained from a total of 85 students. Almost 70% of the answers corresponded to students of the last year of Computer Engineering. The rest corresponded to students of the Master’s Degree.

The methodology was based on a questionnaire, passed upon the completion of the dynamics, with questions on the dynamics linked to self-connections, the connection with others and the own dynamics. A 5-point liker scale was used, in which 1 was not important and 5 was very important. In addition, three open questions were added about the development of the activity itself to obtain feedback for the teacher.

As seen in figure 1, the results are quite homogeneous with low dispersion levels; they present a clearly satisfactory trend at the three levels, i.e., self-connection, connection with others and the development of the own dynamic. Almost all the variables analyzed have values equal to or greater than 4, which highlights the relevance attributed to establishing a common language, the level of concentration, the design of strategies and a clear common objective.

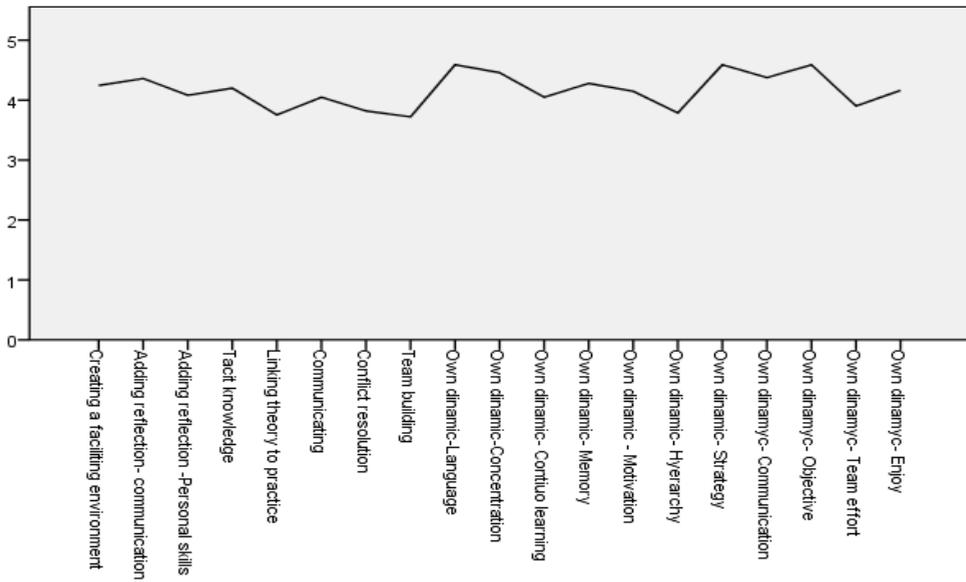


Figure 1. Statistic mean of the variables used.

Subsequently, a cluster analysis was performed to determine whether similar behavior patterns, were present for the variables making up the self-connection as well as for the connection with others. All of them were significant, with the exception of tacit knowledge, which had a value of 0.595. The following illustration reveals two clear behaviors. Cluster 2, composed of 37 cases, grouped the students who most positively assessed the different variables, with values of 4 and 5, mainly in terms of creating a facilitating environment, and

adding reflection-communication, which concerns self connection. Cluster 1 consisted in 24 cases with lower values and followed a similar pattern. Yet the view on the assessment of the dynamics was more critical with an average oscillating between 3 and 4. On the other hand, we also analyzed if the degree of study could influence the results, but we found no statistically significant relationships in any of the cases.

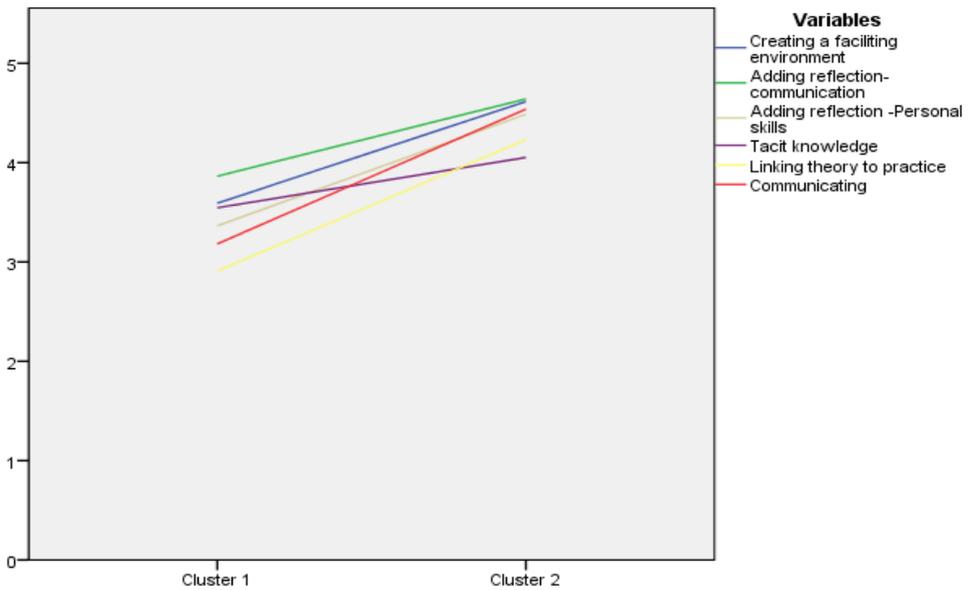


Figure 2. Cluster analysis.

3. Conclusions

As observed both in the review of other work and through the results obtained in this study, the use of gamification in learning processes is highly valued by students in terms of the development of the own dynamics as well as the implicit learning that it proposes.

LEGO blocks are one of the tools that can be used. They facilitate the assimilation of knowledge when working with tangible elements and they are versatile enough to adapt to different dynamics. The game presented in this research, aimed at improving communication and teamwork, focuses more on the connection with others. Although the results obtained after analyzing the responses to the questionnaires were very positive for all the items analyzed, the items linked to self-connection were the most prominent, fundamentally those linked to communication and development in one's own environment. Valuing teamwork came in second place. The free text answer questions corroborate these

results. The students emphasize three items, which most like about activity carried out: to experience how the organization works in a teamwork, the different roles that the members acquire and, mainly, the evolution of communication in the group through the design of a common language of all the members that enables the improvement as a team. On the opposite side, they indicate as a negative point having to develop the dynamics under the pressure of time, since this is limited, for this reason, the most number of participants requested to improve this problem by enabling an initial time to design a common team strategy.

For all of the above, we may affirm that the use of these dynamics facilitates the learning process (Buckley, 2015, Erwin, 2000, McNamara et al., 1999) while also motivating students. It would be interesting for future research to look into why teamwork and conflict resolution was not so relevant. The sample under analysis could also be extended to include students from different fields of knowledge and qualification to see whether the patterns outlined in this paper hold.

References

- All, A. & Havens, R.L. (1997). Cognitive/Conceptual Mapping: A Teaching Strategy for Nursing. *Journal of Advanced Nursing* 25 (6), 1210–1219
- Bethke, K. & Rogers, C. (2013). Engineering design-based science, science content performance and science attitudes in elementary school. *Journal of Engineering Education*, 120 (4), 513–540.
- Bonwell, C.C. & Eison, J. A. (1991). Active Learning: Creating Excitement in the Classroom. ASHE-ERIC Higher Education Report, Washington DC: School of Education and Human Development, George Washington University.
- Buckley, C. (2015). Conceptualizing plagiarism: Using Lego to construct students' understanding of authorship and citation. *Teaching in Higher Education*, 20 (3).
- Connolly, T.M., Boyle, E.A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A Systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, 59, 661–686.
- Daines, J., Daines, C. & Graham, B. (1998). *Adult Learning Adult Teaching*. England: Lavenham Press.
- Erwin, B. (2000). *Creative projects with LEGO mindstorms*. Addison-Wesley.
- Gadomska, A. (2015). Using LEGO blocks for technology-mediated task-based English language learning. *Teaching English with Technology*, 15 (2), 120-132.
- Gauntlett, D. (2007). *Creative Explorations: New Approaches to Identities and Audiences*. U.K.: Routledge
- Hamari, J., & Koivisto, J. (2013). Social motivations to use gamification: An empirical study of gamifying exercise. In Proceedings of the 21st European Conference on Information Systems, Utrecht, The Netherlands, June 5–8, 2013.

- Horwarth, J. & Morrison, T. (1999). *Effective Staff Training in Social Care: From Theory to Practice*. London: Routledge.
- Hunt, C. (2006). Travels with a Turtle: Metaphors and the Making of a Professional Identity. *Reflective Practice* 7 (3), 15–332
- Lawlor, M., & Handley, P. (1996). *The Creative Trainer: Holistic Facilitation Skills for Accelerated Learning*. London: McGraw Hill
- Li, Y., Huang, Z., Jiang, M., & Chang, T. W. (2016). The Effect on Pupils' Science Performance and Problem-Solving Ability through Lego: An Engineering Design-based Modeling Approach. *Educational Technology & Society*, 19 (3), 143–156.
- McNamara, S., Cyr, M., Rogers, C., & Bratzel, B. (1999). LEGO brick sculptures and robotics in education. Paper presented at the *American Society for Engineering Education Annual Conference & Exposition*, Charlotte, NC.
- Osmond, J. & Darlington, Y. (2005). Reflective Analysis: Techniques for Facilitating Reflection. *Australian Social Work*, 58 (1), 3–14.
- Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. New York, NY: Basic Books.
- Papert, S., & Harel, I. (1991). Situating Constructionism. In *Constructionism*, edited by S. Papert and I.Harel. Norwood: Ablex Publishing.<http://www.papert.org/articles/SituatingConstructionism.html>.
- Race, P. (2001). *The Lecturer's Toolkit: A Practical Guide to Learning, Teaching and Assessment. 2nd ed.* London: Kogan Page, Ltd.
- Ruch, G. (2002). From Triangle to Spiral: Reflective Practice in Social Work Education, Practice and Research. *Social Work Education* 21 (2), 2002
- Scannapieco, F.A.(1997). Formaldebate:Anactivelearningstrategy. *Journal of Dental Education*, 61, 955–961.
- Switon, L. (2016). Building communication skills. Management for the Rest of Us. Available in: <http://mftrou.com/communication-skills-game/>
- Werbach, K., & Hunter, D. (2012). *For the Win: How Game Thinking Can Revolutionize Your Business*. London: Wharton Digital Press.
- Zichermann, G., & Cunningham, C. (2011). *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. O'Reilly Media.

Competence-based learning and societal awareness: Building up experiences within the discipline of interior architecture

Vallet, Nathalie; Somers, Inge; Corthaut, Michel

Faculty of Design Sciences, University of Antwerp, Belgium.

Abstract

By means of the bachelor proof, students of interior architecture of the University of Antwerp (Faculty of Design Sciences) are stimulated to design interiors for real-life public libraries in view of particular societal challenges. During three subsequent years the teaching staff elaborated a set of learning objectives and activities that jointly form a competence-based learning process focussed on the development of the societal awareness of design students. In this paper we report on the intermediate experiences of the teaching staff and the students as indicated by a set of mainly qualitative data. In short it concerns four lessons learned relating to the over- and underestimation of (i) disciplinary filters, (ii) comfort-zones, (iii) motivating complexities and (iv) copy-cat behavior.

Keywords: *societal awareness, competence-based learning, academic bachelor interior architecture.*

1. Introduction

Since the end of the eighties, many public institutions are reconsidering the design of their public interior in order to meet a variety of societal challenges such as life-long learning, digitalization, sustainability and social diversity (Dunleavy, et al., 2006; Koliba et al., 2010). Emphasizing for instance *tailormade*, durable and easy-accessible public services clearly demands for a particular, ‘fitting’ interior design of their public buildings.

One such public institution is the public library. Throughout Europe and far beyond, public libraries are redefining the reason of their existence (Aabo, 2005; Dahlkild, 2011; Vallet, 2015). By doing so, their societal added value clearly transcends the traditional image of a ‘storage for lending and borrowing books’. Thus, public libraries become for instance (digitalized) information and learning centers, active defenders of equal rights (eg. supporting the social and cultural needs of vulnerable citizens), and facilitators of public encounter and social cohesion. The remaining challenge is however: how can public libraries implement these new ambitions? What does this imply, not only in terms of activities but also in terms of appropriate library buildings and spaces ?

In order to take up the previously mentioned design challenge, our future society is in need of interior architect students that can sense these societal ambitions and integrate them into the interior design process that generates ‘fitting’ or suitable interior designs (Giunta, 2009; Attiwill, 2011; Caan, 2011; Cunningham, 2014).

Within the faculty of Design Sciences of the University of Antwerp (Belgium), an explorative project has been launched to stimulate the societal competence-based learning of interior architect students. During three subsequent years, the bachelorproof students are assigned to make designs that explicitly fit the particular societal challenges of a selected set of real-life public libraries in Flanders (i.e. case-studies).

In this paper we will present and discuss the intermediate experiences of the teaching staff and the students involved. Due to the explorative and incremental nature of the project, a well-defined set of quantitative ex-post measurements are (presently) lacking. Nonetheless, we have collected an interesting set of relevant qualitative information (i.e. semi-structured interviews, focus group debates) on the basis of which a first and preliminary set of insights as well as associated lessons learned can already be defined and discussed.

2. Methodological design of the project

2.1. The concept of competence-based learning

When considering the theoretical concept of competence-based learning, a competence can be defined as an integrated set of knowledge, skills and attitudes (Burke, 1990; Hoogveld et

al., 2005). From a constructivist epistemological point of view, the learning process is considered to be a kind of quest that is explicitly modelled by the student himself. Thus, the student will elaborate gradually his or her own learning targets and ambitions. Not the final result is the central focus of the learning process, but rather the quest itself. In a competence-based learning process, the real world and a realistic simulation of the professional future of the student is crucial. Gradually, a confrontation with authentic professional settings will stimulate the development of appropriate insights as well as skills and attitudes. Thus, the teacher becomes a coach who gradually (re)contextualizes the developed competences that the student has learned. As such and on the basis of real-life contextualizations, the competences of the student will gradually become fine-tuned and professionalized.

Although the concept of competence-based learning was initially focussed on technical and vocational learning, at present it is also applied in higher education programs and academic studies.

When operationalizing the concept of competence-based learning within the project, it concerns the development of knowledge, skills and attitudes needed to sense and understand the particularities of the societal challenges of real-life public libraries in order to improve the interior design process of their buildings and spaces, and to guarantee a (more) 'fitting' in stead of a general, uniform library design.

2.2. The concept of societal awareness

The concept of societal awareness refers to particular future societal challenges of real-life public institutions. The awareness implies (i) discovering and understanding these societal particularities and (ii) taking them explicitly into consideration when designing the interior of the public institution involved.

When operationalizing the concept of societal awareness in the subsequent three years, the selected public institution was held stable and concerned Flemish public libraries. The major reasons for choosing them are (i) the dynamic change in their future societal challenges and ventilated redesign needs, and (ii) the familiarity of our students with this type of public institution (i.e. libraries are part of their daily life). Thus the presence of an authentic professional setting was guaranteed.

The first year consisted of two case-studies focussing on important library target groups. The cases were (i) the public library in Destelbergen and its particular focus on children and youngsters and (ii) the public library of Lange Munte in Kortrijk and its particular focus on a divers neighbourhood population in terms of age, gender and nationality. The second year consisted of two case-studies focussing on the digitalization hype, being (i) the public library in Elsene near Brussels and its particular focus on the direct neighborhood and

needed makerspaces, and (ii) the public library in Diksmuide and its particular focus on digitalizing a previous church building for a diverse library audience. The third year consisted of one joint case-study focussing on the creation of a so-called experience library in a complex spatial setting. The case was the joint public library of the municipalities of Hemiksem and Schelle near Antwerp, located in a former cistercienser abbey with a subsequent use as a military depot until WWII and a present use as a public administrative center. The complexity of the spatial setting relates to (i) the vast surface, (ii) the subsequent spatial interventions in view of different historical destinations, (iii) the ‘protected’ heritage features of the building that may not be altered by the new design (i.e. juridical and spatial design constraints of the official heritage status).

2.3. The features of the competence-based learning process

During the three subsequent years, the teaching staff developed a set of various teaching activities that jointly gave rise to a competence-based learning process. The phases and various activities are:

- Phase 1 (September- October): a well-considered selection of interesting real-life cases. Therefore the selection is realized together with academic public library specialists and representatives of professional platforms (e.g. CULTUURCONNECT or the Flemish platform of Flemish Libraries and Local Culture Policy; VABB or the Association of Flemish Public Libraries and Archives);
- Phase 2 (November - December): an ex-ante prospection by the teaching staff in order to get a clear understanding of the societal challenges as well as the associated design challenges. As such, the real-life character of the assignment can be guaranteed;
- Phase 3 (first week of February): an intensive kick-off week in which the students are confronted with (i) lectures of national and international library experts (i.e. academics, architects, policy makers, ...), (ii) a set selected by the teaching staff of visual design references of national and international public libraries with similar societal challenges, (iii) a workshop in which the students themselves have to look for additional visual references in view of the particular assignment, (iv) various organized trips to ‘inspiring’ existing public libraries in Belgium and the Netherlands (e.g. Muntpunt in Brussels, the public library in Amsterdam, the chocolate factory library in Gouda, ...), (v) a visit to the actual sites of the cases involved and (vi) oral and written information given by several stakeholders involved (i.e. interviews, plans, photographs given by the library director, library staff members, the administrative coordinator of local culture policy, the alderman of culture policy, social workers, youth consultants, ...). This intensive kick-off week offers a broad ‘bird’-perspective on the assignment (e.g. general library trends and hypes, contextual opportunities and constraints, existing designs or inspiration, conflicting demands of stakeholders).

- Phase 4 (February-March): six weeks of in-depth research realized by student teams on a specific topic of each case (e.g. the location, the architectural plans and maps, the needs of the target groups involved, the historical background, the juridical opportunities and constraints). This teamwork is realized in groups of maximum eight students per topic. The results of the teamwork is compiled into a case-study documentation map given to all students involved. This in depth teamwork offers a more detailed perspective on the assignment and simulates in particular the intensive joint preparation that is needed in a future professional setting. This phase is coached by the teaching staff that gives an intermediate feedback at the end of every week. The feedback consists of content-wise comments related to the topic and of process-wise evaluations related to the organization and planning of the team;
- Phase 5 (April-June): eight weeks to elaborate an individual design that meets the particular requirements, setting and constraints of the case. Students are stimulated but not forced to initiate extra visits to the cases, have interviews with the stakeholders involved or consult additional documents. It is up to the students to organize entirely this part of the learning process. The end result should consist of four representation techniques frequently used in the academic and vocational world of interior architects, being (i) a plan or 2D representation, (ii) a maquette or 3D representation, (iii) several renderings or simulations of actual usage and appearance, and (iv) a study of used materials. Once again this phase is coached by the teaching staff who gives an intermediate feedback at the end of every week. The feedback consists of content-wise comments related to the design itself and of process-wise evaluations related to the organization and planning of each individual student;
- Phase 6 (First week of July): the evaluation of each elaborated design and its four representation techniques by a mixed jury. On the one hand the jury consists of the teaching staff and some additional designer-teachers of the Faculty, on the other hand it consists of several representatives of each case involved. Thus, students have also to convince potential clients who co-defined the assignment and quality of their elaborated design (i.e. public libraries). This phase simulates once again the future professional setting of interior designers. In particular this phase focusses on in-depth reflections made by all parties involved;
- Phase 7 (September and October): in the third year some additional activities were organized to enable some students – though on a voluntary basis - to continue the development of their social awareness competences. Thus, 7 students were given the opportunity to enter an organized contest by the Faculty for the ‘best’ design (including a voting round amongst present users of the library involved). And 17 students were asked to show and present their elaborated design to the general public of Hemiksem and Schelle (i.e. on the yearly Flemish Cultural Heritage Day). In this phase students were confronted with more general reflections made by a ‘non-

designer' public and their perceptions of the societal role of a public library (e.g. what do I as a citizen of Hemiksem find important? What are my expectations towards our future public library?).

3. Experiences of teachers and students: results of a qualitative data-analysis

To check the realization of the initial ambitions, as well as to uncover interesting lessons-learned, qualitative data-gathering techniques were used throughout the entire project.

For the teaching staff intermediate, mainly informal focus group debates were organized to discuss the experiences of the feedback moments (e.g. what are the concerns and communicated challenges by the students themselves ? what kind of design behavior of the students do we observe ? In what way does the societal awareness changes throughout the learning process?) Additionally, the phase of the final jury also offers opportunities to reflect on the lessons learned, and this together with the representatives of the cases or the professional setting itself (e.g. what do they experience and observe in relation to the presence or development of the societal awareness throughout the learning process?).

The experiences of the students were not only registered during the intermediate feedback moments, but also after the finalization of the assignment (phase 6). In the second and third year an ad-random set of students were picked out for an in-depth half-structured interview of approximately 20 minutes. In the second year 18 students were interviewed or nearly 30% of 60 students, and in the third year 25 students or nearly 31 % of 81 students. The interviews were focussed on uncovering their own lessons learned in relation to (i) societal challenges of public libraries throughout the entire assignment, and (ii) the relevance of this information for their own design and developed design competences (i.e. knowledge, skills and attitudes).

The results of the qualitative data-analysis of the experiences of the teaching staff, as well as the students can be summarized in the following four major lessons-learned:

- The ease and willingness with which young people in general (are supposed to) discover and understand evolutions in their broader habitat has clearly been overestimated. Thus, the societal awareness of the interior architect students was not easy to trigger, as several students also explicitly indicated during the in-depth interviews at the end. Of all the given information, documentation and confrontations, only a very limited amount was finally taken into explicit consideration. Many students only selected the information that was “directly” related to the interior discipline (e.g. “I’m an interior architect so I did not find the information given by library experts relevant. Too difficult to really understand”). In short, it seems to be

rather difficult to remove the disciplinary filters and barriers of the students and to install a broader societal awareness that exceeds their own discipline;

- The ease and willingness to step out of a comfort-zone within their own discipline has also been overestimated. All staff members noticed for instance that the students always looked for the “shortest, safest and easiest way” to design, although they are taught otherwise. They mostly glimpse at the “safe” information given by the teaching staff and public libraries involved and rarely realize extra, self-planned observations or interviews. Additionally, the students reflect heavily on the technical and material interior requirements of the cases (e.g. length of bookshelves, available surface), and only to a limited extent on the perceptive and experience-related requirements (e.g. the evoked fascination). The latter is however crucial when using a societal awareness perspective on interior design;
- The way in which complex and difficult assignments trigger and motivate the students to actually leave their comfort-zone has clearly been underestimated. Mainly in the third year the assignment became rather complex, as also historical and juridical elements became part of the societal challenge of the case-study involved. At first the teaching staff and the students were afraid that this would jeopardize the willingness and capability to learn, but the opposite was true. Thus many interviewed students confirmed that the complexity and many constraints actually motivated them “... to leave what I had learned partly behind and start to experiment. Otherwise the assignment was not feasible. And I admit, that was quite fascinating”;
- The way in which the overall limited – absent - societal awareness within the interior discipline hinders the societal awareness building of students has also clearly been underestimated. Most arguments used by interior teachers and designers to explain and account for their own design is based on individual reflections, desires and fascinations, not on societal challenges that have to be solved. “How can we then expect students to behave otherwise and actually make an explicit societal or contextual link?” In short, and mainly according to the teaching staff it is clear that students are not only influenced by their curriculum or “what is taught”, but also by what they actually observe themselves in the design behavior of teachers and famous and leading professionals in their discipline.

4. Conclusion

During three subsequent years, the faculty of Design Sciences of the University of Antwerp has developed a competence-based learning process focussed on the development of the societal awareness of their bachelor students in interior architecture.

The essence of the learning process concerns a gradual evolvement of design-related activities focussed on five real-life case-studies of Flemish public libraries and their respective societal challenges. Throughout the three subsequent years approximately 220 students were involved, as well as a teaching staff of 4 to 6 colleagues. Although the development of the competence-based learning process is still proceeding, a first set of evaluative considerations has already been made on the basis of a qualitative-data analysis.

In this paper we have reported on the design of the competence-based learning process as well as on the intermediate considerations - experiences and reflections - of the teaching staff and students involved. In short, it concerns four lessons-learned relating to the over- and underestimation of disciplinary filters, comfort-zones, (unexpected) motivating effects of complex assignments and copy-cat behavior.

In future and still to be written papers we will (i) elaborate the considerations more in depth, (ii) report on intermediate solutions with which the teaching staff tries to improve the learning process and remedy the uncovered over- and underestimations and (iii) elaborate a quantitative evaluation tool to measure and fine-tune the effects in a more rigorous way.

References

- Aabo, S. (2005). The Role and Value of Public Libraries in the Age of Digital technologies. *Journal of Librarianship and Information Science*, 37(4), 205-211.
- Attiwill, S. (2011). Urban and Interior: techniques for an urban interiorist, in: R. U. Hinkel (Ed.), *Urban Interior. Informal explorations, interventions and occupations*. Baunach (Germany): Spurbuchverlag, 11-24.
- Burke, J. (1990) *Competence based Education and Training*. London: Falmer Press.
- Caan, S. (2011). *Rethinking Design and Interiors. Human Beings in the Built Environment*. London: Laurence King Publishing.
- Cunningham, E. (2014). Navigating the Past: What Does History Offer the Discipline of Interior Design?. *Journal of Interior Design*, 39(3), v-xi. doi: 10.1111/joid.12031.
- Dahlkild, N. (2011). The Emergence and Challenge of the Modern Library Building: Ideal Types, Model Libraries, and Guidelines, from the Enlightenment to the Experience Economy. *Library Trends*, 60(1), 11-42.
- Dunleavy, P., Magetts, H., Bastow, S. & Tinker, J. (2006). New Public Management is Dead – Long Live Digital-Era Governance. *Journal of Public Administration Research and Theory*, 16, 467-494.
- Giunta, E.E. (2009). Urban interiors. Artificial territories. Designing 'spatial script' for relational field. *IDEA Journal(Interior Territories)*, 52-61.
- Hoogveld A.W.M., Paas, F & Jochems, W.M.G. (2005) Training higher education teachers for instructional design of competency-based education: Product-oriented versus process-oriented worked examples. *Teaching and Teacher Education*, 21(3), 287-297.

- Koliba, C., Meek, J.W. & Zia, A. (2010). *Governance Networks in Public Administration and Public Policy*. New York: CRC Press, Taylor and Francis Group.
- Vallet, N. (2015). The Odyssey of Flemish Public Libraries. Facing opportunities and threats when becoming strategic partners in urban development. *Library Management*, 36 (8/9), 1-14.

The development trends of the main drivers for attracting students into the tertiary education sector in Latvia – distance learning and internationalization

Skvorcovs, Aleksandrs^a; Titareva, Tatjana^b and Graurs, Igors^c

^aDistance Learning Department, RISEBA University, Latvia, ^bBusiness Department, RISEBA University, Latvia, ^cManagement Department, RISEBA University, Latvia.

Abstract

The European Union (EC-JRC, 2010), has stressed that higher education must change and adapt to economic and social needs, that institutional change is essential to educational innovation, and that information and communication technologies (ICT) must form part of the teaching and learning process. The second international challenge is to encourage international cooperation between institutions in order to share knowledge across borders and facilitate collaboration (Morin, 2009) and post-cosmopolitan citizenship.

The main research question of this paper is: the general development trends of the main drivers for attracting more students into the tertiary education sector in Latvia by means of online education and internationalization.

The methodology of the study includes: critical analysis of scientific and educational literature, analysis of statistical data and analysis of empirical data.

The relevance of the research: the authors review the intersections of the distance learning and internationalization as the optimal solutions for the critical situation in the Latvian higher education sector where supply exceeds the demand (the trend of constantly decreasing students in the highed education institutions in Latvia).

Keywords: *higher education; HEIs; distance learning; internationalization; Latvia.*

1. Introduction

Rapid changes in the labour market as well as **globalisation** and the **development of the information society** have made the operational environment of higher education more complex (Jääskelä, Nykänen, Tynjälä, 2016). The **European Union** (EC-JRC, 2010), has stressed that higher education must change and adapt to economic and social needs, that institutional change is essential to educational innovation, and that **information and communication technologies (ICT) must form part of the teaching and learning** process. The second international challenge is **to encourage international cooperation between institutions** in order to share knowledge across borders and facilitate collaboration (Morin, 2009) and post-cosmopolitan citizenship (Dobson and Bell, 2006).

The dramatic decrease of the number of students in the last 10 years in the higher education institutions (HEIs) in Latvia (number of students has decreased from 129 503 in 2006 to 82 914 students in 2016, dropping by 64%) and disproportionally high number of HE institutions (58 higher education institutions for the population of less than 2 million people), makes Latvia's Government, the Ministry of Education and Science and higher education institutions to look for new ways to structure and optimize the processes in the higher education sector. Additionally, Latvia has to follow the latest trends of the HE industry worldwide, such as distance learning and internationalization, and try to develop attractive offers in these fields for local and international students.

The methodology of the study In this study, the following research methods were primarily used: critical analysis of scientific and educational literature, analysis of statistical data and analysis of empirical data.

The **main research question** of this paper is: the general development trends of the main drivers for attracting more students into the tertiary education sector in Latvia – online education and internationalization and what is required in order to improve their development in Latvia. One of the **research tasks** is to analyse and develop a new scheme that shows the current situation and the future development trends in the distance learning and internationalization of the higher education. The **relevance of the research**: the authors review the intersections of the distance learning and internationalization as the optimal solutions for the critical situation in the Latvian higher education sector with lack of students.

2. Distance learning and the use of ICT in modern education

Distance education as one of the new and perspective forms of completing higher education increases in popularity around the world. The two main factors have led to an explosion of interest in distance learning: the growing need for continual skills upgrading and retraining;

and the technological advances that have made it possible to teach more and more subjects at a distance (UNESCO, 2002). In 2013 the European Commission launched an initiative "to set out a framework for enhancing learning and teaching through new technologies and open digital content at all levels of education." The changing learning and teaching environment encourages higher education institutions to use distance learning tools more intensively (Bierne, Titko, 2016).

The current trends in the field of distance learning involve the shift in pedagogical prospects and theoretical frameworks, while the cooperation of students underlies the student-oriented constructivist environment (Beldarrain, 2017). Today the learning process is occurring as follows: the cooperation of a lecturer and students with each other takes place at a distance via the Internet, without losing the components of the learning process.

Global informatization of the society initiates the education informatization. The education informatization implies the information and educational environment establishment process. This process is directly connected with the establishment of the necessary material and technical base of the educational system, and includes the preparation of the training materials of the new generation, as well as the formation of a fundamentally new culture of teaching in the conditions of applying the information education environment. It is considered that the process of informatization of the educational system is developing in the following key areas (Figure 1):

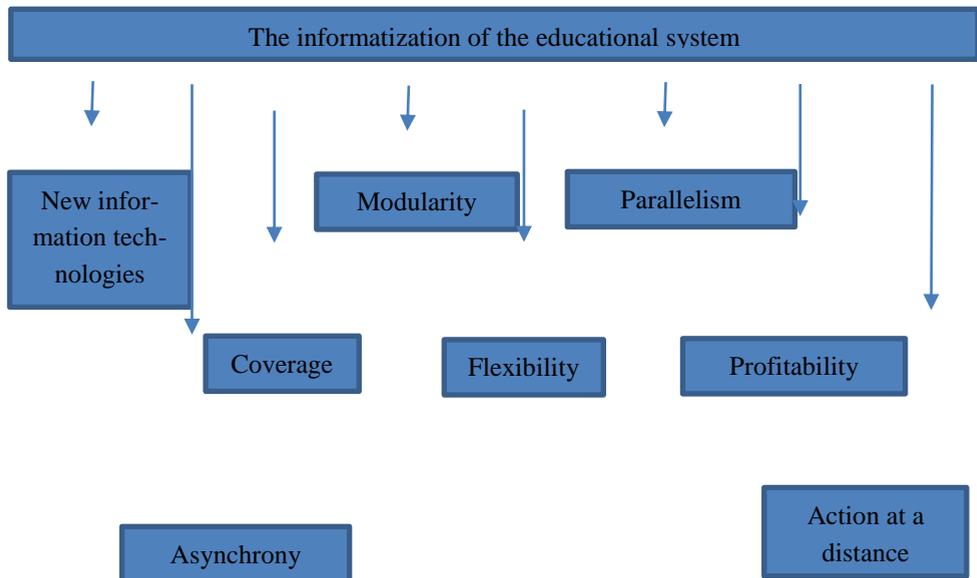


Figure. 1. The key areas of development of the informatization of the educational system. Source: authors (2018).

3. The Distance Learning in Latvia

The distance learning in Latvia appeared more than 12 years ago and successfully existed on experimental basis for improving the pedagogical skills of the Latvian lecturers and preparing reports for international scientific conferences. Over the past three to five years, the situation has changed significantly. Almost all Latvian universities started using teleconferences for communication between their branches located in different regions of Latvia. The active use of the European Union funds essentially improved the electronic communication capabilities in the country.

According to the authors' opinion, it is necessary to understand the fact that this method of education does not suit all students, but only well-motivated ones. For school graduates without the previous work experience and self-discipline, it is better to study full-time under the supervision of experienced lecturers, attending classes every day at an university. Distance form of learning requires the certain self-sufficiency and time management skills.

The distance learning system should include four main components, which are shown in Figure 2 below.

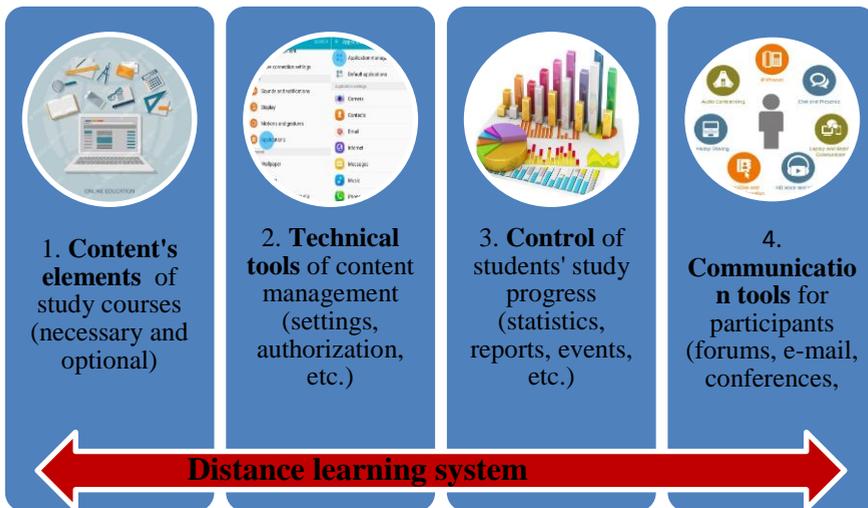


Figure 2. Main components of the distance learning system. Source: authors (2018).

According to the authors' conclusions inspired by the experts presentations at CEEMAN conference in Bled, Slovenia in December 2017, the following components will become important in the digital learning (Figure 3 below):

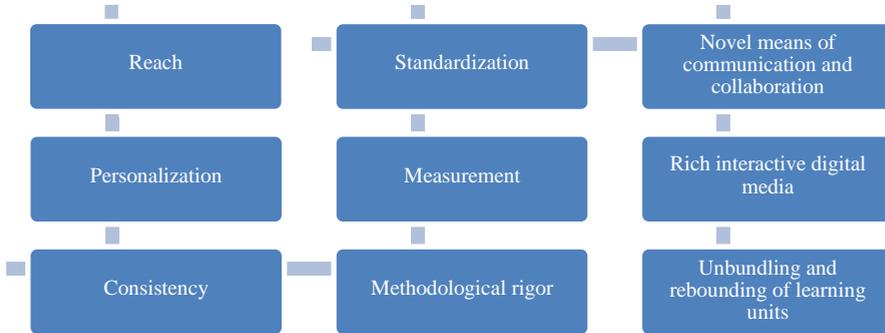


Figure 3. The future most important components in the digital space. Source: authors (2018).

As the outcome of the research, the authors of the work suggest the following principles of distance learning at the level of each course:

1. Separate the technical, factual, mechanistic components and deliver them online via new-style instructions and assessment tools.
2. Maintain the consistent quality and measurement of the attainment.
3. Focus on face-to-face sessions exclusively on experiential learning: project work, games, simulations, debates, etc.:
 - a. Make contact hours more engaging and memorable, more satisfying for both students and academic staff.
 - b. Autonomous, self-directed learning.
 - c. Faculty as coach.
4. Free up to 30%-50% of programme faculty hours:
 - a. Reinvest in more experimental learning.
 - b. Add more students (class sections).
 - c. Direct to faculty research.
5. Adjust to Full-Time, Part-Time, Modular, or Distance formats.

According to Vasilevska et. al. (2017) the distance education model in Latvia at the current stage of development remains not fully demanded. However, according to the same authors, there is evidence that full-time students are willing to have their education supplemented with up-to-date teaching and learning methods, using information technologies (Vasilevska, Rivza, Pivac, 2017). Despite the need for improvement, the future of distance learning in Latvia seems bright. Increasing numbers of students enrolling in distance learning classes underscore the need for comprehensive and thoughtful evolution of distance education if it is to become the educational model of the future (Harnar, et al., 2000).

4. Internationalization of HEIs in Latvia

As per the Ministry of Education and Science of Latvia (2016), since 2006-2007, when the number of local students started to decrease, **the percentage of international students in Latvia raised from 1 % in 2006-2008 to 10% and reached the number of 8 137 students with large potential and tendency to increase every year.**

The internationalization of study programmes has for years been perceived as one of the basic factors of development of higher education institutions (Deardorff, Wit, & Heyl, 2012; Churski, et al., 2017). As per Jensen and Thøgersen 2011:19, the more international students, the higher the quality of education. In addition, internationalization, either abroad or at home, is almost automatically considered to improve students' language and cultural skills and provide them with better opportunities in the labour market (Coleman 2006: 5, Lam and Wächter 2014: 18, Saarinen and Nikula 2013: 139). Moreover, internationalisation is crucial as it brings in new students desperately needed for improving the bleak demographic outlook of many European countries (Hazelkorn 2011), including Latvia. Therefore, this makes internationalisation largely a matter of economics.

However, it is not always a manifestation of the actual measures taken, often remaining in the sphere of marketing slogans (Rizvi, 2007). Its significance grows with the advancing globalization of the world (Killick, 2015) and its consequences, including the spread of economic crises (Fortuijna, 2012). The measures taken to foster internationalization go in two directions. They involve on the one hand the organization of educational programmes increasing the proportion of foreign students (Ryan, 2013), and on the other the expansion of programmes to include various classes conducted by international experts, workshops and practical placements abroad, as well as modules or semesters implemented as part of inter-university exchanges (Lemmons, 2015; Mullens & Cuper, 2015). Of special significance for the development of those didactic innovations boosting the level of internationalization of educational programmes is the extension of the networking of university staff, with networks often starting in the field of scientific cooperation and with time growing to embrace didactic activity as well (Wakefield & Dismore, 2015). While those are the usual changes in standard development trends in higher education in advanced countries, their

adaptation and course in the conditions of the new member states of the European Union, demonstrate interesting individual features (Halangescu, 2015; Wende, 2001; de Wit, 2002; Zgaga, 2009), with Latvia being no exception (authors' comment). The implementation of such innovations is a real challenge in these states because of a lack of former experience (Churski, et al., 2017).

As result of research, the authors came to conclusions that in order to improve the distance learning and internationalization aspects of HEIs in Latvia and become a more attractive destination for the international students in the higher education industry, the Latvia's government as well as the Ministry of Education and Science and higher education institutions have to work on the following aspects:

- **Develop a common strategy and action plan for the export of higher education, providing changes in the law that foresee the full implementation of the internationalization of the higher education in Latvia, and improve consular and immigration questions.**
- **Implement required changes in faculty, curriculums, structure, processes in order to change mentality, processes and procedures from localization to internationalization.**
- **Improve policies about English language as the officially allowed language of teaching and academia in Latvia.**
- **HEIs should ally with each other in order to pool resources to be more efficient and more visible on the international higher education market.**
- **Promote and develop the marketing and advertising campaigns about the study opportunities in Latvia.**
- **Focus on face-to-face sessions exclusively on experiential learning: project work, games, simulations, debates, etc.**
- **Free up to 30%-50% of programme faculty hours by: reinvesting into more experimental learning; adding more students (class sections); directing to faculty research.**
- **Separate the technical, factual, communication tools and deliver them online via new style instructions and assessment tools.**

References

Bierne, J., Titko, J. (2016). Perception of e-teaching experience in Latvian higher education institutions. Proceedings of the 28th International Business Information Management

- Association Conference - Vision 2020: Innovation Management, Development Sustainability, and Competitive Economic Growth 2016, 1723-1730.
- Beldarrain Y. (2017). Distance Education Trends: Integrating new technologies to foster student interaction and collaboration. *Journal of Distance Education*, 27(2).
- CEEMAN's Ed Tech seminar on Challenges of Digital Transformation in Management Education. (2017) Bled, Slovenia. <http://www.ceeman.org/news/it-was-a-great-learning-experience> (07.12.2017.)
- Churski, P., Motek, P., Stryjakiewicz, T., CybalMichalska, A. (2017). Internationalization as a challenge for geographical education in Poland: experience of a new postgraduate study "cultural industries in the development policies of cities and regions". *Journal of Geography in Higher Education*, 41(4), 506-520.
- Čirjevskis, A. (2015). SUSTAINABILITY IN HIGHER EDUCATION: DISCOURSE ON DYNAMIC CAPABILITIES OF PRIVATELY RUN HIGHER EDUCATIONAL INSTITUTIONS (HEI) IN LATVIA. *Journal of Security and Sustainability*, 5(1).
- Dombrovskis, V. (2009). Is anything wrong with higher education in Latvia? *Baltic Journal of Economics*, 9(2), 5-24.
- Hampel, R., de los Arcos, B. (2013). Interacting at a distance: A critical review of the role of ICT in developing the learner-context interface in a university language programme. *Innovation in Language Learning and Teaching*, 7(2), 158-178.
- Iļjinsa, J., Erina, I., Gaile-Sarkane, E. (2014). Project based internationalization as a driving force for change management in higher education institutions in Latvia. *Procedia – Social and Behavioral Sciences*, 156, 47-52.
- Jääskelä, P., Nykänen, S., Tynjälä, P. (2016). Models for the development of generic skills in Finnish higher education. *Journal of Further and Higher Education*, 42(1), 130-142.
- Kibbermann, K. (2017). Responses to the Internationalisation of Higher Education in language policies of Estonia and Latvia. *University of Tartu Press*, 8(1), 97-113.
- Lapiņa, I., Roga, R., Mūūrsepp, P. (2016). Quality of higher education: International students' satisfaction and learning experience. *International Journal of Quality and Service Sciences*, 8(3), 263-278.
- Lapina G., Slaidins, I. (2014). "Teaching Open Innovation at the Universities in Latvia", *Journal of Business Management*, 8, 1691 – 5348.
- Lašáková A. , Bajzíkóvá, L., Dedze, I. (2017). Case study-based evidence across ten European universities. *International Journal of Educational Development*, 55, 69-79.
- Latvijas Universitášu asociácija (2012). Universitášu ieguldījums Latvijas tautsaimniecībā: https://www.lu.lv/fileadmin/user_upload/lu_portal/par/strukturvienibas-un-infrastruktura/saist/lu/Universitasu_ieguldijums_Latvijas_tautsaimnieciba.pdf.
- Lemaître, D. (2016). Current developments in the French engineering education system. *European Journal of Engineering Education*, 42(2), 131-141.
- Statistics of the Ministry of Education and Science (MOES) of the Republic of Latvia (2016): http://www.izm.gov.lv/images/izglitiba_augst/Parskats_augstaka_izglitiba_2016.pdf

- Vasiljeva, T., Lapina, G., Novinkina, J. (2015). EXPLORATORY STUDY OF VIDEO LESSONS' INTRODUCTION IN HIGHER EDUCATION DISTANCE LEARNING, Proceedings of ICERI2015 Conference, Spain, ISBN: 978-84-608-2657-6.
- Vasilevska, D., Rivza, B., Pivac, T., Alekneviciene, V., Parliņska, A. (2017). Analysis of the Demand for Distance Education at Eastern and Central European Higher Education Institutions. *Journal of Teacher Education for Sustainability*, 19(1), 106-116.

Teaching and Learning with Smartphone: Qualitative Explorative Study from Pakistan

Dr. Rahman, Haji^a and Hameed, Mehtab^b

^aDepartment of Management Sciences, University of Buner, KP, Pakistan, ^bFaculty of Business Administration, Preston University Islamabad, Pakistan

Abstract

This paper investigates the perceptions of teachers and students about using smartphone for teaching and learning practices in private sector universities of Islamabad through cross-sectional based qualitative explorative study. Focus group interviews were conducted from teachers and students through self-selection sampling technique. Current study is guided by Grounded Theory for which semi-structured questionnaire was adopted and modified. The results suggested two categories of teachers. Realist teachers believe that they have to follow and act according to principles of reality that prevails on ground. Idealist teachers believe that their job is to enlarge the intellectual capacity of students with focus on cognitive development rather vocational training. To sum up, integration of modern technologies like smartphone in higher education stimulates to adopt creative and innovative ways for teaching and learning practices because of its bilateral, media-rich and knowledge sharing nature thus necessary for gaining competitive advantage. Few restrictions were faced by researchers. The study is limited to city of Islamabad only. A practical implication of this study along with few recommendations for future research is also given.

Keywords: *Teaching; learning; smartphone; perceptions; private universities.*

1. Introduction

This paper aims to find out the different perceptions of students and teachers with respect to using smartphone during teaching and learning at higher education classroom settings. Need was felt to pursue a qualitative research in this perspective because world has adopted the nature of mobility (Odom, 2015), which stimulated both society and industry to react accordingly. According to Ally (2012) in education sector, digital libraries are accessed by learners through their mobiles and other educational resources (Ally & Tsinakos, 2014). Such educational technologies makes teaching and learning practices more effective (Richey, Silber & Ely, 2008), however, its integration in the classroom setting is more important (Ross, Moorison & Lowther, 2010). In this connection, study of Berk (2010) indicated a positive correlation between technology and learning.

Successful educational innovation depends on teacher's personal willingness (Groff & Mouza, 2008) and sense of professional responsibility (Vanderlinde & Braak, 2011). Becker and Ravitz (1999) provided concept of constructivist teachers; having student oriented approach of teaching based on inquiry. Alternate to this, Niederhauser and Stoddart (2001) presented concept of behaviorist teachers; having traditional belief of teaching and learning with instructional methods. Montrieux, Vandertlinde, Scheliens and Marez (2015) contributed by giving concept of instrumental (behaviorist) and innovative (constructivist) teachers. The former did not changed their belief and teaching style whereas the later one have adopted the role as required by/for development of diverse students.

Millennials are accessing online course materials through smartphone (Lella, Lipsman & Martin, 2015) due to its unique features like a phone, camera, watch, phonebook, flashlight, calendar, notebook, calculator and media player etc. Philosophy of Bring Your Own Device (BYOD) was highlighted by Akuity (2014) which was first reported in 2007 business forum where employees were allowed making use of personal smartphones and laptops etc for official tasks. Results of the survey conducted by educause in USA revealed that initially 86% students prefer laptop as primary computer device for education purpose but this trend has been shifted to tablets 15% and now highly preferred smartphone with 62% (Dahlstrom & Bichsel, 2016). This is too high in higher education which clearly expresses wide acceptance of BYOD in education.

Higher Education Commission (HEC) of Pakistan is further strengthening the initiative of Government of Pakistan regarding Prime Minister Youth Laptop Schemes which was launched in 2013 for only talented students of public sector universities for five years. This is a matter of great concern because talented students are also available in private sector universities as well. Laptops cannot be integrated in every class due to complex requirements of different disciplines. Additionally, not only students will feel overburden but also it will create congested environment if connectivity support is provided. Mobile

tablets can also be used during classroom however handling/operating will be a problem while listening and capturing teachers knowledge. Alternatively, smartphone is a good option due to its safe handling and lighter weight. According to McDonald and Reushle (2002) flexibility is always demanded by students, so keeping students on safe side, teachers need to show flexibility and provide creative environment. This elasticity is a main driver of furnishing learning needs of diverse students effectively and efficiently (Yorke & Thomas, 2003).

Problem is identified by thorough review of literature wrt education industry in Pakistan, where very little research is available. Foreign teachers takes initiative to provide flexible and technology supported creative environment to students to keep and retain their interest but unfortunately, in Pakistan, it is not like that. The gap between our technique of delivering and grasping lecture in comparison to other foreign countries in the world needs consideration because actual problem is less understanding of being change and digitized. Literature did not provide any clue regarding perceptions focusing this region therefore specific research is needed to explore teachers and students perceptions about using smartphone for teaching and learning in private sector universities of Pakistan. In order to answer aforementioned problem statement, grounded theory of Glaser and Strauss (1967) is being followed for exploring below mentioned queries:-

- How teachers role is perceived by students and teachers in smartphone integration?
- How students and teachers perceive such advancements in learning practice?
- What conditions can be perceived that support this teaching and learning practice?
- What benefits and challenges are perceived by the teachers and students?

2. Research Methodology

Following deductive method, cross-sectional based qualitative explorative study with focus group interviews were conducted through semi-structured questionnaire (illustrated in table 1) which was adopted and modified. Population comprises forty (15 teachers and 25 students) respondents recruited through self selection sampling technique from six (06) private sector universities of Islamabad i.e. Abasyn, CASE, FAST, IQRA, CUST and Preston. Major disciplines that were focused for this study; comprised of Management Sciences, Computer Sciences, International Relations and Psychology. Following Kruger and Casey's (2014) concept, six focus groups were organized for an interview of 60 minutes.

Asking questions slightly inspired the findings of Hattie (2008) claimed the role of teacher (RQ1), teaching and learning practice (RQ1&2), need of professionalism (RQ3) while benefits and challenges (RQ4) as quoted by Odom (2015). Whole discussions were audio-taped and conversations were transcribed which was loaded into NVivo, qualitative data analysis computer software package through coding system. Following Miles and

Huberman (1994) route, vertical (within-case) analysis was done through fixed set of paragraphs format. Horizontal (cross-site) analysis was done through systematically comparison of data of focus groups for their similarities and differences.

Table 1. Semistructured interview from teachers and students.

Section	Questions Asked
Intro (n = 2)	Please introduce yourself. Using smatphone inside classroom adds value. Comment.
Teaching Practices (n = 2)	How do you see your responsibility as a teacher / role of your teacher in classroom? Teachers have adequate skills to teach with smartphone. Comment.
Learning Practices (n = 4)	Using smartphone, I / students achieve better. Using smartphone, students can grasp their lesson easily. Using smartphone, it is fun to learn. Using smartphone, I / students work more collaboratively with peers.
Final Questions (n = 4)	Sum up pros and cons of susing smartphone during classroom. Have you faced some problems while using smartphone? What are your expectations for the future? Should smartphone be introduced by HEC in university classrooms?

3. Results

RQ1:How teachers role is perceived by students and teachers in smartphone integration?

Both teachers and students described two kinds of teaching styles, labeled by researchers as “realist teachers” (70%) and “idealist teachers” (30%). Researchers defined realist teachers as those who did not change their role and teaching style thus quoting that only difference is the addition of smartphone with updated knowledge having negative aspect of easy distraction as well as no control over the class. Philosophical perspective in education named it as realism; underwhich such teachers believe that reality prevails in physical world where we live and knowledge is gained through reasons and experiences. They also feels that our job is to teach what course has been given to us as essential to develop their reasoning powers.

Alternatively, idealist teachers see themselves as coach because they believe that aim of education is to develop the intellectual capacity of students with focus on their cognitive development. Respondents believe that such advancements will explore their analytical, logical and conceptual skills during learning thus good investment for future. Philosophical perspective in education named it as idealism underwhich such teachers teach key concepts from classics, patiently guide them in search for truth and skillfully promote thinking in

students through enhancing spirit of inquiry. Ultimate end result will be transferring of teacher based education (knowledge transmission) to focus on student learning.

RQ2: How students and teachers perceive such advancements in learning practice?

Respondents appreciate its added value wrt ease of use, speedy access, taking pictures and audio/video recording plus reduced weight of previously heavy bags. Majority students reported learning in interesting way because it will boost informal brainstorming sessions where students can not only easily argue, communicate but also their logical, analytical and reference based skills will be enhanced. In sum, it will increase the collaborative approach among students to share information with each other thus enhancing their self confidence and strong social influence among peer members.

RQ3: What conditions can be perceived that support this teaching and learning practice?

Respondents revealed administrative based organizational support, categorized by researchers as resource based approach and professionalism. Resource based approach was derived from Barney (1991) theory called Resource Based View (RBV) focusing on heterogenous bundle of resources that persist over time. Respondents perceived other conditions like high speed internet connectivity, strong network administration, customized software, security cameras and ethical guidelines/SOPs for monitoring and evaluation. Professionalism means developing adequate skills to operate smartphone easily in classroom supporting text material in terms of topic related videos, case studies, funny stories, market oriented assignments, individuals and group based presentations for skills enhancement.

RQ4: What benefits and challenges are perceived by the teachers and students?

Benefits perceived by teachers and students as (1) Enhancement of learner-centric-approch given by McQuiggen, Sabourin and Kosturko (2015). (2) Increase in collaborative interactive approach given by Yu (2012) which follows social development theory (SDT) of Russian psychologist Vygotsky's (1962) that social interaction influences cognitive developments. (3) Motivates students to learn given by Warnich and Gordon (2015). (4) Quick assessment of students in short time (Hussein (2015)). (5) Increase teacher/students communication given by Stone (2014). He also prefers whatsapp, facebook, twitter, snapchat and remind.com in conjunction with virtual learning management system.

Challenges perceived by teachers and students as (1) Easy distraction with smartphone like twitter, instagram given by Gikas and Grant (2012). Few students revealed distraction, however, coming back to assigned task is also simple. (2) Miniature of screen is also paintaking for longer use inside classroom given by McQuiggen, Sabourin and Kosturko (2015). (3) Cost of and access to device may produce depths available in market. (4)

Pregvailing attitudes and prejudices of teachers and students as some teachers prohibit use of cell phone in class which is also supported by few students.

4. Discussions and Conclusions

Results confirmed the driving role of teachers for successful implementations of technology to classroom (Chen, Looi & Chen, 2009). In line with comprehensive literature and our individual practice of delivering lectures with smartphone, we believe that students will love this innovative type of learning where student engagement can be made through collaborative learning exercises (Park, 2011). Some negative aspects like easy distraction (surfing google, facebook, twitter etc) and loss of control over the class (maintaining discipline and technology supported learning environment) may be raised. Wastage of time due to distraction will lead to indiscipline attitudes of both teachers and students towards each other could be the major risk. Regardless of small sample size, still respondents were influenced from this type of innovative teaching and learning methods. To conclude, using smartphone during class not only make it effective but also stimulating to reach mobile oriented inhabitants of this century.

5. Limitations and Future Research

This paper was restricted to private sector universities of Islamabad individuals. Apart from this, small sample size was taken into consideration due to some ground realities. Policy makers (HEC and University Management) should consider the pitfall highlighted for smooth integration in future. Study recommends not only greater sample size for in-depth analysis of the perceptions regarding this change in teaching and learning practices but also to have analysis of perceptions of public/private universities. It may be expanded to other medical, nursing, engineering, technical and vocational institutions as well.

6. Research Implications

Academically, it provides avenues to the researchers to examine competitive advantages of this technology (smartphone) integration in classroom setting. From managerial perspective, it offers to recognize the possible use of technology in order to gain value added benefits like creativity, innovation, knowledge sharing and experience through formal or informal discussions and brainstorming.

References

- Akuity (2014). Seven Stats About The Future of BYOD Retrieved from <http://www.akuity.com/2014/03/17/seven-stats-about-the-future-of-byod/>.
- Ally, M. (2012). Education for all with mobile technology: the role of libraries. *M-Libraries 3: Transforming Libraries with Mobile Technology*, 1.

- Ally, M., & Tsinakos, A. (Eds.) (2014). Increasing access through mobile learning. Vancouver, BC: Commonwealth of Learning Press.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
- Becker, H. J., & Ravitz, J. (1999). The influence of computer and Internet use on teachers' pedagogical practices and perceptions. *Journal of research on computing in education*, 31(4), 356-384.
- Berk, R. A. (2010). How do you leverage the latest technologies, including Web 2.0 tools, in your classroom?. *International Journal of Technology in Teaching & Learning*, 6(1): p.13.
- Chen, F. H., Looi, C. K., & Chen, W. (2009). Integrating technology in the classroom: a visual conceptualization of teachers' knowledge, goals and beliefs. *Journal of Computer Assisted Learning*, 25(5), 470-488.
- Dahlstrom, E., & Bichsel, J. (2016). *ECAR study of undergraduate students and information technology*. Research report. Louisville, CO: ECAR, October 2014. Disponível em <http://www.educause.edu/ecar> Acesso em: 22 fev.
- Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, 19, 18-26.
- Glaser, B., & Strauss, A. (1967). The discovery of grounded theory Chicago. *Adeline, USA*.
- Groff, J., & Mouza, C. (2008). A framework for addressing challenges to classroom technology use. *AACe Journal*, 16(1), 21-46.
- Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
- Hussein, B. A. (2015). A blended learning approach to teaching project management: A model for active participation and involvement: Insights from Norway. *Education Sciences*, 5(2), 104-125.
- Krueger, R. A., & Casey, M. A. (2014). *Focus groups: A practical guide for applied research*. Sage publications.
- Lella, A., Lipsman, A., & Martin, B. (2015). A Global Mobile Report: How Multi-Platform Audiences and Engagement Compare in the US, Canada, UK and Beyond.
- McDonald, J., & Reushle, S. (2002, December). Charting the role of the online teacher in higher education: Winds of change. In *Proceedings ASCILITE 2002: 19th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education* (pp. 431-440). Australasian Society for Computers in Learning in Tertiary Education (ASCILITE).

- McQuiggan, S., McQuiggan, J., Sabourin, J., & Kosturko, L. (2015). *Mobile learning: A handbook for developers, educators, and learners*. John Wiley & Sons.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. sage.
- Montrieux, H., Vanderlinde, R., Schellens, T., & De Marez, L. (2015). Teaching and learning with mobile technology: A qualitative explorative study about the introduction of tablet devices in secondary education. *PloS one*, *10*(12), e0144008.
- Niederhauser, D. S., & Stoddart, T. (2001). Teachers' instructional perspectives and use of educational software. *Teaching and teacher education*, *17*(1), 15-31.
- Odom, D. (2015). Teaching with Smartphones in the Higher Education Classroom. *AYME*, 1-13.
- Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *The International Review of Research in Open and Distributed Learning*, *12*(2), 78-102.
- Richey, R. C., Silber, K. H., & Ely, D. P. (2008). Reflections on the 2008 AECT Definitions of the Field. *TechTrends*, *52*(1), 24-25.
- Ross, S. M., Morrison, G. R., & Lowther, D. L. (2010). Educational Technology Research Past and Present: Balancing: Rigor and Relevance to Impact School Learning. *Contemporary Educational Technology*, *1*(1).p.19.
- Stone, B. (2014). "The teaching app at the head of the class," *BloombergBusiness*. Retrieved from <http://www.bloomberg.com/bw/articles/2014-08-28/the-teaching-tool-topping-the-app-store/>.
- Vanderlinde, R., & van Braak, J. (2011). A New ICT Curriculum for Primary Education in Flanders: Defining and Predicting Teachers' Perceptions of Innovation Attributes. *Educational Technology & Society*, *14*(2), 124-135.
- Vygotsky, L.S. (1962). *Thought and Language*. Cambridge, MA: MIT Press.
- Warnich, P., & Gordon, C. (2015). The integration of cell phone technology and poll everywhere as teaching and learning tools into the school History classroom. *Yesterday and Today*, (13), 40-66.
- Yorke, M., & Thomas, L. (2003). Improving the retention of students from lower socio-economic groups. *Journal of higher education policy and management*, *25*(1), 63-74.
- Yu, F., & Conway, A. R. (2012). Mobile/smart phone use in higher education. *Proceedings of the 2012 Southwest Decision Sciences Institute*, 831-839.

Factors that Influence Student Retention

Devereux, Aisling^a; Hofmann, Markus^b

^aAthlone Institute of Technology, Ireland, ^b Department of Informatics, Institute of Technology Blanchardstown, Ireland

Abstract

With the increase in enrolment figures from second level education to third level education over the last number of decades, non-progression rates continue to give cause for concern in certain levels and disciplines. It has been widely argued that in addition to increasing enrolment numbers, higher education must also be concerned with the success of these students. In both the Irish and the international sector, the negative consequences of non-progression has been highlighted, not just on a societal level, but also for the students themselves. It is crucial for first-year student experience to have a positive experience and be fully supported in achieving the goals of higher education. From researching several reports in the area of retention and in particular the reports published by the Irish Higher Education Authority and the National Forum for the Enhancement of Teaching and Learning in Higher Education in this area, it is clear that there is a need to analyse the data available and present the findings in a clear way to the key decision makers to allow for early intervention. This paper uses the different phases of the CRISP-DM methodology and applies data mining techniques and models to a real student dataset with the aim to predict the students that will progress.

Keywords: *Learning analytics; Data Mining; Higher Education; Retention.*

1. Introduction

Student retention is a big issue in the Higher Education sector both at a national and international level. A big challenge for the Higher Educational sector is finding students that are at risk of not completing their studies and dropping out before they become a statistic. Learning Analytics (LA) and Data Mining can help to identify such students months before they drop out according to O Farrell (2016). This paper investigates the issue of the ever increase in enrolment figures from 2nd level to 3rd level education, high non-progression rates (see Table 1) on level 6 programmes in Institutes of Technologies Ireland (IOTI) and the increase in the number of students withdrawing from third level education throughout the Institute of Technology and the University sector in Ireland and Universities abroad (Frawley, Pigott, & Carroll, 2017). Retention is an issue that is being focused on currently at the Athlone Institute of Technology (AIT). PricewaterhouseCooper (PwC) auditors were commissioned to complete a review on retention (March 2017) in AIT. One of its objectives is to gain an understanding of progression rates for each faculty and the strategies employed. Using data mining techniques and models, the information captured on various systems employed in AIT is explored to find the most influential attributes to predict students that will progress.

Table 1. Non-progression rates by level.

Sector	Level	Most Common Points Attained	% Non Progression
<i>Institutes of</i>	Level 6	250-300	25%
<i>Technology</i>	Level 7	250-300	26%
	Level 8	300-350	16%
	L8 3 yr duration	300-350	16%
	L8 4 yr duration	300-350	16%

Source: Frawley, Pigott, & Carroll, (2017).

2. Background

2.1 Overview of Data

Two datasets are used in the project (2014/15 and 2015/16). Both datasets contain the same variables except for the class label (Progress) included in the 2014/15 dataset. This class label is the outcome that will be predicted in the 2015/16 dataset and describes whether the student will progress or not progress into the second year of the course.

The 2014/15 dataset contains 1,118 examples with 2 special attributes and 62 regular attributes. The special attributes are the Spriden PIDM which is the unique identifier for each student and the class label (Progress). The 2015/16 dataset contains 1,041 examples with 1 special attributes (Spriden PIDM) and 62 regular attributes.

The data is sourced from many of the internal systems in the AIT. This includes the student record system which store the students' personal details, admission records, registration information, grant records, bio/demographic information, examination results and student account information; Moodle data; data from the library system; data from the disability office; the Student Resource Centre; and the Central Admissions Office (CAO) providing Maths Points, English Points, Leaving Cert Score, Acceptance Round, Acceptance Date and Course Preference Number. All student data was anonymised during this project.

3. Related Work

Learning Analytics and Educational Data Mining are emerging disciplines (Agudo-Peregrina, Iglesias-Pradas, Conde-González, & Hernández-García, 2014), concerned with developing techniques for exploring the different types of unique data that come from the educational context. O Farrell (2018) mentions that the most widely-used source of data is student interactions within the virtual learning environment (VLE). VLE systems are online platforms that accumulate a vast amount of information (Thakur, Olama, McNair, Sukumar, & Studham, 2014) which is extremely useful for analysing students' behaviour and trends. This type of analysis could be very beneficial to the Higher Educational sector in Ireland. It is evident there is a link between academic performance and Moodle activity usage but according to (Casey, Gibson, & Paris, 2010) in their research, this is at a basic level. Activity log data can provide an opportunity to address some of the critical challenges within the Higher Education sector such as high drop-out rates (Siemens & Long, 2011), (Thakur, Olama, McNair, Sukumar, & Studham, 2014) and (Azcona, Corrigan, Scanlon, & Smeaton, 2017). O Farrell (2018) discuss in a report that for all the benefits that learning analytics can provide within the educational domain, it is just a resource for providing insights, uncovering hidden patterns in data and providing answers. In order to enhance teaching and learning, learning analytics must be used effectively and when this is the case, it can become an essential and invaluable tool for supporting and informing successful policies such as a retention strategy. Thoroughly tracking and assess all students' activities while evaluating the structure and contents of courses and its effectiveness for the learning process (Zorrilla, Menasalvas, Marin, Mora, & Segovia, 2005) can pose both, an opportunity and a challenge. A very promising area for attaining this objective is the use of data mining (Zaiane, 2001).

4. Methodology

The Cross-Industry Process for Data Mining (CRISP-DM) methodology provides a structured approach to planning a data mining project. The following stages will be reviewed during the lifecycle of this project: Business understanding, Data understanding, Data preparation, Modelling, Evaluation and Deployment. The following listing outlines the data mining objectives for this project:

- Collect and clean data for the 2014/15 and 2015/16 academic years.
- Explore / Visualise the data to identify factors predictive of students' success at AIT.
- Predictive statistical models and data mining techniques to model students progress:
 - ROC curves are applied and compared to the unmodified dataset to check which algorithm best suited the data and again after the data preparation stage.
 - Train a model using 2014/15 dataset.
 - Test and evaluate performance of the models on the unlabelled 2015/16 dataset.

5. Results

During the data exploration phase of this project all of the attributes are further investigated. The following attribute *Moodle Usage* is an example of this and turns out to be one of the most useful attributes for predicting the class label.

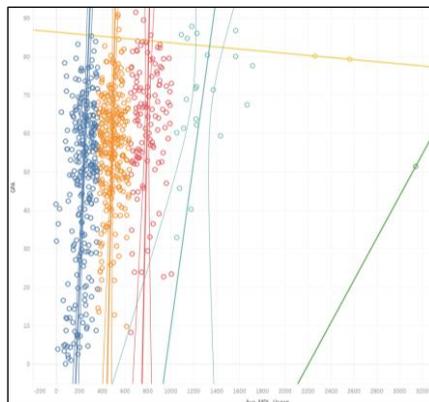


Figure 1. Average Moodle Usage with GPA.

5.1. Moodle Usage

Taking a look at the attribute *Moodle Usage*, gives us an insight into how many times a student has logged onto their Moodle account in the 2014/15 academic year. Within the

data it is evident that students with the higher moodle usage have a higher GPA. Clustering has been added to this graph which indicates the number of different groupings (see Figure 1). Cluster 5 and Cluster 6 have a few unusual points which could be potential outliers. Outliers are not always errors but they may skew the mean and standard deviation if there are many of them. If the values are more then ± 3 times the standard deviation from the mean then outlier detection methods need to be implemented. The standard deviation is 343.7 for this attribute and the values for some of the points are greater than 1,000. Knowing the data, these outliers are not errors. There are a number of students that have high usage on Moodle.

5.2 Model Evaluation

Most of the models using both Method 1 and Method 2 have resulted in high accuracy, precision, R^2 values and fairly good predictions for the 2014/15 labelled dataset which is evident from the results in Table 2.

Method 1: AcadYr and CourseYr are excluded from the dataset. These attributes exhibit very low variance so are not useful in the dataset when trying to predict the class label.

Method 2: (Same attributes as Method 1) with Remove Correlated and Remove Useless Attributes algorithms applied.

Table 2. Summary of results from models tested on 2014/15 dataset using RapidMiner

Method 1	14/15 Model	R²	Accuracy	Precision	RMSE	AUC	15/16 Misclassified
Select Attribute	Decision Tree	0.986	99.82+/- 0.36	99.41+/- 1.76	0.019+/- 0.038	0.5	0 / 15
	Naïve Bayes(Kernel)	0.888	98.48+/- 1.39	94.28+/- 6.74	0.101+/- 0.052	0.997	6 / 48
	Logistic Regression	0.937	99.2 +/- 0.84	99.33+/- 2.00	0.054+/- 0.058	1	1 / 33
	k-NN	0.159	88.01+/- 1.39	89.67+/- 15.45	0.299+/- 0.013	0.83	16 / 397
	Linear Regression	0.772	97.07+/- 0.27	98.43+/- 0.70	0.400+/- 0.000	0.998	6 / 265
Method 2	14/15 Model	R²	Accuracy	Precision	RMSE	AUC	15/16 Misclassified
Remove Correlated Attributes	Decision Tree	0.993	99.82+/- 0.36	99.41+/- 1.76	0.019+/- 0.038	0.5	0 / 15
	Naïve Bayes(Kernel)	0.825	97.67+/- 0.72	93.09+/- 4.92	0.147+/- 0.022	0.976	16 / 61
	Logistic Regression	0.476	92.22+/- 2.26	74.36+/- 8.46	0.330+/- 0.020	0.927	7 / 282
	k-NN	0	85.42+/- 0.42	0	0.229+/- 0.013	0.656	11 / 830
	Linear Regression	0.765	96.98+/- 0.13	98.83+/- 0.84	0.399+/- 0.000	0.999	6 / 91

k-fold cross validation is used in all models. This divides the training dataset into k=10 separate folds. Each time the algorithm is run, it will be trained on 90% of the data and tested on 10%, and each run of the algorithm will change which 10% of the data the algorithm is tested on. Using this method of cross-validation the entire 2014/15 dataset is used. The full 2014/15 dataset is used to train the model and then the 2015/16 unseen dataset will be used to test the model. When the trained model is applied to the unseen dataset the results will be evaluated using the unlabelled 2015/16 dataset for validation.

The decision tree is the first model that is tested on the 2014/15 dataset. Different parameters were applied to the decision tree. The confidence level was changed, pruning and pre-pruning set to on and off, information gain and gini index were tested, the minimal leaf size was changed from 4 to 8 and the minimal leaf size was changed from 2 to 4 but the output remained unchanged. The Remove Correlated Attributes operator (Method 2) was applied to the dataset but this did not change the result either. It is evident from the results in Table 2 that the Decision Tree is the most accurate and robust model, displaying high values for R^2 but this is taking the attribute GPA and always splitting at the greater than 40 and less than 40 in all cases. If the GPA is omitted the accuracy of the model will reduce to 90% and the AUC to 0.720 which is considerably lower. k-NN produced the model with the lowest accuracy using both methods. This model has a very low R^2 using both methods and has misclassified a large proportion of the 2015/16 dataset. Naive Bayes (Kernel) with the estimation mode set to greedy produces good prediction and has a high R^2 . Linear regression has high precision values and high values for AUC in both models with the R^2 of 77%.

5.3 Logistic Regression - Results using Method 1

In relation to the accuracy of the different models and in order to evaluate whether the business objective was met, the logistical regression model displayed the most accurate results with both accuracy and precision at 99% and a high R^2 of 94% when applied to the 2014/15 training dataset (see Table 3).

Table 3. Logistic Regression performance on labelled 2014/15 dataset using RapidMiner

accuracy: 99.19% +/- 0.63%	true Progress	true NotProgress	class precision
pred. Progress	954	8	99.17%
pred. NotProgress	1	155	99.36%
class recall	99.90%	95.09%	

After applying the trained model to the unseen 2015/16 dataset (see Figure 2) the number of students predicted to Progress is 865 and NotProgress is 175.

Prediction prediction(Progress)	Polynomial	0	Least NotProgress (175)	Most Progress (865)	Values Progress (865), NotProgress (175)
Confidence_Progress confidence(Progress)	Real	0	Min 0	Max 1	Average 0.844
Confidence_NotProgress confidence(NotProgress)	Real	0	Min 0	Max 1	Average 0.156

Figure 2. Logistic Regression Model on unlabelled 2015/16 dataset – Predicted outcome

Table 4 displays a summary of results. The first column shows the class label of which there are 1,040 first year students. The next column ‘Predicted’ displays the predicted probability of the occurrence of the class label from the unlabelled 2015/16 data model (see Figure 2). The next column ‘Actual’ contains the exact number of student that progressed from first year using the 2015/16 dataset by checking their GPA and finally the last column gives the number of predicted outcomes that were misclassified. Looking at the misclassifications, one student was misclassified as Progress when they actually had a GPA under 40 and 33 students were misclassified as Not Progress when their actual GPA was greater than 40. The results for this model is showing good levels of accuracy and the probable classification using logistic regression of the labels is high.

Table 4. Summary of Predicted class label 2015/16 validated against actual 2015/16 dataset

Class (1040)	Predicted (unlabelled dataset 2015/16)	Actual (2015/16 Student Results)	Misclassified
Progress	865	897	1
Not Progress	175	143	33

6. Conclusion

The aspiration of this project was to provide a stepping stone using the outcome from the results in the data to start a bigger discussion in the third level institute around retention policies and cross-departmental initiatives. Working with real data had its advantages. It was difficult to spot some useful patterns in the dataset during the initial data exploration stage due to its complexity. There were problems with data files at the beginning of the project. The main issue with the dataset was the inconsistency of data that is recorded across the various systems in AIT. Going forward more emphasis should be placed on the data collection ensuring data quality and integrity.

It is evident from the results section that implementing data mining techniques on educational datasets can result in good models for predicting student progression rates

based on the most influential attributes captured from the relevant data systems. Using the data mining modelling technique of logistic regression and applying to the unlabelled 2015/16 dataset and validating against the actual values from the 2015/16 dataset it is clear that the number of misclassifications are minimal meaning that the predictive modelling has evident abilities to be applied to new and unseen data and therefore can be used to identify potential drop outs earlier than without using the advanced modelling techniques.

References

- Agudo-Peregrina, Á. F., Iglesias-Pradas, S., Conde-González, M. Á., & Hernández-García, Á. (2014). Can we predict success from log data in VLEs? Classification of interactions for learning analytics and their relation with performance in VLE-supported F2F and online learning. *Computers in human behavior*, *31*, 542-550.
- Azcona, D., Corrigan, O., Scanlon, P., & Smeaton, A. F. (2017). Innovative learning analytics research at a data-driven HEI. *Editorial Universitat Politècnica de València*.
- Casey, K., Gibson, P., & Paris, I. S. (2010). Mining moodle to understand student behaviour. *International Conference on Engaging Pedagogy. (ICEP10)*, National University of Ireland Maynooth. Retrieved from <http://www-public.tem-tsp.eu/~gibson/Research/Publications/E-Copies/ICEP10.pdf>.
- Frawley, D., Pigott, V., & Carroll, D. (2017, March). A Study of Progression in Irish Higher Education 2012/13 to 2013/14. Dublin: Higher Education Authority.
- O Farrell, L. (2016). Learning Analytics and Educational Data Mining for Learning Impact.
- O Farrell, L. (2018). Using Learning Analytics to support the enhancement of Teaching and Learning in Higher Education. National Forum for the Enhancement of Teaching and Learning in Higher Education.
- Siemens, G., & Long, P. (2011). Penetrating the Fog: Analytics in Learning and education. *EDUCAUSE review*, *46(5)*, 30.
- Thakur, G., Olama, M. M., McNair, W., Sukumar, S. R., & Studham, S. (2014, January). Towards adaptive educational assessments: predicting student performance using temporal stability and data analytics in learning management systems. In Proceedings 20th ACM SIGKDD conference on knowledge discovery and data mining.
- Zaiane, O. (2001). Web usage mining for a better web-based learning environment.
- Zorrilla, M. E., Menasalvas, E., Marin, D., Mora, E., & Segovia, J. (2005, February). Web usage mining project for improving web-based learning sites. In *International Conference on Computer Aided Systems Theory* (pp. 205-210). Springer, Berlin, Heidelberg.

Enriching Online Education through Differentiated Learning

Montebello, Matthew; Pinheiro, Petrilson; Cope, Bill; Kalantzis, Mary; Haniya, Samaa; Tzirides, Anastasia Olga; Amina, Tabassum and Searsmith, Duane.
University of Illinois, USA.

Abstract

Online education has been going through numerous transformations as new and innovative technologies influence and shape new e-learning portals. Differentiated e-learning promises to add value and enhance the educational services provided by an academic institution. In this paper we present our online learning model that advocates and endorses differentiated learning as an e-learning affordance that has been facilitated through the development of new learning technologies. We demonstrate how the online portal enables and supports multiple instances whereby differentiated learning is applied and practiced, including through the use of a novel analytics tool that sums up the overall learner effort in one visual.

The paper advances the notion of “productive diversity” in learning, replacing the templated sameness characterizing the communicative practices of “didactic pedagogy,” including textbooks, lectures, tests. Today’s computer-mediated, networked learning environments can support differentiated learning on a number of dimensions, where students are able to work at their own pace, choose their own topics within a general disciplinary rubric, and offer each other feedback in such a way that differences in perspective become a valuable resource for learning. The paper concludes by demonstrating a technology that attempts to translate these principles into practice—the CGScholar platform, including the high level progress visualizations it offers in its learning analytics.

Keywords: *differentiated learning; e-learning; online portal; e-learning affordances.*

1. Introduction

The proliferation of e-learning at an international level is testament to the increased demand and rising awareness of education (Zhang, et al., 2004). In this respect Massive Open Online Courses (MOOCs) set a new trend to provide higher education programmes to the masses. MOOCs took the world by storm around 2012 (Matkin, 2013). These are essentially online courses that are open for all those online learners who would like to register, enrol and follow. Thousands of students typically attend such courses, making it impossible to personalise and adapt the courses to the individual needs and interests of each individual student. Amongst the numerous criticisms related to assessment, accreditation, and quality, is the impersonal nature of delivery, and this is the main motivation of our paper. It is obvious that higher education academics cannot give feedback to the individual participants of a typical MOOC keeping in mind thousands of enrolled participants. Rees (2013) argues that such online systems can never offer their students the kind of personalised education that dedicated faculty members at universities everywhere can. This could potentially be one of the reasons for dramatic decline in student retention in MOOCs (Gul, 2018), with “only about half of the students who registered ever viewed a lecture and only 4% completed a course” (Koller, Ng, Do, & Chen, 2013).

This paper will specifically address differentiated learning as an e-learning affordance, in an effort to add value to the entire e-learning experience. Numerous online courses delivered over our e-learning portal, called Common Ground Scholar (CGScholar), purposely developed with specific design delimiters that are grounded within a reflexive pedagogical rationale. Our philosophy is based on Bloom’s theoretical recommendations (Bloom, 1968) on how to aim towards mastery learning, together with an educational model of new learning affordances (Kalantzis & Cope, 2012), made feasible through new media. One such affordance relates to differentiated learning, similar to adaptive (Shute & Zapata-Rivera, 2012) and personalised learning (Conati & Kardan, 2013) which calibrates learning to individuals (Walkington, 2012).

In this paper, we discuss how we manage to achieve differentiated learning within the online portal as learners are encouraged to express individual identities through the topical areas they choose to include, and the ways in which their senses of engagement and motivation deepen as they interact with other learners in an environment that promotes heterogeneity. In the next section we elaborate on the concept of differentiated learning, giving a broader background to our rationale, followed by a detailed description of our new learning model upon which the online portal is founded. Section 4 presents the practical aspect of how differentiated learning manifests itself within our online environment, accompanied by qualitative data analysis of survey results collected at the end of three graduate online courses held at the end of last year. Finally, we close the paper with learning conclusions and research recommendations.

2. Differentiated Learning

Educational settings have always encountered learner differences, but chose to ignore, erase or remove the differences for pragmatic or ideological reasons (Kalantzis & Cope, 2012). Nevertheless, when learners have the means to meet their needs, they are more productive. Differentiated instruction implements pedagogical techniques that adapts to the needs of the learners and try to take full advantage of their diverse abilities, interests and learning profiles (Subban, 2006). Bloom's notion of 'mastery learning' can also be supported with differentiated learning. The objective of teaching and learning is for every student to achieve mastery of a particular aspect of a domain, but they don't always have to follow the same path to achieve mastery. Formative assessment can facilitate this process, offering feedback that directs the students incrementally towards mastery objectives. Instead of retrospectively judging relative success and failure across a norm, formative assessment can tell a learner and their teacher what they still need to learn to achieve mastery. Thus, differentiated learning is most beneficial to learners who do not fit the generalized mold (Tomlinson, 2010).

Differentiated instruction is considered the way of teaching that aims to achieve success of all students, taking into account the needs of each one of them in a class (Morgan, 2014), reinforcing their responsibility and choice, peer tutoring and flexible grouping (Grimes & Stevens, 2009). It is also very important as the diversity in student population is only increasing and so are their educational needs. Productive diversity in learning is possible with new educational media and inclusive pedagogy that incorporates learner diversity rather than being built on the one-size-fits all teaching philosophy. In today's technology-enhanced leaning environments, it is possible to engage students more deeply than was the case in traditional approaches. Students can begin learning from their own level of expertise and achieve the expected mastery at their own pace. The presence of new technological means has created a shift towards a more personalized learning (Kalantzis & Cope, 2012; Mentis, 2007). Technological tools and media like smart phones and tablets, cloud-based computers, learning management systems, Google and many more provide the opportunity to learners to define their own learning, based on their own personal needs, to collaborate and interact with their teachers and peers and, as a consequence, to be co-designers of the learning process and content. Therefore, in today's information society, which is overwhelmed by so many technological means, we can observe a shift in the balance of agency (Kalantzis & Cope, 2012), meaning that learners have more opportunities to participate in the learning process, be engaged and modify it according to their needs and preferences and all these become real in the spectrum of the principles of differentiated learning.

3. e-Learning Affordance

New educational technologies have emerged since the introduction of computer-mediated and online learning. Some of these key educational technologies are related to Learning Management Systems, e-Textbooks, Flipped Classrooms, Intelligent Tutors, Games and Simulations, Discussion Boards, Web workspaces and e-Portfolios, Adaptive, Personalized and Differentiated Instruction and Machine Assessments (Cope & Kalantzis, 2016). Yet, none of these technologies is particularly new, since shifts in educational media have been a long time coming. In fact, digital media do not necessarily change anything fundamental in schools (Cope & Kalantzis, 2017), and some of them have already been present for quite a long time in traditional schooling contexts and not rarely have been used to replicate old teaching and learning practices (Knobel & Lankshear, 2007; Lankshear & Knobel, 2008; Cope & Kalantzis, 2013).

In a different direction, however, it is possible to use educational technologies to promote real changes in the education system from an e-learning ecologies perspective, which can impact learners' configurations of space, their relationships, the textual forms of knowledge to which they are exposed, the kinds of knowledge artefacts that they create, and the way the outcomes of their learning are measured (Cope & Kalantzis, 2103; 2016; 2017). According to Cope and Kalantzis (2017), e-learning ecologies would be a kind of 'metaphor' to understand the learning environment as an ecosystem, consisting of the complex interaction between human, textual, discursive and spatial dynamics. These e-learning ecologies are, therefore, pedagogical and epistemic forms that underlie reflexive/inclusive education (Cope and Kalantzis, 2017). In order to operationalize such e-learning ecologies, Cope and Kalantzis (2013) heuristically segmented them into seven "new learning" affordances (e-Learning Affordances): ubiquitous learning, active knowledge production, multimodal knowledge representations, recursive feedback, collaborative intelligence, metacognitive reflection and differentiated learning. The authors also point out that, in the CGScholar environment, these affordances constitute an 'agenda for new learning and assessment' to reframe the relations of knowledge and learning, recalibrating traditional modes of pedagogy in order to create learning ecologies which are more appropriately attuned to our times. All the seven affordances constitute the grounds for the reflexive pedagogical rationale and the learning analytics with which CGScholar deals.

The focus of this paper is particularly on differentiated learning. "Traditional classroom communication architectures were oriented to one-size-fits-all transmission of homogeneous content" (Cope & Kalantzis, 2013, p. 353). In this environment, the schooling system ignore or even erase students' differences, both for pragmatic reasons, which are intrinsic to the one-to-many character of educational system, and for ideological reasons, in order to enforce uniformity related to the homogenizing project of the nation-

state (Cope and Kalantzis, 2017). Conversely, in the CGScholar environment, it is more feasible to promote a differentiated learning because, first of all, learners can work at their own pace. This means that if a “work involves research, drafting, review, revision and publication, not every student has to be up to the same stage in the process at the same stage. The teacher has an immediate view of where they are up to in the project status screen” [...]. “Moreover, positioning the student as a knowledge producer affords more space for student voice, interest, experience and localized relevance. In general terms, the intellectual project might be the same, but the topics may vary” (Cope and Kalantzis, 2013, p. 354). Therefore, rather than maintaining homogeneity, typical of a traditional classroom, CGScholar deals with the principle of productive diversity or the complementarity of differential knowledge and experiences (Cope and Kalantzis, 2013).

4. Scholar’s Case Study

We present a case study where we embrace digital tools for differentiating students’ learning. The online e-learning platform CGScholar educators have the capability to differentiate learning in many different ways. First, this platform helps to differentiate the learning content when teachers work on developing a learning module with multimodal learning elements including videos, images, audio files, charts, reports, ppt slides and plain text as to accommodate different learning styles. Secondly, CGScholar makes it possible to differentiate the process of learning in the way how students learn. It allows teachers to design multiple individual and collaborative learning activities to suit students’ needs such as making posts, commenting on others’ posts, peer-review assignments, collaborative writing and taking quizzes. Third, this platform also allows for differentiating the products relying on formative assessments and recursive feedback from instructors, experts, peers and even a self-review of one’s own work. Lastly, the platform makes it possible for students to work at their own pace as they work through the learning content, participate in the class discussion, and do their assignments. Along the way, they are able to check their progress via the visual learning tool that we will explain below in more detail.

Scholar Analytics is a learning visualization tool, where in any unit of work a student can see their progress towards mastery, and a teacher can see the comparative progress towards mastery of all members of the class, identifying which students may require more time or special attention to achieve mastery. As students work they have access at all times to an aster plot visualization (shown in Figure 1) where each petal of the “flower” represents a type of learner activity and individual progress is displayed. At the start of a unit of work the plot is empty of colour. As learners progress in their work unit the petals grow using data continuously mined across all learning activities. The width of a petal is the weighting given by the teacher to this aspect of learning. The length of the petal shows learner

achievement to this point. The central score, θ , is the weighted average of all petals showing progress towards mastery. Petals are divided into three sectors: "Focus," φ , is "perseverance," measuring variables such as time on task and amount of work produced; β , "Help," measures community contributions and collaborations, such as the extent and quality of comments on others' posts and peer reviews; and ε , "Knowledge," measures knowledge via data elements such as quizzes and peer review ratings against rubrics.

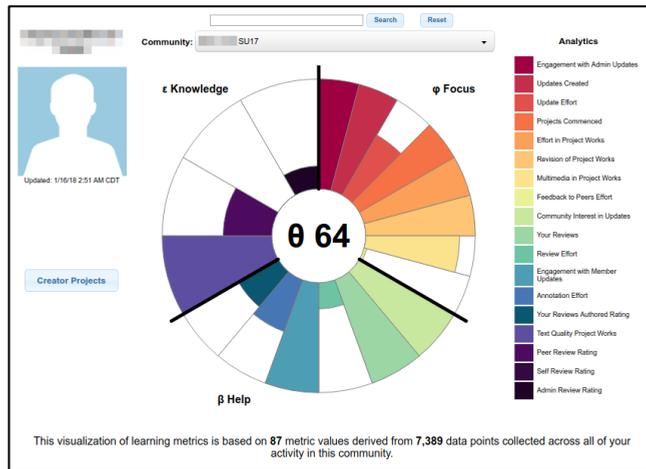


Figure 1 - Aster Plot for an individual student

The teacher can choose to include a petal or not for different units of work. Custom petals can also be added to the visualization where scores are entered manually with personalized feedback to the learner. This visualization provides differentiated learning support for students in several ways. The petals are active. When the learner places the mouse pointer over a title a score appears, and when clicked a window opens up with information about a student's performance accompanied by help text provided by the teacher, customized for the particular learning activity. At any time during the work unit a student has access to this formative feedback, a clear depiction of their progress to that point in time with guidance for improvement. The plot as a whole depicts all of the areas where additional work is needed, and as work is completed the petals grow denoting accomplishment. Each learner's plot will be different, reflecting the individual progress and the specific pace of the same student, showing how efforts have been distributed.

The plot serves as motivational device denoting progress, facilitating planning, and rewarding effort. In addition, learning activities are channelled across aspects of grit (help), knowledge, and collaboration (help), indicated by the three sectors. Individual petal scores are capped at the perimeter of the circle, meaning over-achievement in one activity is not rewarded, guiding the student's efforts to under-developed areas of the plot. At any point students can access their work data to drill down on the particulars of a petal's score such as

peer reviews, quiz results, versions of their writing assignments, and their written collaborations with peers and teachers. Teachers also see an aster plot that averages scores over the entire class. On a separate screen there is a table breakdown of each petal's score (columns) per student (rows). During the unit of work, the teacher is able to access each student's progress visualization, including the capacity to dig deep into areas requiring additional attention by an individual learner. This makes visible deficiencies which might otherwise pass unnoticed by the teacher. As work progresses, teachers may modify the plot at any time by removing or adding petals and changing weightings to accommodate the needs of the class dynamics.

5. Conclusion

In this paper, we have considered the challenge of differentiating learning both theoretically and practically. In theoretical terms, differentiated learning is the achievement of comparable ends in ways which are not necessarily identical. For instance, students may work at a different pace. They may address general disciplinary objectives as outlined in a rubric, but the content or subject matter may be of their own choosing. They may become actively involved offering each other peer feedback, where the differences in perspective become a resource for learning. Here we call the difference “productive diversity” rather than the templated architecture of sameness—textbooks in which all students are on the same metaphorical page, lectures that everyone must hear together, and tests that are “standardized”. In a pedagogy of productive diversity, learner differences become a valuable resource for learning. However, any such learning is logistically complex—far more complex than traditional, didactic pedagogy. One of the affordances of computer mediated, networked learning is the potential to manage this complexity. The CGScholar Analytics aster plot we have described in this paper is one such tool, designed to manage this level of complexity. Learning can be differentiated, but every learner has a running record of their own progress towards the general learning objectives determined by the teacher and the curriculum.

References

- Bloom, B. (1968). Learning for mastery. *UCLA - CSEIP, Evaluation Comment, 1*(2), 1-12.
- Conati, C., & Kardan, S. (2013). Student Modeling: Supporting Personalized Instruction, from Problem Solving to Exploratory Open-Ended Activities. *AI Magazine, 34*, 13–26.
- Cope, B., & Kalantzis, M. (2013). Towards a new learning : the Scholar social knowledge workspace, in theory and practice. *E-Learning and Digital Media, 10*(4), 332-356.

- Cope, B., & Kalantzis, M. (2016). New media and productive diversity in learning. In S. Barsch, & S. Glutsch, *Diversity in der LehrerInnenbildung*. Münster, Germany: Waxmann.
- Cope, B., & Kalantzis, M. (2017). *e-Learning Ecologies*. New York, USA: Routledge.
- Grimes, K. J., & Stevens, D. (2009). Glass, bug, mud. *Phi Delta Kappan* 90(9), 677–680.
- Gul, S. M. (2018). Massive open online courses: Hype and hope. *DESIDOC Journal of Library and Information Technology*, 38(1), 63-66.
- Kalantzis, M., & Cope, B. (2012). *New Learning: Elements of a Science of Education*. Illinois: Cambridge University Press.
- Kalantzis, M., & Cope, B. (2016). Learner Differences in Theory and Practice. *Open Review of Educational Research*, 3.
- Knobel, M., & Lanlshear, C. (2007). *A new literacies sampler*. New York, USA: Peter Lang Publishing, Inc.
- Koller, D., Ng, A., Do, C., & Chen, Z. (2013). Retention and intention in Massive open online Courses. *Educase Review*, 62-63.
- Lankshear, C., & Knobel, M. (2008). *Digital literacies: concepts, policies and practices*. New York: Peter Lang Publ. Inc.
- Matkin, G. (2013). Massive Open Online Courses: Looking Ahead by Looking Back. *Continuing Higher Education Review*, 77, 49-56.
- Mentis, M. (2007). Different Technologies for Differentiated Education: Social Networks, Identity and Diversity in e-Learning. *The International Journal of Diversity in Organisations, Communities and Nations*, 7(3), 86–93.
- Morgan, H. (2014). Maximizing Student Success with Differentiated Learning. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 87(1), 34–38.
- Rees, J. (2013). *The MOOC Racket*. Retrieved March 12, 2014, from Future Tense: http://www.slate.com/articles/technology/future_tense/2013/07/moocs_could_be_disastrous_for_students_and_professors.html
- Shute, V., & Zapata-Rivera, D. (2012). Adaptive Educational Systems. In P. Durlach, & A. (. Lesgold, *Adaptive Technologies for Training and Education*. New York: Cambridge University Press.
- Subban, P. (2006). Differentiated instruction: A research basis. *International Education Journal*, 7(7), 935–947.
- Tomlinson, C. (2010). One kid at a time. *Educational Leadership* 67(5), 12–16.
- Walkington, C. (2012). Using Adaptive Learning Technologies to Personalize Instruction to Student Interests: The Impact of Relevant Contexts on Performance and Learning Outcomes. *Journal of Educational Psychology*, 105, 932–45.

Crowdsourced Recommender System

Montebello, Matthew and Mallia-Milanes, Mario

Faculty of Information and Communication Technology, Department of Artificial Intelligence, University of Malta, Malta.

Abstract

The use of artificially intelligent techniques to overcome specific shortcomings within e-learning systems is a well-researched area that keeps on evolving in an attempt to optimise such resourceful practices. The lack of personalization and the sentiment of isolation coupled with a feeling of being treated like all others, tends to discourage and push learners away from courses that are very well prepared academically and excellently projected intellectually. The use of recommender systems to deliver relevant information in a timely manner that is specifically differentiated to a unique learner is once more being investigated to alleviate the e-learning issue of being impersonal. The application of such a technique also assists the learner by reducing information overload and providing learning material that can be shared, criticized and reviewed at one's own pace. In this paper we propose the use of a fully automated recommender system based on recent AI developments together with Web 2.0 applications and socially networked technologies. We argue that such technologies have provided the extra capabilities that were required to deliver a realistic and practical interfacing medium to assist online learners and take recommender systems to the next level.

Keywords: *Artificial Intelligence; e-Learning; Recommender System; Collaborative; Crowdsourced.*

1. Introduction

E-Learning may seem to be a new idea, but in actual fact it was preceded by what used to be distance learning or correspondence learning. Its roots can be traced back to the 18th century whereby material was distributed to students, not in close proximity to the teaching source, via post (Montebello M. , 2018). This idea evolved over the years and the use of the Internet facilitated distribution. With the advent of Web 2.0 the capability to display multimedia became available and thus learning material became feature rich. It can be said, at this point, that students were not actually bound by proximity or time anymore. Which at face value is a very significant factor as it reduces cost and can open up courses to larger audiences. In theory anyone all over the world can attend.

Sadly e-learning and its various mutations did not really achieve the success that was thought would be reaped. In many instances the dropout rate from courses was extremely high (Rivard, 2013). The reason for this was not immediately apparent. It soon became evident that the pedagogy never changed since the inception of the remote learning concept. Design materials, package them in a convenient way and distribute them to as many people as possible. This one-size-fits-all scenario really lived on through the ages, and survived different dissemination media. So, when we ask the question what was the impact of Information Technology on learning the answer is difficult to ascertain.

Currently many institutes like Coursera and Udemy deliver a variety of on-line courses. Material is in no way customized to suit individual needs, learning styles or abilities. A mass-produced package is delivered. This is very convenient for the institution, very cost effective, but not learner centric.

So, having described the scenario so far, it would be appropriate to define an important point at this stage; the meaning of learning. Chen and Wei state this properly as “*learning is an active, interactive and social process*” (Chen & Wei, 2004). A look at this definition it becomes clear that distance learning is not conducive to it. This because learning requires synergy between a number of activities. Each activity facilitates the uptake of new skills. Ultimately learning can also be seen as the activity carried out by a person to acquire new skills or knowledge, even by interacting with others. So, there should be some sort of conduit between teacher, learner and peers. This interaction places the learner at the centre of the knowledge transfer activity.

Questions to solve this problem start to become apparent, namely:

- What makes a student want to study?
- What engages a student?
- Can a software system be designed to solve this issue?

2. The E-learning Concept

As a concept e-learning means different things to different people. In this paper it is taken to mean the use of technology to facilitate learning. In other words, the act of transcribing manual notes into a digital format is not accepted as e-learning. Commonly e-Learning is delivered over the Internet and provides interactivity with the student, having materials focused on the student (Nicholson, 2007).

Early in the 20th Century John Dewey, and later on Carl Rogers, insisted that education should focus on the experience of the learner. Many criticize modern e-learning tools with their incapacity to do this. Despite the benefit of having material shared globally at one go the issue of having personalized material still remains. No two learners are alike, and hence the task of assimilating material to each individual still needs to be handled properly. The environment students are placed in when taking an on-line course is that of autonomy and self-direction. And the user, the student, is not at the centre of the equation (Garrison, 2011).

2.1. Tools for e-Learning

There are a plethora of tools that are available for the content designer today. E-mail, presentation packages, video material, content management systems, social media and blogs practically cover the whole spectrum. But in taking a closer look at these tools it can be noticed that they cannot scale well to a user's needs. Collaboration is limited and may not be in real-time either. Thus, one of the most important elements, that of peer collaboration, would be conspicuous by its absence (Mallia-Milanes & Montebello, 2017).

Collaboration uniquely helps the development of the identity of the learner by allowing him to interact with an environment that projects roles and values on that person. Conversely by limiting the ability to share and interact with others would induce demotivation and make a student leave a course. This is reflected in the low completion rates experienced on e-learning courses (Rivard, 2013).

2.2. Taking the Next Step

So effectively what is needed is a new approach to e-learning rather than the technology. The approach has to be flexible and scalable. This to adjust to communities of users who would wish to take up learning a new skill within their own time, and at their own pace. So, we need a system that can adapt to a student and as yet leave room for flexibility to allow the student to experience and absorb his way through the subject.

Artificial Intelligence techniques can be used to fill in this role (Montebello M. , 2014). Rather than delivering a whole software package a team of agents, each specialized in its own realm, can be deployed with the aim of assisting the student. These groups of agents

would collaborate to deliver a seamless output to the student that makes sense to him. Moreover, output needs to be delivered in a timely fashion. Montebello (2018) puts forward three models which can assist, namely:

- Capture of user's interests;
- Profile of the user;
- Recommender systems.

All three are necessary and would be able to feature as a group of agents within a system capable of delivering the desired output.

The first and second point of the list could be managed in a number of ways. Either by asking a potential student questions to get an idea of what he needs and what are his abilities. On the other hand, the agent system can surreptitiously form a profile and a list of interests by "observing" the user's behaviour. Naturally a plethora of ethical issues would emerge of each approach. This would demand a study in its own. AI systems are insensitive to people's behaviour, so unfettered reporting and profiling can be uncomfortable, inappropriate, or even illegal.

2.3. Recommender Systems

Recommender systems have come into play for a number of applications. Their main stay has been in sales websites where a client is offered items that he may also like. Netflix, Amazon and also YouTube are typical examples of such websites. So, in essence the aim of a recommender system is twofold; to induce sales, and to reduce information overload (Jannach & Zanker, 2011). The techniques are rooted in information retrieval and filtering.

There are two basic approaches to recommender systems, namely, Collaborative filtering (*Jannach & Zanker, 2011*), and Similarity indexing (*Jannach & Zanker, 2011*). In collaborative filtering, the algorithm has to match a closest neighbour. This is basically done by comparing the buying patterns of the current user, with that to others who have purchased similar items in the past. Recommendations are then put forward on the basis of the likelihood that the current user would probably have the same taste as other users with similar patterns. The similarity indexing approach rates and marks each product on offer. When a user chooses a particular product then others similar to it are put forward as a recommendation. Both approaches have issues. Typically, the collaborative filtering approach suffers from cold start. How shall we compare if we have very little or no data to go on? On the other hand, a similarity indexing solution is computationally intensive. Imagine a situation with thousands of users on-line at the same time each going through many items available for sale.

3. Adaptation to e-Learning

As discussed earlier on, one of the main issues of current e-learning systems are that they suffer from the lack of personalization. One way to jump over this hurdle is to “cocoon” the student within an automated learning environment that recommends and coaches learners with adequate resources and personalised suggestions. This would be made up of a teacher, peers, and material to draw on. Material can be crowdsourced, by having many input points feeding the student with his necessities (*Montebello M. , 2015*).

The point of the recommender system in this setup would be to prevent a cognitive overload by supplying too much in too little time to the user. Moreover, the system would have to deal with information relevance apart from its timeliness (Jannach & Zanker, 2011).

3.1. Hybrid Approach

So, we are proposing a system (Figure 1) whereby data is brought up to the student which is relevant to his learning needs. This can be done in a straightforward way as if one is buying items of the Internet. In addition to the material, the recommender system will have to match the current user with others who have similar needs or experiences, and also a teacher who has a declared expertise in the subject matter. Crowdsourced material, experts and peers can be pulled together on the fly to create an environment similar to a class, but without the boundaries imposed by space and time. This would give the student the opportunity to share, experience and scaffold though material till the level of skill is acquired. Teams of agents can be employed to make up the learning system. A recommender system can also comprise a sub team of agents which cooperate to deliver timely information to the student.

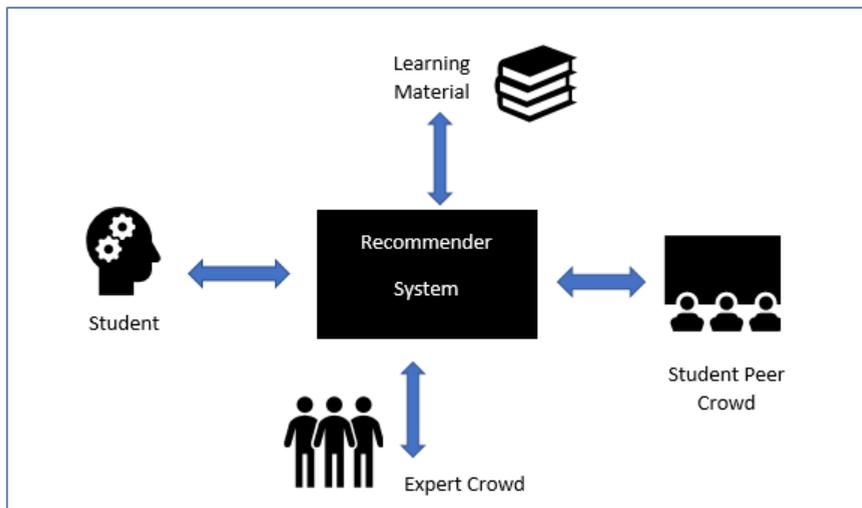


Figure 1 High Level Architecture for Proposed Crowdsourced Recommender System

4. Conclusion

By creating a crowdsourced recommender system that could adapt to the needs of students individually would put the learner at the centre of learning. This would help students gain experience as they progress along with their studies and in turn collaborate with others in their learning experience. An intelligent environment will certainly help with student retention rate and additionally improve skill acquisition. A recommender system is only a small, but important, part of the e-learning eco system. Information has to be media neutral and different elements have to be combined to display the same results by different means that appeal to the user. In this paper we have put forward our arguments in favour of the use of artificially intelligent techniques to overcome specific shortcomings within e-learning systems. We strongly believe that the lack of personalization brings about a unfavourable sense of isolation that hinders rather than facilitates the learning process. The use of a recommender systems based on latest technologies to deliver personalised education material is opportune and suits all our requirements and objectives. Such a methodology further assists alleviate the issue of information overload as specifically targeted educational material will be put forward to the individual learners. In our opinion the recent developments in technology has enabled recommender systems to move to their next phase whereby networked technologies unleashed resourceful affordances that before were not possible, and that potentially they can take e-learning to its next generation.

References

- Chen, P., & Wei, D. (2004). Multi-Agent Based Educational Environment. In F. Lin, & M. Ally, *Designing Distributed Learning Environments with Distributed Software Agents* (p. 311). London: Idea Publishing Group.
- Garrison, R. (2011, January 2). *e-Learning in the 21st Century: A Framework for Research and Practice*. Retrieved June 17, 2017, from Research Gate: researchgate.net
- Jannach, D., & Zanker, M. (2011). *Recommender Systems: An Introduction*. London: Cambridge University Press.
- Mallia-Milanes, M., & Montebello, M. (2017). Agent Assisted Collaborative Learning. *9th International Conference on Agents and Artificial Intelligence. Porto Portugal February 2017*.
- Montebello, M. (2014). Artificial Intelligence to the Rescue of e-Learning. *6th International Conference on Education and New Learning Technologies. Barcellona, Spain*. . EDULearn 14.
- Montebello, M. (2015). Investigating Crowd Sourcing in Higher Education. *Higher Education in the Globalised Age conference*. Sheffield.
- Montebello, M. (2018). *AI Injected e-learning* (1st ed., Vol. 745). Switzerland: Springer International Publishing.
- Nicholson, P. (2007). Computers and Education: Elearning from Theory to Practice. In *A Hybrid Intelligence-Aided Approach to Affect-Sensitive e-Learning* (pp. 1-11). Springer.
- Rivard, R. (2013, March 8). *Measuring the MOOC Dropout Rate*. Retrieved April 26, 2015, from Inside Higher Ed: www.highered.com

External Peer Review of Teaching (ExPeRT) Portfolios for Promotion

Chalmers, Denise and Partridge, Lee

University of Western Australia , Australia

Abstract

This paper focuses on the role and purpose of external expert peer review of teaching portfolios for promotion, using institutional criteria. This is grounded in the recognition that higher education institutions typically struggle to identify suitably experienced, expert reviewers of teaching portfolios for promotion purposes. It considers the feasibility of establishing a 'College of Peers' who are endorsed and trained teaching and learning experts to carry out the reviews. A model of training expert peer reviewers was trailed. While grounded in the Australian context, the issues and applications are international.

Keywords: *Expert peer review, teaching portfolio, promotion*

This paper focuses on the role and purpose of external peer review of teaching, with a focus on reviewing portfolios for promotion using institutional criteria. It considers the feasibility of establishing a ‘College of Peers’ who are endorsed and trained teaching and learning experts to carry out the reviews. This is grounded in the recognition that higher education institutions typically struggle to identify suitably experienced, expert reviewers of teaching portfolios for promotion purposes.

The paper is organised in four parts. It:

1. Provides an overview of peer review in Australia, including an examination of models of contextually appropriate peer review from the literature
2. Identifies potential challenges including the recruiting of expert reviewers, engagement by the sector, and sustainability of the process
3. Outlines the characteristics upon which the ExPeRT model is based
4. Concludes with the outcomes of a trial of the training of experts for the purposes of promotion and recognition .

1 Peer review in Australian higher education

There has been strong advocacy and support for the use of peer review in the Australia higher education sector. For example, nationally funded studies and projects (Harris et al., 2008; Crisp et al., 2009; McKenzie et al., 2011; Wood et al., 2011; Sachs et al., 2013; Nash et al., 2014; Krause et al., 2014, Booth et al, 2015) have long promoted its use for both developmental and performative purposes. This reflects over 50 years of international advocacy that peers and colleagues should be considered as legitimate and valuable sources of information about teachers and teaching (Simpson, 1967; Hildebrand, 1971; Chalmers & Hunt, 2016).

The Australian studies have focused on different aspects of peer review of teaching including classroom observation, online teaching, and assessment to ensure standards. The purpose of the reviews has been predominantly for teacher development and are conducted within institutions. Two studies have looked at external peer review (Crisp et al., 2009; Krause et al., 2014). The project by Crisp and colleagues (2009) on ‘Peer Review of Teaching for Promotion Purposes’ considered both within institution teacher observation and external peer review of documented evidence for evaluative purpose and trialled it across 4 universities. They concluded that “summative peer review of teaching has the ability to improve both the status and the quality of teaching at tertiary level, by encouraging the promotion of exceptional teachers and academics engaged in the scholarship of teaching at all levels” (2009, p 5). They recommended that “for a summative peer review of teaching program to be successful, peer reviewers must be trained and experienced” (2009, p 5). However, to date there has been little progress made on establishing and training a pool of teaching and learning experts that can be called on by

universities to review teaching portfolios against institutional or external criteria for promotion purposes.

1.1 Models of peer review

Models of peer review of teaching can simplistically be categorised as internal or external and for summative or formative purposes. The benefits of external peer review have long been accepted and practiced (Conley-Tyler, 2005) in academia especially for summative purposes where independence of judgement is valued for research but has been met with active resistance for teaching (Shulman 1999; Gosling, 2014). It has been argued that internal peer review is better suited for formative purposes where a degree of familiarity of the reviewees and their practice can be an advantage in the provision of constructive feedback for improvement (Bell & Cooper, 2013; Sachs et al., 2013; Nash et al., 2014).

These models are utilised for a variety of purposes and at varying levels across the higher education sector. They may be undertaken at a faculty, institutional or sector level and may be conducted for purposes such as institutional quality assurance of courses, accreditation of degrees, assessment standards and quality of teaching for the purposes of recognition and/or promotion.

While there is a natural alignment between external review for summative purposes and internal review for formative outcomes there are exceptions to this trend. The internal-summative model, is less common as it is contrary to the long established academic tradition of external examiners provision of unbiased assessment (Gaunt, 1999). There are however examples of this in cases such as institutional fellowships. There is an increasing number of examples of the external-formative model where external reviewers offer formative advice related to teaching, assessment and academic standards generally. In each of the examples of this type listed, a community of qualified assessors support the practice. Hybrid models also exist where both internal and external assessors work together for summative purposes, such as the HEA Fellowship, and for formative purposes such as the Peer Review Assessment Network (PRAN)

In reality, the dimensions and characteristics of a peer review model of teaching are more complex and include:

- Whether the reviewers are internal or external (including whether the review is blind)
- The purpose of the review (summative or formative)
- The knowledge and experience of the reviewers (including whether training of the reviewers occurs)
- The reviewing process (including the standards against which the review is conducted)

Booth et al. (2015) advocate the adoption of a multi-level approach to peer review to meet the particular requirements of the HE sector. In the context of reviewing assessment, they propose a five-level approach, each level becoming more sophisticated and rigorous than the previous. Only the lowest level involves an internal review process within an institution. The next four levels incorporate external review with increasingly experienced reviewers. More recently a number of scholars (Bloxham and Price, 2015; Medland, 2015) have questioned the assumption that external review alone is sufficient to ensure rigour of judgement. They stress the need for external reviewers to be not only qualified and experienced but also trained in the process of review. Consequently, the highest level of review noted by Booth et al (2015) and exemplified by the Achievement Matters model involves trained assessors to ensure both quality and calibrated reviews enhancing the reliability and validity of the process.

Currently, the assessment of teaching quality by models such as those employed by the HEA Fellowship and academic promotional practices do not reach the highest level supporting reliability and validity of assessment (Booth et al., 2015). While reviewers in both cases are demonstrably expert teachers, by virtue of their institutional or association status, they are not specifically trained in the reviewing, assessing or moderating of other's practice. This highlights an apparent gap in the sector's mission to assure quality of teaching and learning.

This paper proposes a new model for the external peer review of teaching excellence against institutional or externally standards for the purpose of promotion or recognition. The model will be referred to as the **ExPeRT** (External Peer Review of Teaching) model.

2 Challenges

A number of obvious challenges are present in developing the ExPeRT model of peer review for academic promotion and recognition. These include the recruitment of experts, engagement by institutions and the sustainability of the process. Each of these will be addressed in turn.

2.1 Identifying and recruiting assessors and establishing a register of ExPeRTs

External peer review processes necessitate the establishment of a community of reviewers that can be accessed to undertake reviews as required. These groups mostly consist of scholars who have demonstrated qualifications and experience. The groups are variously known by names such as College of Peer Observers (University of Queensland, 2015), Register of experts (TEQSA, 2012), and College of Peers (Peer Review of Assessment Networks, 2015).

The process of identifying potential assessors can be approached in a number of ways. A call for prospective assessors can be made across the sector as is done by TEQSA with

applicants supplying their bona fides, and demonstrating their expertise to undertake the process. Experienced individuals may be invited to join the network of assessors. Existing groups, such as HERDSA, OLT Fellows or CADAD, that already undertake teaching and learning assessment may be asked to nominate potential assessors. The register of ExPeRTs then could be integrated in established frameworks by drawing on existing communities of assessors as a base.

The motivations for individual academics to join the register of ExPeRTs are likely to include a variety of aspects. Included amongst these is the recognition it carries, which is valuable for their own career progression; the professional development and networking opportunities it provides; and the desire to promote quality teaching and learning in the Australian HE sector.

Digital platforms such as PRAN or Spark Plus®, which is used by the Assessment Matters project, could be utilised to home and manage the ExPeRT group and process.

2.2 Engagement by institutions

For the ExPeRT model to gain acceptance it needs to have buy-in either by individual institutions or by the sector as a whole. To consider why institutions might engage with this model it is useful to examine the value proposition being offered. Currently, institutions frequently struggle to find appropriate assessors for the teaching and learning components of academic portfolios for promotion. Assessors that are identified tend not to be trained through processes of calibration or moderation. It is not unreasonable in these circumstances to question the reliability and validity of judgement.

The EXPERT model of peer review being proposed would provide a ready source of not only experienced but also trained reviewers. The current alternatives fall far short of the proposed model leaving considerable gaps in the sector's quality assurance.

2.3 Sustainability of the process

The proposed ExPeRT model is most likely to be sustainable if adopted by an existing group such as HERDSA, CADAD or OLT Fellows to administer as core business for their association. The provision of this resource could be structured as a fee-for-service business model along the lines of the services offered by the HEA thereby enhancing its sustainability.

3 Characteristics of model

The following characteristics underpin this proposed ExPeRT model of peer review of teaching:

- *Quality* is paramount in the operation of the ExPeRT model. As such reviewers must demonstrate their record in the area of teaching and learning excellence before they can join the register of ExPeRTs.
- *External review* is central to this model, helping support ethical considerations including the reduction of bias in assessments.
- *Training* of assessors is the key characteristic which sets this model apart from existing forms of peer review of teaching. Both initial (calibration) training and ongoing (moderation) processes will be employed to ensure the continued rigour of the model.
- *Sustainability* must be established and ensured to maintain the process as a key component of quality assurance in the Australian HE Sector.
- *Relevance*, such that the peer review process is flexible and fit-for-purpose is paramount. The ExPeRT model will provide reviewers that can rigorously assess teaching and learning quality against a range of criteria.

4 Trialling the ExPeRT training of assessors

A pilot training program for the ExPeRT model was conducted in June 2017 with an invited group of senior academics from across the Australian HE sector. The process trialled was as follows:

1. Assessors were invited to attend a half day workshop in Sydney.
2. Participants were sent de-identified teaching portfolios submitted in support of academic promotion and the criteria against which they were to be assessed. Reviewers were asked to assess the portfolios and submit their assessment prior to meeting.
3. Participants reviewed others' assessments and compared them with their own at the workshop.
4. The workshop procedure was modelled on the the 'Assessment Matters' calibration process to bring assessors to a common and agreed position on each portfolio.
5. The participants' comments and suggestion for improving the process and supporting its ongoing sustainability were sought.
6. Following the calibration workshop, participants were sent an additional portfolio to review and submit an assessment.
7. Plans to expand the ExPeRT model for a second round of recruitment and training were formulated.

5. Conclusion

This paper has argued for the establishment of an ExPeRT (External Peer Review of Teaching) model in the Australian higher education context for the purposes of assessing academic promotion and recognition against either institutional criteria or external criteria. The key themes that have arisen for consideration include that 1) the model be based on the principle of quality, which is achieved through the provision of external reviewers who have been trained to ensure a calibrated assessment; 2) the success of the model relies on the individual or collective buy-in of HE institutions and; 3) ownership of the model should be established to ensure its growth and sustainability into the future. It is argued that if quality teaching and learning in higher education is important, these themes must be actively fostered.

References

- Barnard, A., Nash, R., Bolt, S., Shannon, S., McEvoy, K., Waters, C. & Rochester, S. (2014). *Developing a culture of peer review of teaching through a distributive leadership approach*.
- Bell, M., & Cooper, P. (2013). Peer observation of teaching in university departments: A framework for implementation. *International Journal for Academic Development*, 18(1), 60-73
- Bloxham, S., & Price, M. (2015). External examining: fit for purpose? *Studies in Higher Education*, 40(2), pp.195-211.
- Booth, S., Beckett, B., Saunders, C., Freeman, M., Alexander, H., Oliver, R., Thompson, M., Fernandez, J. & Valore, R. (2015). *Peer review of assessment networks: Sector-wide options for assuring and calibrating achievement standards within and across disciplines and other networks*. Report prepared for the Office for Learning and Teaching, Australia Government.
- Chalmers, D. (2017). *Recognising and rewarding teaching: Australian teaching standards and expert peer review*. OTL National Senior Teaching Fellowship. www.recognisinguniteaching.edu.au
- Chalmers D., & Hunt, L. (2016). Evaluating teaching. *HERSDA Review of Higher Education*, 3, 25-55. <http://herdsa.org.au/herdsa-review-higher-education-vol-3/25-55>
- Conley-Tyler, M. (2005). A fundamental choice: internal or external evaluation? *Evaluation Journal of Australasia*, 4(1/2), 3.
- Crisp, G., Sadler, R., Krause, K. L., Buckridge, M., Wills, S., Brown, C., & Brougham, B. (2009). *Peer Review of Teaching for Promotion Purposes: Final Project Report*. Australian Learning and Teaching Council.

- Gaunt, D. (1999). The Practitioner as External Examiner. *Quality in Higher Education*, 5(1). pp.81-90.
- Gosling, D. (2014). Collaborative peer supported review of teaching. In J. Sachs & M. Parsell, M. (Eds) *Peer review of learning and teaching in higher education: International perspectives* pp.13-31. [*Professional Learning and Development in Schools and Higher Education*](#). 9, Dordrecht: Springer.
- Harris, K-L., Farrell, K., Bell, M., Devlin, M., & James, R. (2008). *Peer review of teaching in Australian higher education: A handbook to support institutions in developing an embedding effective policies and practices*. Sydney, NSW: Office for Learning and Teaching. <http://www.olt.gov.au/resource-peer-review-of-teaching-melbourne-2009> .
- Higher Education Research and Development Society of Australasia (HERDSA) <http://herdsa.org.au/>
- Hildebrand, M., Wilson, R.C., & Dienst, E.R. (1971). *Evaluating university teaching*. University of California, Berkeley: Centre for Research and Development in Higher Education.
- Krause, K., Scott, G., Aubin, K., Alexander, H., Angelo, T., Campbell, S., Carroll, M., Deane, E., Nulty, D., Pattison, P., Probert, B., Sachs, J., Solomonides, I., Vaughan, S. (2013). *Assuring final year subject and program achievement standards through inter-university peer review and moderation*. www.uws.edu.au/latstandards.
- McKenzie, J, & Parker, N. (2011). *Peer review in online and blended learning environment*. <http://www.uts.edu.au/sites/default/files/final-report.pdf>onments. ALTC project, University of Technology Sydney. <http://www.uts.edu.au/sites/default/files/final-report.pdf>
- Medland, E. (2015). Examining the assessment literacy of external examiners. *London Review of Education*, 13(3), pp. 21-33.
- Nash, R., and Barnard, A. (2014). *Developing a culture of peer review of teaching through a distributive leadership approach*. Sydney, NSW: Office for Learning and Teaching. <http://www.olt.gov.au/resource-library>
- Nash, R., Bolt, S., Barnard, A., Rochester, S. Mcevoy, K., Shannon, S. & Philip, R. (2014). *Developing a culture of peer review of teaching through a distributive leadership approach*. Sydney, NSW: Office for Learning and Teaching. <http://www.olt.gov.au/project-developing-culture-peer-review-teaching-through-distributive-leadership-approach-2011>.
- Peer Review of Assessment Network (PRAN) <http://www.utas.edu.au/curriculum-and-quality/quality/external-referencing/peer-review/pran-network>
- Sach, J., & Parsell, M. (2014) Introduction: The place of peer review in learning and teaching. In J. Sachs & M. Parsell.(eds). *Peer review in learning and teaching in higher education: International perspectives*. Springer, Dordrecht. p.1-12.

- Sachs, J., Parsell, M., Ambler, T., Cassidy, S., Homewood, J., Solomonides, I., et al. (2013). *Social, communicative and interpersonal leadership in the context of peer review*. Sydney, NSW: Office for Learning and Teaching. <http://www.olt.gov.au/project-social-communicative-interpersonal-leadership-macquarie-2009>
- Shulman, L. (1993). Teaching as community property: Putting an end to pedagogical solitude. *Change: The Magazine of Higher Learning*, 25, (6), 6-7.
- Simpson, R.H. (1967). Evaluation of college teachers and teaching, *Journal of Farm Economics*, 49 (1) Part 2, 286-298.
- Watty, K., M. Freeman, B. Howieson, P. Hancock, B. O'Connell, P. De Lange & A. Abraham (2014). Social moderation, assessment and assuring standards for accounting graduates. *Assessment & Evaluation in Higher Education*. 39(4) pp. 461-478.
- Wood, D, Scutter, S., & Wache, D., (2011) *Peer Review of Online Learning and Teaching University of South Australia*. Sydney, NSW: Office for Learning and Teaching http://www.communitywebs.org/peer_review/

Effectiveness of bite-sized lecture on student learning outcomes

Koh, Noi Sian^a; Gottipati, Swapna^b and Shankararaman, Venky^b

^aSchool of Information Technology, Nanyang Polytechnic, Singapore, ^bSchool of Information Systems, Singapore Management University, Singapore

Abstract

Bite-Sized teaching approach uses relatively small learning units with short-term focused activities. The paper presents the effectiveness of Bite-Sized lecture pedagogy on learning outcomes for an analytics course offered by the School of Information Technology at Nanyang Polytechnic. The methodology involves breaking a typical 1 hour lecture into 3 to 4 short lectures followed by related tutorial / practical exercises relevant to each respective short lecture. The results from the exercises shows statistically significant improvements in the assessed learning outcomes for the Bite-Sized lecture over the traditional one hour lecture. 75% of the surveyed respondents agreed that the speed of course materials presented in the Bite-Sized lecture was just right. Majority of the respondents agreed or strongly agreed that Bite-Sized lecture helped them to learn better. Although this paper is primarily based on education experiences made within an analytics module, the findings presented are applicable to any other computing related courses or even mathematics related courses in general.

Keywords: *Bite-Sized lecture, mini lecture, short attention span, small learning units*

1. Introduction

Research has shown that the digital lifestyles and instant communication technologies have led to a decrease in sustained attention overall. Particularly for those who consume more media, they struggle to focus in environments where prolonged attention is needed. Specifically in the study of content heavy modules with lecture-based delivery still being the dominant form of teaching in many higher education institutions (Bligh, 2000), keeping students engaged through the learning process is an important endeavour. To adapt to changes in the patterns of engagement with learning, this prompted an alternative lecture teaching strategy.

Emerging pedagogies in higher education have applied research findings from areas such as student engagement, information processing, and instructional design to improve teaching practice. For example, by using information about students' attention spans, teachers have included one or two brief rests called focus break in their 50 minute lectures (Stuart & Rutherford 1978, Johnstone & Percival 1976). These pedagogical innovations tackle the problems with the way traditional lectures are delivered and have shown that students benefit from changes in teaching practice.

Miller (1956) suggested humans have a limited amount of "working memory" to use when learning. His conception is that the working memory consists of approximately seven chunks. For example, seven random digits are possible to hold in memory relatively easily, but a dozen will be harder without some cognitive tricks. Cognitive Load Theory extends those ideas to suggest that our working memory is subject to certain types of load and that overloading working memory impedes learning. From a cognitive load perspective, Bite-Sized lectures will help to better manage working memory than the traditional long hours of lectures (Clark et al. 2005).

If the content of the lecture is rich and the pace of presentation is fast, learners may not have enough time to engage in the deeper processes of organizing their thoughts. By the time the learner selects relevant words spoken by the lecturer, then align it with the words and graphics on the presentation slides for one segment of the presentation, the next segment begins, thus cutting short the time needed for deeper processing. This situation leads to cognitive overload in which available cognitive capacity is not sufficient to meet the required processing demands. Sweller (1999) referred to this situation as one in which the presented material has high-intrinsic load; that is, the material is conceptually complex. Although it might not be possible to simplify the presented material, it is possible to allow learners to digest intellectually one chunk of it before moving on to the next.

In prior research, it was found that clinical learners respond best to presentations of topics when they are offered "easily digestible bites" or mini-lessons, presented in tandem with clinical problem-solving (Wyer et al. 2004). Ilse and Shankararaman (2004), presented

three design models of face-to-face teaching sessions for computing courses extensively using enterprise level systems. They found that mini-lectures followed by laboratory tasks are most successful in scenarios when there is a need to introduce completely new concepts or theories to students. The student is able to acquire new skills and abilities as the linkage of the underlying theories to the practical skill are explained in staggered. This finding highlights the possible effectiveness of better learning experiences by having mini lectures with focused activities related to each mini lecture.

As existing studies on Bite-Sized teaching are qualitative and limited on the quantitative studies, we address the gap in the current literature by assessing the effectiveness of Bite-Sized lecture approach on the learning outcomes. Thus, we experimented with a course design where the instructor breaks a typical one hour lecture into three to four short lectures. Each short lecture is followed by a related tutorial and practical exercises with reference to various cognitive levels based on the Bloom's taxonomy (Bloom et al. 1956). After each tutorial or practical exercise, the instructor will go through the answers and give immediate feedback and clarifications based on the exercises. This process is iterated over three to four rounds per three hour of face-to-face session. In each session, we assess students based on the learning outcomes related to the topic taught. The findings of the Bite-Sized lecture approach are based on the experiment data which we collected during the teaching sessions.

The rest of the paper is structured as follows: The next section describes the details of course used in our experiment. Subsequently, the dataset collection and the evaluation of the results are discussed, followed by a final section that concludes this work.

2. Course Design

The course used in this study was taught to students enrolled in a Specialist Diploma in Business Analytics at the School of Information Technology at Nanyang Polytechnic. The class is taught in the evening and consists of 45 working adults, aged 25 to 65 years old. Majority of the students do not have prior knowledge or background on the subject content. The course content included an introduction to analytics, statistics and predictive modelling. A total of eight weeks of lessons were conducted, with four weeks using the traditional style of teaching (control) (see Figure 1) and four weeks using Bite-Sized teaching (see Figure 2). The classes were held on Wednesday evenings from 6.30pm to 9.30pm.

In the traditional lecture course design, the session begins with an introduction of the topic, followed by one hour of lecture then one hour of tutorial exercises, one hour of practical / laboratory tasks and finally a wrap up for closure for the three hour lesson. In the Bite-

Sized lecture course design, the lecture is broken into three to four mini-lectures of 15 to 20mins each. It is then followed by tutorial exercises and/or practical tasks related to the mini-lecture. Once the student have completed the tutorial exercises / practical tasks, the instructor goes through the answers for the tutorials / practical and then wrap up before proceeding to the next mini-lecture. A common observation during the wrap up for each mini-session is that several students will be asking questions for clarifications related to the lecture, tutorial and/or practical.

The selection on the course design is random for the different topics. As a topic could be taught over a span of few weeks, both course design were used for most of the topics. For example, the topic on inferential statistics is taught using the traditional approach for the first lesson and subsequently for the next lesson, the Bite-Sized lecture approach was used.

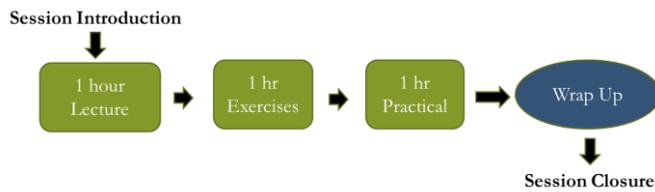


Figure 1. Traditional lecture course design for an analytics course

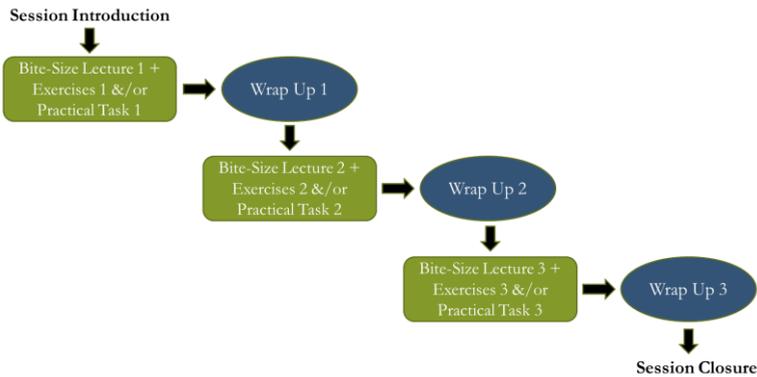


Figure 2. Bite-Sized lecture course design for an analytics course

3. Results and Discussion

3.1. Data

There are two sets of data collected. One dataset on the scores obtained for each assessed learning outcomes in the topics taught using the two different course designs, the other dataset is a survey conducted at the end of the eight weeks of lessons. We created a survey that primed students to think about the quality of the learning experience using Bite-Sized

lecture approach. It includes questions on three areas – Competency and Learning Outcomes, Class Delivery, Students’ In-Class Behavior. Qualitative feedback was also sought from the participants. There were five absentees when the survey was conducted, hence forty students responded to the survey.

For each lesson, the students were assessed on their learning. The questions tested consist of multiple choice questions and structured questions. All scores allocated for the questions were standardised to a scale of 0 to 10 marks. The questions tested were classified into various cognitive levels (Bloom et al. 1956). Cognitive Level 1 on *Remembering*, Cognitive Level 2 on *Understanding*, Cognitive Level 3 on *Applying* and Cognitive Level 4 on *Analysing*. (Cognitive Level 5 on *Evaluating* and Cognitive Level 6 on *Creating* were out of the scope of the syllabus in this course). Our summative assessments suggest that the Bite-Sized pedagogy produced higher average scores in the course (see Figure 3). Particularly the Bite-Sized teaching approach is better for Cognitive Level 2 on *Understanding* and Cognitive Level 4 on *Analysing*. In the Bite-Sized session, it is observed that most of the students were able to answer the questions without referring to the lecture notes whereas in the traditional lecture session, most of the students had to refer to the lecture notes to answer the questions and yet, many were not able to get the correct answer for the questions that requires application and analysis.

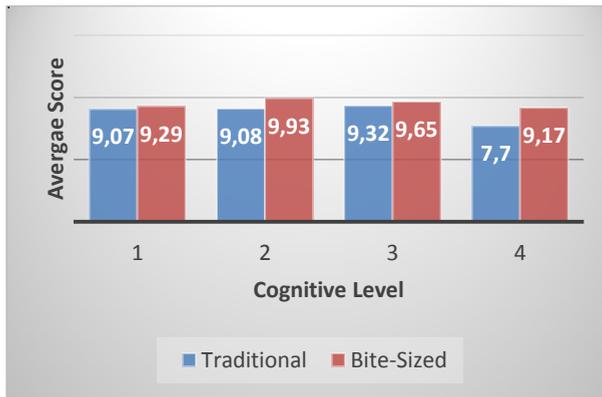


Figure 3. Average score obtained in Traditional course design vs. Bite-Sized course design for the different cognitive levels

Questionnaire			
Number of Students / Survey Respondents: 40			
Competency and learning outcomes			
Rate how useful bite-sized lecture was in helping you to remember concepts. For example, the question on "Describe what a model is".	Very Useful	27.5%	80%
	Somewhat Useful	52.5%	
	Not very useful	15%	
	Not useful at all	5%	
Rate how useful bite-sized lecture was in helping you to understand concepts. For example, the question on "Explain if outliers should be removed in the analysis?"	Very Useful	42.5%	77.5%
	Somewhat Useful	35%	
	Not very useful	12.5%	
	Not useful at all	10%	
Rate how useful bite-sized lecture was in helping you to apply concepts. For example, the question on "Interpret the statistical significance of the variables based on the p-value".	Very Useful	42.5%	87.5%
	Somewhat Useful	45%	
	Not very useful	7.5%	
	Not useful at all	5%	
Rate how useful bite-sized lecture was in helping you to analyse. For example, the question on "Examine the dataset and identify the correct statistical test to use".	Very Useful	32.5%	85%
	Somewhat Useful	52.5%	
	Not very useful	12.5%	
	Not useful at all	2.5%	

Figure 4. Survey on Competency and Learning Outcomes

A T-test was conducted to check the mean difference between the scores obtained in the Traditional course design and the Bite-Sized course design. The T-test results shows that the improvement in test score using Bite-Sized teaching is statistically significant ($p\text{-value} < 0.0001$). The survey on competency and learning outcomes (see Figure 4) also indicates that above 75% of the students find the Bite-Sized lecture helpful for them to remember and understand. Above 85% of the students find bite-sized lecture helping them to apply concepts and analyze problems.

Number of Students / Survey Respondents	40		
Questionnaire	(Strongly) Disagree	Neutral	(Strongly) Agree
Class Delivery			
Bite-Sized Lecture is preferred over 1 hour lecture for the teaching of "Introduction to Statistics".	7.5%	32.5%	60%
Bite-Sized Lecture is preferred over 1 hour lecture for the teaching of "Descriptive Statistics".	10%	27.5%	62.5%
Bite-Sized Lecture is preferred over 1 hour lecture for the teaching of "Inferential Statistics".	5%	25%	67.5%
Bite-Sized Lecture is preferred over 1 hour lecture for the teaching of "Predictive Modelling".	7.5%	17.5%	75%
Bite-Sized Lecture is preferred over 1 hour lecture for the teaching of "Supervised Learning".	7.5%	17.5%	75%
In the Bite-Sized lecture, the speed with which your instructor presented the course material was just right.	7.5%	17.5%	75%
The class exercises are aligned with the content covered during the Bite-Sized lecture.	12.5%	22.5%	65%
The difficulty level of class exercises is manageable in the given time.	5%	20%	75%
Student's In-Class Behaviour			
I am motivated to consume content in short bursts and then immediately apply the concept to test myself on my skills.	7.5%	27.5%	65%
Bite-Sized lectures with exercises enables me to be more focused in class.	10%	30%	60%
Compared to 1-hour lecture, Bite-Sized Lecture encourages me to ask questions and participate in class discussions.	10%	27.5%	62.5%
Compared to 1-hour lecture, in Bite-Sized Lecture, the feedback on exercises were timely and reinforced my learning.	15%	15%	70%
Compared to 1-hour lecture, Bite-Sized Lecture enable me to have sufficient reflection time.	12.5%	22.5%	65%

Figure 5. Survey on Class Delivery and Student's In-Class Behavior

Please share your thoughts and suggestions on Bite-Sized lectures

- Good to recap immediately
- It keeps me focused in class and encourage active learning and application most of the times.
- It was useful in quicker learning process.
- I preferred the bite-sized approach. However, the pace of the lesson could slow down somewhat. Sometimes, before you were able to digest the content thoroughly, you had to move on to the next bit.
- Bite Sized is more effective when the topic involves calculation as we can see how it is applied and how it is interpreted
- cannot concentrate
- Bite Sized lectures are very suitable for the new and tougher topics like predictive modelling
- It breaks the monotony of listening to lecture. It reinforces some of the concepts being taught
- Bit-Sized lecture is effective especially if we are dealing with application type of question, question that need us to digest the concept and understanding and see how the calculation works.
- I find it very useful to help me think, apply and seal in knowledge bit by bit. Many times we assume this & that, and we think we understand, but this helps me see whether I really understood it or not, what I had just learnt in class or when I am revising at home. So if this is available, it helps in revision at home especially when topics get more difficult, and I need more time to read and ponder before I can fully understand. Way to go.

Figure 6. Qualitative Feedback on Bite-Sized Lectures

In terms of class delivery (see Figure 5), about 60% of the students surveyed agree or strongly agree that they prefer to be taught using Bite-Sized lecture over the one hour lecture. 75% agree or strongly agree that the speed in which the instructor presented the materials were just right. Figure 6 presents the qualitative feedback on Bite-Sized lectures. The comments suggested that Bite-Sized lectures helps them in learning new topics and is effective when they are “dealing with application type of question” or when “the topic involves calculation”.

4. Conclusions

In this paper, we experimented with the Bite-Sized lecture pedagogy to teach an analytics module and assessed its effectiveness in acquiring the learning outcomes. The results show that Bite-Sized lecture offer many advantages over traditional lectures. It can augment student learning by allowing the student to “digest” the content in sections. To the best of our knowledge, this is the first study to evaluate the different types of lecture delivery – Traditional vs Bite-Sized, using quantitative assessed learning outcomes. As determined by the questionnaire, the Bite-Sized lecture was more popular than the traditional lecture. We have also provided evidence that the different modes of delivery can affect the different depths of learning as classified by Bloom's taxonomy. Although it seems likely that similar study designs might produce contrasting results depending on the skill and enthusiasm of the teacher, nevertheless the statistical difference in the mean scores in particular areas and survey results suggest effects attributable to the mode of delivery.

Although this paper is primarily based on education experiences made within an analytics module, the findings presented are equally applicable to any other computing education field or even mathematics related education in general. A number of possibilities exist to extend this study. As the course is taught to adult learners, the results may be due to confounding reasons that may not be generalizable for tertiary students. Thus, the same approach can be used and evaluated to see if the results of Bite-Sized lecture still holds for different cohort of students. Future research will be undertaken to investigate this possibility.

References

- Baumgartner, I., & Shankararaman, V. (2014). Structure of face-to-face teaching sessions for an undergraduate technology-centered computing course: Establishing a set of best practices. In *Global Engineering Education Conference (EDUCON)*, 2014 IEEE (pp. 184-191).
- Bligh, D. A. (2000). *What's the Use of Lectures?* Intellect books.
- Bloom, B.S., Engelhart, M.D., Furst, E.J., Hilland, W.H., & Krathwohl, D.R. (1956). Taxonomy of educational objectives, *Handbook I: Cognitive Domain*, New York: David McKay, vol. 19, pp. 56.
- Clark, R. C., Nguyen, F., & Sweller, J. (2005). *Efficiency in learning: Evidence based guidelines to manage cognitive load*. Pfeiffer.
- Johnstone, A. H., & Percival, F. (1976). Attention breaks in lectures. *Education in Chemistry*, 13(2), 49-50.
- Miller, G. A. (1956). The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological Review*, 63(2), 81-97.
- Stuart, J., & Rutherford, R. J. D. (1978). Medical student concentration during lectures. *The Lancet*, 312(8088), 514-516.
- Sweller, J. (1999). *Instructional Design in Technical Areas*. Camberwell, Australia: ACER Press.
- Wyer, P. C., Keitz, S., Hatala, R., Hayward, R., Barratt, A., Montori, V. Montori & Guyatt, G. (2004). Tips for learning and teaching evidence-based medicine: introduction to the series. *Canadian Medical Association Journal*, 171(4), 347-348.

Circuit simulators for circuit analysis in graduate engineering courses

Cubells-Beltrán, María-Dolores and Reig, Cándid

Department of Electronic Engineering, University of València, Spain.

Abstract

Circuit simulators are extensively used as an aid in many courses at the graduate level in many different engineering and applied sciences programs. SPICE (Simulation Program with Integrated Circuits Emphasis) based software programs have been used for long due to their traditional market position. If we focus on circuits analysis and linear systems subjects, the features that are required from a given simulator can be found in student/limited versions of commercial EDA (Electronic Design Automation) suites or in freeware/open source codes. In this contribution, we analyse and compare the most relevant characteristics of a representative set of the software packages that are commonly adopted in these courses, focusing on the Spanish University system. For this purpose, the analysis (transient, DC and AC) of a typical second order passive low-pass filter is approached making use of each one. Then, we give some comments and recommendations, based on our own expertise, always taking into account the particular circumstances within a given academic scenario.

Keywords: *circuit simulators; circuits analysis; teaching/learning; educational technology.*

1. Introduction

Electrical circuits and linear systems are in the curriculum of all the programs in engineering and applied sciences. A proper teaching and understanding of these topics are key in the correct development of the career of the students (Johnson, Butcher, Ozogul, & Reisslein, 2014). Simple circuits containing few components can be analytically approached with regular graduate mathematics (complex numbers, arrays and calculus) or experimentally studied within basic workbenches. When circuits and systems become more complexes, or as complementary supporting tool, software simulators enter into play (Gimeno et al., 2016).

Circuit simulators have been used as pedagogical aids for long (Pota, 1997). The software SPICE (Simulation Program with Integrated Circuits Emphasis) was originally developed in 1973 by Donald O. Pederson and Laurence W. Nagel at the University of California, Berkeley. Since then, it has become a globally accepted reference in this field (Prigozy, 1989), being recognized in 2011, in its 40th anyversary, as an IEEE Milestone (Nagel, 2011).

Nowadays, different vendors provide circuit simulators embedded in electronic design software suites with a large number of improved features including differend kind of analysis (transient, frequencial, noise ...), behavioral models for nonlinear (electronic) elements, printed circuit board design and development tools, high frequency capabilities and many others. Of course, not for free. In this scenario, a good election of a circuit simulation software for electrical circuits and and linear system at the graduate courses in engineering and applied sciences programs has turned out a major issue in the definition of the curriculum.

Up to our knowledge, the use of a particular circuit simulator has been analysed in a particular topic (Hart, 1993) or in a particular university (N. A. O. Demerdash, 1993), but no as a comparative approach among different ones used in different universities. In this paper, we make a comparison among different options that can be found, giving recommendations depending on the particular case. After defining the scope of the study in section 2, the considered method is described in section 3. Then, conclusions are provided.

2. Scope of the study

As before stated, we will focus on circuit analysis and linear systems subjects included in the first courses of engineering and applied sciences programs. Slightly changing from one case to another, in the most of these courses the following topics are treated:

- Linear components: R, C and L.

- Transient, DC and AC regimes.
- One or Two ports networks. Quadripoles. Transfer functions.
- Magnetic coupling. Lineal transformers,
- Laplace transform and Fourier analysis (optional)
- Transmission lines (optional)
- Passive filters (optional)
- Linear applications of operational amplifiers (rare)

The topics marked as optional are common in electrical engineering programs but are often skipped in science oriented courses. Then, the considered circuit simulator should include all the above mentioned capabilities. We have limited our study to circuit simulators that are currently being used or have been used in the recent past in graduate courses of engineering programs in Spanish universities, as detailed in Tab. 1. All of them fall withing the student version or the open software schemes.

Table 1. Circuit simulators used in engineering graduate courses in Spanish universities.

University	PSpice	OrCAD PSpice	LTSpice	Microcap	QUCS
Complutense de Madrid	■				
Sevilla	■			■	
Extremadura	■				
Politecnica de Cartagena	■			■	
Illes Balears	■				
Pública de Navarra	■		■		
Cantabria	■				
Miguel Hernández		■			
Alcalá		■			
Santiago de Compostela		■			
Cádiz				■	■
Politècnica de Catalunya	■	■			■
Jaén		■			
Barcelona	■				
Politécnica de Valencia	■	■	■	■	
Murcia		■			
Zaragoza				■	
Carlos III		■			
Las Palmas de Gran Canaria			■		
València	■		■		
Castilla – La Mancha	■	■	■		
Politécnica de Madrid		■			■
UNED				■	■

2.1. PSpice

The most of current and past circuit simulators are based on the original kernel of SPICE, developed at Berkeley in the seventies, being SPICE3F5 the last freely released version. In fact, since then, commercial versions with enhanced tools have evolved based on the original SPICE code. PSpice was the first PC oriented Spice simulator, firstly released in 1984 by MicroSim. In 1998, MicroSim was acquired by OrCAD, which itself was subsequently purchased by Cadence Design in July 1999. In this way, the last version of MicroSim PSpice (8.0) was discontinued in 1998, but a lot of institutions are still using it, assuming that no updates or new models will be available.

2.2. OrCAD PSpice

OrCAD PSpice took over MicroSim PSpice with its 9.1 release, including a student vesion, which become as popular as its predecessor, remaining as the reference in the academic environment. Now we are with the 16th version.

2.3. MicroCAP

First version of MicroCAP (from Spectrum Software) was released in 1982 both for Apple II and IBM platforms. Since then, it has followed a compiting evolution with PSpice, up to the current 11th version, also releasing the corresponding student versions.

2.5. LTSpice

LTSpice is a SPICE based simulator, schematic capture and waveform viewer, courtesy of Linear Technology (LT), also providing electronic models of their own components. With a lot of support from LT and general users, it display comparable features with PSpice or Microcap. With the purchasing of LT by Analog Devices in 2017, the free distribution of LTSpice could be questioned.

2.4. QUCS

The Quite Universal Circuit Simulator (QUCS) is a free-software electronics circuit simulator, released under the GPL scheme. It is intended as an easier-to-use tool, when compared with OrCAD or MicroCAP suites. It is powerful, easy-to-use and with a high number of additional featres such as transmission lines analysis, Verilog/VHDL support or allowing the use of different simulation kernels.

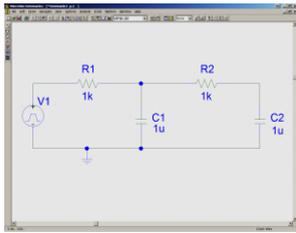
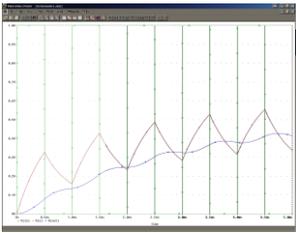
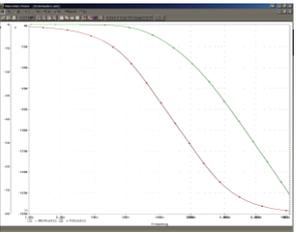
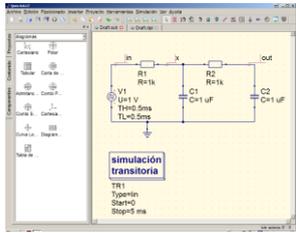
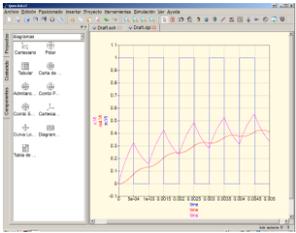
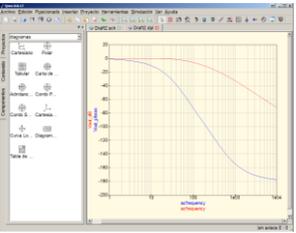
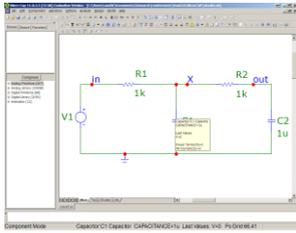
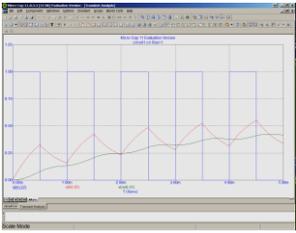
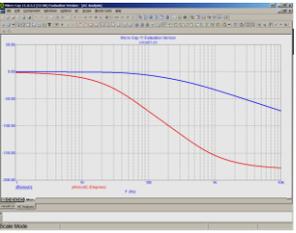
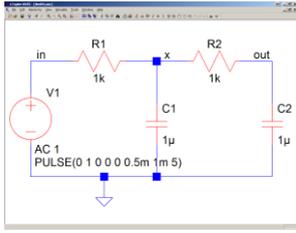
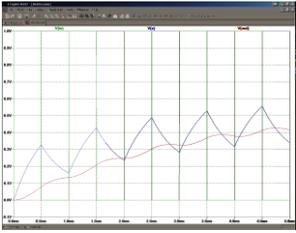
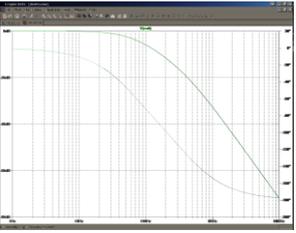
2.5. gEDA

It was launched as a project for providing Linux users of a good EDA suite, including Gnuicap as the circuit simulator. Being an excellent tool, it will be not considered in the current study.

2.6. Web based simulators

Nowadays, open web-based circuit simulators can be also considered for circuit analysys (Weyten, Rombouts, & De Maeyer, 2009). Among the most popular, we can name PartSim (“PartSim,” 2018), CircuitLab (“CircuitLab,” 2018) and EasyEDA (“EasyEDA,” 2018) as excellent options. The main concern on web based simulators is that there is not warranty of having it available for long, what is a handicap for the programation of future courses.

Table 2. Results on typical analysis performed with the considered circuit simulators.

	schematic	Transient analysis	AC analysis
PSPice			
QUCS			
MicroCAP			
LTSpice			

2.6. Full versions

Some vendors offer university programs at a reasonable price, giving access to full versions of the software. ADS from Keysight, AWR from National Instruments or Virtuoso/Systems from Cadence are valid examples of this policy. These software packages are very powerful and all of them include tools for circuit analysis. Nevertheless, they focus on specific fields of electronics (high frequency or microelectronics) and they require advanced training efforts, not justified at first courses. In addition, the number of released licensed sites in these university programs are usually limited, which is often sufficient in postgraduate courses, but hardly compatible for scheduling different laboratory groups.

3. Method

In order to highlight the above exposed considerations, a representative example is approached with the different considered circuit simulators. We will consider a second order low-pass passive filter, and we will perform the typical DC, transient and AC analysis. Such kind of circuits are frequently used as testbenches for the evaluation of simulation tools and academic approaches (Coppens, Van den Bossche, & De Cock, 2017). The results are collected in Table 2.

With proper teaching guidance, freshman year students are capable to perform any of the proposed analysis in less than an hour, regardless the considered simulator. That is to say, a laboratory session dealing with the full analysis of this circuit (schematic, transient and frequency analysis) can be easily completed in three hours, which is a common duration of the laboratory sessions. If mixed experimental/simulation laboratory sessions are considered, it is a good practice to dedicate the first laboratory session as introductory both for the basic instruments and the used simulator.

In any case, all the considered circuit simulators have demonstrated its good performance in the different analysis listed at the beginning of Section 2. Parametric analysis, use of combined equations, exportation of results, compability with netlists of different origins and many other are common built-in features. In summary, all the considered simulators perfectly match the requirements for circuit analysis courses. In this regards, we should note that, in addition to the technical capabilities of the software, other characteristics play an important role in the selection process. Academically speaking, we consider as valuable the following characteristics, with valorations collected in Tab. 3:

- Freely available for the students
- Good amount of supporting documents, tutorials ...
- Good learning curve, allowing students to focus on the problem, not on the tool.
- Useful for other subjects: analog/digital electronics, VLSI design, HF circuits ...

- Others

When possible, is highly recommendable to propose the same circuit simulator in circuit analysis matters as well as in introductory electronics courses, including digital electronics. In this way, the teaching/learning process is optimized. In addition, the students assume the potential of the circuit simulator as a useful tool in different fields, gaining confidence in this respect. It is also considered a good practice to provide the students with laboratory scripts not linked to a particular circuit simulator. Then, a set of supporting material can be provided in parallel. In this way, the idea of the simulator as an aiding tool is better perceived by the students. In some particular cases, a certain flexibility in the use of different circuit simulators can be beneficial. The definition of the circuit by direct writing of the netlist, skipping the use of the schematic editor can also being plausible as a pedagogical exercise. Finally, depending on the specific specialization of a particular engineering degree (electrical, communications, industrial ...), the use of full versions of EDA suites can be considered in intermediate courses, as an initial training step.

Table 3. Assessment of the more relevant features of the considered circuit simulators.

	PSpice	OrCAD PSpice	LTSpice	Microcap	QUCS
Full version	yes	no	yes	no	yes
Linux/Mac version	no / no	no / no	yes / yes	no / no	yes / yes
Availability	3	4	5	5	5
Schematic editor	yes	yes	yes	yes	yes
Learning curve	4	4	4	4	4
Graphics capabilities	4	4	2	4	4
Documentation and support	3	4	5	4	5
Export and import options	3	3	3	3	3
A/D electronics devices	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4
Additional features	PCB design	PCP design	TI models	Stability	HF analysis

Scale 1-5 (5 is the best – 1 is the worst)

4. Conclusions

The use of circuit simulators as a supporting tool in circuit analysis and linear systems courses is essential, as demonstrated for long, but it must not substitute the analytical approach and the experimental measurements. Because free versions of circuit simulators have been proved to fulfil the contents of common courses, the election of a particular one in an specific degree must be understood as an academic decision, and it must be taken after a reflection exercise, taking into account the related particular circumstances such as the nature of the degree, the background of the students or the schedule of the laboratories. The

learning outcomes as a function of the specifically considered simulator are not easy to assess and still remain as a matter of concern.

References

- CircuitLab. (2018). Retrieved from <https://www.circuitlab.com>
- Coppens, P., Van den Bossche, J., & De Cock, M. (2017). Student understanding of first order RC filters. *American Journal of Physics*, 85(12), 937–947. <http://doi.org/10.1119/1.5003805>
- N. A. O. Demerdash, R. H. (1993). Impact of Academic Computing on Teaching Electrical Engineering at Clarkson University. *IEEE Transactions on Education*, 36(1), 94-102.
- EasyEDA. (2018). Retrieved from <https://easyeda.com>
- Gimeno, C., Sánchez-Azqueta, J., Celma, C. B., Santiago, Aldea, & Concepción. (2016). Electrónica enREDada: An experience with a webinar program. In *2nd International Conference on Higher Education Advances, HEAd'16*. <http://doi.org/10.4995/HEAd16.2016.2552>
- Hart, D. W. (1993). Circuit Simulation as an Aid in Teaching the Principles of Power Electronics. *IEEE Transactions on Education*, vol. 36, 10-16.
- Johnson, A. M., Butcher, K. R., Ozogul, G., & Reisslein, M. (2014). Introductory Circuit Analysis Learning From Abstract and Contextualized Circuit Representations: Effects of Diagram Labels. *IEEE Transactions on Education*, 57(3), 160–168. <http://doi.org/10.1109/TE.2013.2284258>
- Nagel, L. (2011). The 40th Anniversary of SPICE: An IEEE Milestone [Guest Editorial]. *IEEE Solid-State Circuits Magazine*, 3(2), 7–82. <http://doi.org/10.1109/MSSC.2011.941445>
- PartSim. (2018). Retrieved from <http://www.partsim.com/simulator>
- Pota, H. R. (1997). Circuit Theory and Analog Electronics — Computer Aided Teaching. *International Journal of Electrical Engineering Education*, 34(2), 141–160. <http://doi.org/10.1177/002072099703400205>
- Prigozy, S. (1989). Novel applications of SPICE in engineering education. *IEEE Transactions on Education*, 32(1), 35–38. <http://doi.org/10.1109/13.21160>
- Weyten, L., Rombouts, P., & De Maeyer, J. (2009). Web-Based Trainer for Electrical Circuit Analysis. *IEEE Transactions on Education*, 52(1), 185–189. <http://doi.org/10.1109/TE.2008.924213>

Yes you can, follow your goals! Individual Coaching for female Computer scientists on career development

Förtsch, Silvia

Faculty of Information Systems and Applied Computer Sciences, University of Bamberg,
Germany

Abstract

Earlier results show that female computer scientists show a lower self-efficacy compared to male colleagues. Similarly, gender-typical attributions, in the sense of gender stereotypes, are considered a disorder. As a result, a coaching program that supports computer scientists after a re-entry into professional life also, in a new orientation or with regard to management ambitions has been developed at the University of Bamberg. The measure strengthens computer scientists in their motivational resources and enables them to take advantage of professional opportunities. A scientifically founded analysis of their potential helps the coachees to become aware of their abilities and competences. The coaching program based on the potential analysis, takes important life goals of the coachees into account. Individual career plans are developed in coaching sessions, including a clear definition of the objective and implementation strategy. An open and modern corporate culture offers new opportunities of career paths for female computer scientists. If the company philosophy is based on appreciation of good performance, women in computer science are more motivated strengthen their career ambitions.

Keywords: *Women in computer science; self-efficacy beliefs; potential analysis; individual coaching; career development*

1. Introduction

Women, despite finishing college faster than men, do not have equal career perspectives (Leuze & Rusconi, 2009). A gender-typical choice of study field leads to gender-typical job-market perspectives, therefore less pay and a higher focus on work-family compability (ibd.). Male connoted jobs in the IT-field are associated with a high willingness to perform, unexpected work hours, readiness to travel and a sole identification with the job (ibd.). Women, unwilling to aspire said male employment biography are at risk to face disadvantages in their career (ibd.). Women, despite their academic performance, underestimate their competencies and have low self-efficacy expectations (Förtsch et al., 2018; Reuben et al., 2010). Supporting womem's career ambitions, e.g. through coaching programmes, can have a positive impact.

This article is based on the results of the project Career Coaching in STEM. It was studied in what degree an individual coaching program can have an impact on increased confidence in their own competencies, a distinct work vision and an understanding of the possibility of a compability of leading work positions and a good work-life balance including a family. Withal, a better understanding of their own competencies was aimed for. This article focuses on the factors that hinder or promote career development of female computer scientists.

After embedding the contribution in the theoretical framework, the coaching measure with its processes as well as the underlying test for personality analysis will be presented in more detail. Subsequently, a case study shows the practice of coaching with the developed individual career steps and their implementation and illustrates the potential of coaching measures to support the career planning of women in computer science.

2. Theoretical Framework

Self-efficacy expectation

Self-efficacy, a theoretical concept by Bandura (1997), is one of the most important theories of action (ibd.) Self-efficacy expectation stands in context with the assessment of one's own abilities and the motivation to carry out actions. It is known from literature that professional self-efficacy expectations of women after entering the labor market weakens. Men, on the contrary, tend to increase their confidence with work experience.

Women seem to process professional failures and difficulties worse than men. For men, lived experiences lead to concrete career ideas. Women rather start to question their abilities, especially in male dominated work environments (Abele, 2013). Results of previous studies show the same effect for the occupational group of computer scientists. Female

graduates, despite similar final grades, showed lower self-efficacy expectations than the male graduates after entering the work life (Förtsch et al., 2017).

Gender Stereotypes

In order to explain career inequalities between women and men, theoretical concepts refer to the existence of gender stereotypes (Spencer et al., 1999; Steele, 1997) and gender roles (Abele, 2003; Athenstaedt, 2002; Athenstaedt & Alfermann, 2011). The underlying theoretical assumption of those models implicates, that deeply rooted social gender roles and gender stereotypes have an impact on decision making and the behavior of employers and employees. This has the effect, that career chances and ambitions of women systematically differ from those of men (Boye, 2009; Claffey & Mickelson, 2009; Russo, 1976).

3. Research design and method

Career promoting measures like a coaching program for female computer scientist are, due to the mentioned mechanisms, valuable (Förtsch et al., 2015). The aim of coaching is to expand the scope of action which lead to behavioral change. This process is only successful, if the coachee links an idea of their own effectiveness with their actions (Bandura, 1997). An awareness of their own competencies as a computer scientist is necessary, to plan, conduct and successfully finalize actions. This can be reaching higher position in a company. A high self-efficacy expectation, regardless of the actual abilities, generally leads to positive results. In critical situations own resources can be accessed more easily (Loebbert, 2017). Coaching processes are to be seen as social exchange relationships. The usefulness of the course of action will be evaluated by the coachee's subjective experience. A successful coaching connects self-efficacy expectations with action, drawn from developed career enhancing steps, to a realized objective.

Participant Structure

15 women (between 24 and 40 years old) who either graduated with a degree in applied computer science or economic computer science or are enrolled in a master program participated in the coaching program.

Implementation

The implementation of the coaching measures is divided in five phases (contact, contract, hypotheses, interventions and evaluation) in accordance with the model of person-centered process consultancy. A personality analysis on the basis of a job-related compe-

tency test, the Business-Focused Inventory of Personality (BIP)¹, took place before the first coaching session.

Business-Focused Inventory of Personality (BIP)

The BIP questionnaire includes 210 items, which have to be ranked by the test person on a six level scale from „strongly agree“ to „strongly disagree“. 14 personality traits, belonging to 4 personality areas, are analysed (Hossiep & Paschen, 2003). Those include the following facets such as **professional orientation**: achievement motivation, motivation to shape, leadership ambition; **work behavior**: conscientiousness, flexibility, activity orientation; **social competencies**: sensitivity, interpersonal competencies, sociability, teamwork, assertiveness; **mental condition**: emotional strength, physical resilience and self-awareness. The evaluation of the data was done in a 10-stage standardization.

Evaluation of the Questionnaire

The evaluation of the participants answers happened in comparison to the reference groups of professional and managerial staff. A special focus of the coaching was put on the management potential. The emphasis of the dimensions leadership motivation, achievement motivation, sensitivity, interpersonal competencies and assertiveness are important for management potential development. The markedness of the dimensions conscientiousness, sociability and teamwork should lie in the mid-range (Kanning & Kempermann, 2012).

4. Case Study

Project Manager Plans Entry to the Management Level

The coachee, a 35 years old mother of two children (kindergarten and elementary level), holds a leading position as an IT-consultant and project manager and she is completing a coaching education, graduating in 2017. The further qualification strengthens her position in the company, as offered coaching sessions will expand the company's service portfolio. In the first half of 2017, she plans to join the management level with a financial participation. The company's corporate culture offers a high degree of creative possibilities. With 40 hours a week, the fifth day each week is reserved for continuing education and training with continued salary payment. Compensation for overtime can be used for time off from work.

The coachee works part-time with 30 hours a week on four days, including a home office day, often used as a „buffer“ for client meetings on-site. Childcare is arranged, yet the or-

¹The Business- Focused Inventory of Personality Bochum (BIP, Hossiep & Paschen, 2003) is a psychological test that systematically records occupational personality traits. For this purpose, the participant is presented with statements that he should judge in terms of the personal validity of the statements. The answers are summarized on the basis of relevant professional dimensions in each case to numerical values, represented graphically by means of a profile sheet and summarized in a psychological report. GDP can be applied in different contexts, such as: Eg in coaching measures

ganization calls for a high level of discipline and no flexibility, changing booked kindergarten hours is nearly impossible. Her husband and parents-in-law support her in terms of childcare.

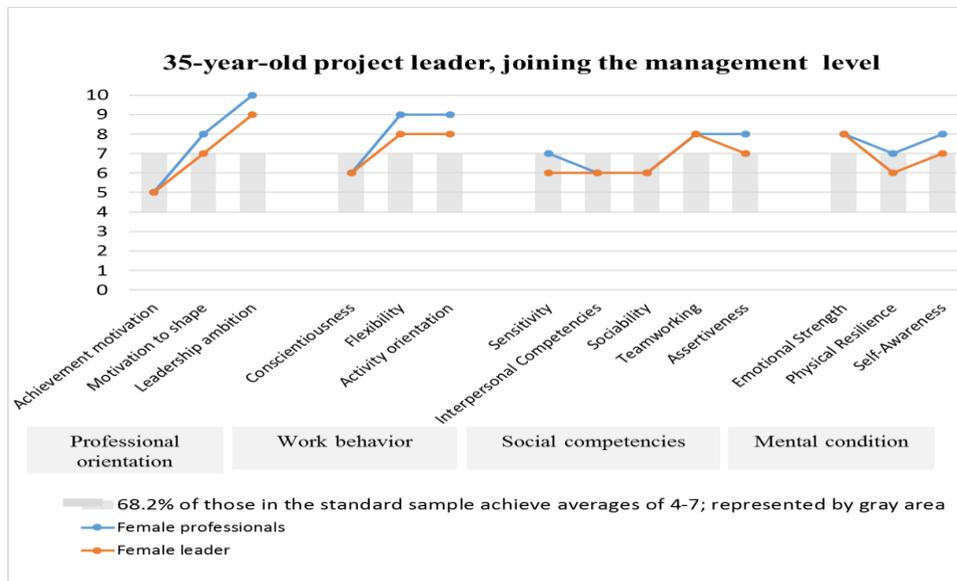


Figure 1: Result for the potential analysis for the reference groups of female professionals and leader for case-example 1 (Source: Own illustration, 2018).

Interpretation of the Results

Figure 1 shows the results of the coachee in comparison to both referential groups. Particularly the dimensions relevant for managerial staff as explained above appear for the coachee as follows: The figure for leadership ambition is above average, for assertiveness at the margins of above average and achievement motivation, sensitivity and interpersonal competencies are ranked average in comparison to the reference group. The dimensions conscientiousness and sociability are average, teamwork is above average. The comparison of the two reference groups indicate that management tasks will be important for the coachee in the future as well. Due to the well-defined profile, the coachee would be subchallenged with a exclusively professional career. The potential would be left unused.

The coachee perceives herself as a leader and identifies with the relevant qualities. She considers her social exertion of influence as competent and feels valued and respected as a team leader. It is important to her, that the workload is appropriate for the expected results. She sees herself as a person, who has to maintain an overview (Hossiep & Paschen, 2003). The markedness of flexibility indicates an ability to easily adjust to changing conditions. She needs new challenges for professional satisfaction, is open to new experiences and wants to contribute innovative ideas to the work process. Due to her time management, she

is able to complete all tasks. In terms of activity orientation, she is capable to perform parallel chores. The interaction with the coachee confirmed the test results. She was perceived as a sensitive person during the coaching session. Due to her empathy, she detects the mood of others and successfully deals with difficult conversational situations. She mentioned to first listen and then react openly in communication. At first she tends to be rather cautious. She depicts herself as a person, who does not show sympathy and antipathy up front. During the coaching session, she described herself as a person who reconsiders her objectives if necessary. She asserts herself in her work field and mediates if problems arise. She successfully convinces others of ideas and so motivates them to set their own goals. She uses her distinct emotional stability and shows resilience due to her additional burden of a coaching education besides work and family. She is used to perform efficient and effective over long periods of time and is aware of her competencies and leadership qualities and uses them. Criticism is dealt with without losing self-confidence [12]. Yet, she questions her external impact, which distinguishes her as a leader: The accordance of the self-perception with the results of the BIP questionnaire was verified in the coaching session. The coachee was not surprised with the result. She indicated a change of attitude and potential with the coaching education and therefore many results are marked above average. The coaching session focussed on possible career developments especially changes in the near future aiming to incorporate professional success with a certain life satisfaction.

Career Planning

After a joint discussion and evaluation of the results, the career planning was finalized by laying out the first steps, those were visualized and agreed on, as shown in figure 2.

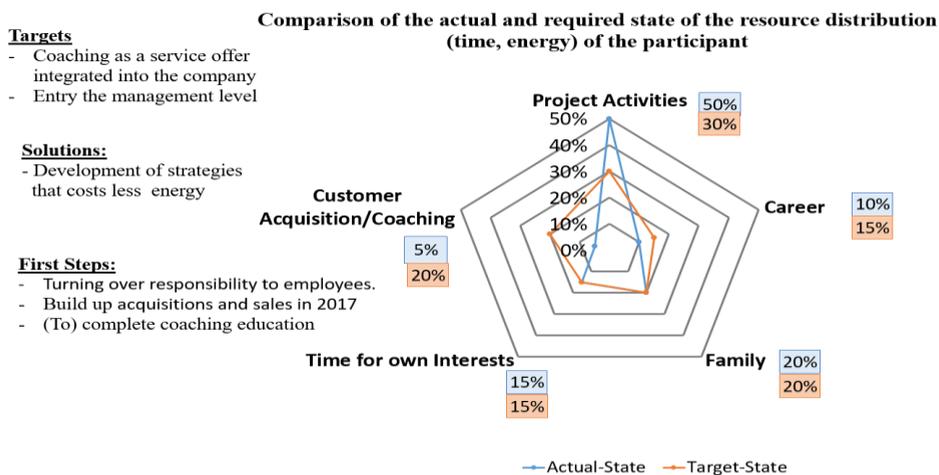


Figure 2: Visual presentation of developed career steps for case-example 1 (Source: Own illustration, 2018).

Evaluation of the Coaching Measure

The method was a case-by-case analysis. Due to the target group of the coaching measure, e. g. graduates of the Faculty of Information Systems and Applied Computer Sciences at the University of Bamberg who work in different areas of computer science and different businesses the method of an experiment could not be chosen. Therefore, the evaluation was carried out three months after each session via a narrative interview and questionnaire. The coaching was rated as successful if new perspectives were evolved and first career steps were achieved

„At the time of the coaching the next career step was clear to me. We worked out the different partial aspects, which belong to my position, and decided on a proportionate time budget for each (variance analysis). Due to that I had a clear understanding of my goals and knew how to operate. This way, the time management is still realistic, partly still with action required, to reach target figures.“ (Coachee)

The current work situation of the coachee did not change organizationally. Project management still takes up too much time. The new employees need assistance due to lacking experience. A high workload for individual topics is therefore necessary and time for distribution and acquisition is missing. Due to a good order situation client acquisition is not in the foreground. Because of capacity reasons some topics need to be postponed. The transition to the management level is developing hesitantly, the scope of action is expanding.

„With some topics, a transition happened, I send offerings etc. autonomously. While I am not satisfied because of the lack of new customers, I am working on contentwise very interesting topics, that I don't want to miss one of them. The most important goal, to be a certified coach, I have reached since the coaching session. I completed my coaching education with the certification (dvct) end of March“ (Coachee).

„Coaching“ as a service in the company seems to work well. The coached clients's feedback is consistently positive. Appointments with current and new clients exist.

5. Conclusion

This case study indicates that career ambitions are affected by personal engagement, existing corporate structures and family situation. The appreciative and supportive corporate structure in this IT-company furthers the coachee's career plans. The insufficient day care capacity is compromised by the husband's and parents-in-law's support and allows her to pursue her target. The most important career goal, the completion of the coaching education, was reached. The goal to enter the management level proved to be more difficult than expected, but is still aspired and is supposed to be realised in the following months. It has to be discussed whether it is actually due to the non-existent financial statements that the can-

didate has not yet completed this career step or whether she must send out even stronger signals in order to reach the level of senior management. Is she possibly attributed lower productivity due to her motherhood? The time management of the Coachee needs improvement.

“The coaching was very useful for me, which worked out the different aspects of my position and provided them with a proportionate time budget. With that, I had the goals clearly in mind, and where something should shift” (Coachee).

References

- Abele, A. E. (2013). Berufserfolg von Frauen und Männern im Vergleich. Warum entwickelt sich die „Schiere“ immer noch auseinander? *Gender* 2013, 41–59.
- Abele, A. (2003). Geschlecht, geschlechtsbezogenes Selbstkonzept und Berufserfolg. Befunde aus einer prospektiven Längsschnittstudie mit Hochschulabsolventinnen und -absolventen. (H. H. Verlag, Hrsg.) *Zeitschrift für Sozialpsychologie*, 3, S. 162-172.
- Athenstaedt, U. (2002). Gender role self-concept, gender role attitudes and the participation in gender-typed vocational and leisure sport courses. *Psychologische Beiträge*, 44.
- Athenstaedt, U., & Alfermann, D. (2011). Geschlechterrollen und ihre Folgen. Eine sozialpsychologische Betrachtung. Kohlhammer.
- Bandura, A. 1997. Self-efficacy. The exercise of control. W.H. Freeman, New York
- Leuze, K. and Rusconi, A. (2009). Karriere ist Männersache. Auch hochqualifizierte Frauen haben im Job schlechtere Chancen. *WZB-Mitteilungen*.
- Boye, K. (2009). Relatively different? How do gender differences in well-being depend on paid and unpaid work in Europe? *Social Indicators Research*, 93, S. 509-525.
- Claffey, S. T., & Mickelson, K. (2009). Division of household labor and distress: The role of perceived fairness for employed mothers. *Sex Roles*, 60, S. 819-831.
- Förtsch, S. / Gärtig-Daug, A. / Buchholz, S. / Schmid, U. (2017; zur Veröffentlichung angenommen). Keep it going, Girl! An Empirical Analysis of Gendered Career Chances and Career Aspirations Among German Graduates in Computer Sciences. *International Journal of Gender, Science and Technology*.
- Förtsch, S., Gärtig-Daug, A., und Schmid, U. 2015. Unternehmenskulturen im Wandel - Karriereentwicklung im Informatikbereich. Ergebnisse des Forschungsprojekts *Alumnae Tracking*, Bamberg.
- Hossiep, R. und Paschen, M. 2003. *Bochumer Inventar zur berufsbezogenen Persönlichkeitsbeschreibung*, Manuel Loebbert, M. 2017. *Coaching Theorie. Eine Einführung*. Springer, Fachmedien.

- Kanning, U. P. und Kempermann, H. 2012. Fallbuch BIP. Das Bochumer Inventar zur berufsbezogenen Persönlichkeitsbeschreibung in der Praxis. Hogrefe, Göttingen [u.a.].
- Reuben, E., Rey-Biel, P., Sapienza, P., and Zingales, L. (2010). The emergence of male leadership in competitive environments. Discussion paper series // Forschungsinstitut zur Zukunft der Arbeit, No. 5300.
- Russo, N. F. (1976). The motherhood mandate. *Journal of Social Issues*, 32, S. 143-154.
- OECD (2013). Gleichstellung der Geschlechter – Zeit zu handeln.
- Spencer, S., Steele, C., & Quinn, D. (1999). Stereotype Threat and Women's Math Performance. *Journal of Experimental Social Psychology* 35, S. 4-28. *Journal of Experimental Social Psychology*, 35, 4–28.
- Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, 52(6), 613–629. doi:10.1037/0003-066X.52.6.613

Implementing Management Systems and Demand Driven MRP concepts: A Project Based Learning experience in Industrial Organization Engineering

Kortabarria, Alaitz and Elizburu, Ander

Mechanical and Manufacturing Department, Mondragon Unibertsitatea Faculty of Engineering, Spain.

Abstract

This research work presents an experience of the Faculty of Engineering of Mondragon Unibertsitatea using Project Based Learning (PBL) with the students of 4th semester of Bachelor's Degree in Industrial Organization Engineering (IOE).

The PBL delved into the concepts developed in the subjects of Management Systems and Production Logistics. The project was contextualized in a company that produced parts for the automotive sector. Teams of students implemented a management system that enabled the efficient management of materials and the production process using tools such as Demand Driven MRP (DDMRP). As a result, they had to solve the proposed problem, develop a simulation and choose the proposal that best met the needs of the company.

In order to assess PBL performance a survey was carried out. The results confirmed that the experience was positive since the achieved knowledge provided a meaningful learning experience for the students, while facilitating the development of both technical and transversal competences.

Keywords: *Project Based Learning; Management Systems; DDMRP; Teaching methods.*

1. Introduction

The current paradigm that surrounds us is increasingly dynamic and volatile, requiring the ability to predict future trends and adapt to them. Globalization in the information and knowledge society, has led us to acquire new skills, new ways of seeing the world, the use of new tools and languages, etc. Great efforts are therefore needed to adapt and deal with this complex and volatile environment (Castells, 1996).

In view of this situation, nobody disputes the need to support students in the acquisition of new competences for their proper insertion into the world of work, as the working environment has new requirements as well (EUROPEIA, 2014). The efficient performance of any profession needs the ability to solve increasingly complex tasks and the linkage of education with the professional career is therefore becoming more and more necessary (Gallo-Martinez et al., 2015).

In this regard, education requires new teaching-learning models that fulfil the demand of this new paradigm. Therefore, educational institutions should take into account the following three aspects to facilitate the transition to new models: First, it should be assumed that the formal environment will not always be the main source of knowledge. Secondly, in the era of mass data, new competences such as searching, evaluating, organizing, selecting are needed to make effective use of information. Finally, it should be considered that learning is a continuous process that develops throughout life and extends beyond the period of formal education (Pozo, 2006).

It is important to note that in the learning process, students are the real protagonists and that not only learning to learn is important, but learning to do, learning to be and learning to live together is also essential (Century et al., 1996).

The present work therefore, describes and analyzes how the Faculty of Engineering of Mondragon Unibertsitatea (MGEP), with the teaching-learning model based on projects, trains the students of the Bachelor's Degree of Industrial Organization Engineering (IOE) so that they can satisfy the future demands of this new paradigm.

2. Project Based Learning

According to Laffey et al. (1998), Project Base Learning (PBL) is a modification of what was initially conceived as a methodology that drove students to generate knowledge and address issues in a previously raised context. PBL also presents an ideal opportunity to create simulated situations which can arise in the real world, enabling students to propose a collaborative solution (Thomas et al., 2005).

Moreover, PBL stimulates motivation of the students since they have meaningful goal to aim for (Green, 1998). This type of teaching encourages students to take on a dynamic role that leads to a deep understanding of the concepts worked on. This goal is hard to achieve with classic teaching models like information transmitted from a teacher, a computer or a book, which results in a rather superficial learning (Krajcik et al., 2006).

According to Arana-Arexolaleiba et al. (2017), PBL allows students to develop both technical and transversal competences. The technical competences are related to the technical section of the project and directly related to the worked subjects. The transversal competences enable working concepts such as thinking oriented to problem solving, decision making, effective communication, teamwork, global vision, leadership and learning to learn.

3. PBL in the Faculty of Engineering of Mondragon Unibertsitatea

The primary goal of MGEP is to prepare profiles with a markedly professional character in an industrial environment. In order to achieve this goal, in 2002 MGEP opted for the PBL methodology and nowadays it is implemented in all Bachelor and Master Degrees.

In the PBL model implemented in MGEP, each semester two tactics are merged: at the beginning of each semester teachers have an active role and teach essential knowledge in different topics. In the second part of the semester, the roles are reversed. Students take the active role and develop a project, putting into practice and investigating in greater depth the subjects worked on in the semester.

Depending on the semester the weight of the project will account for between 20% and 50% of the European Credit Transfer System (ECTS) of whole semester (Figure 1) (Arana-Arexolaleiba et al., 2017).

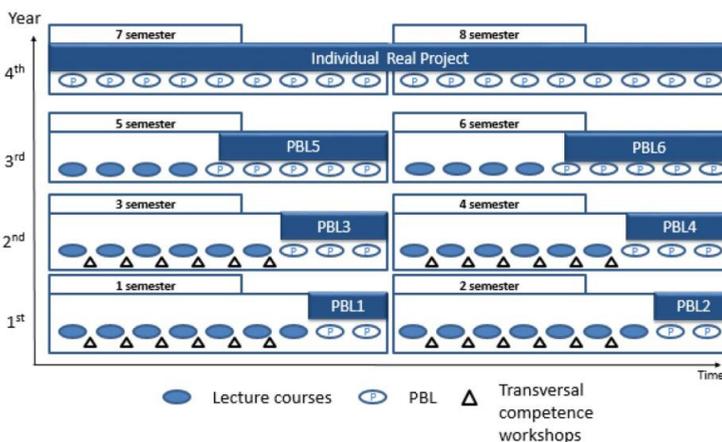


Figure 1: MGEP curriculum structure. Source: Arana-Arexolaleiba et al. (2017).

To ensure that students progress according to the objective of the project, each team of students has a tutor and experts for each topic worked on. The main objective of the tutor is to ensure that each group manages the project effectively and all tasks are carried out on time. In addition, the tutor supervises the active participation of each team member in the assigned tasks.

The role of the experts is completely different as they provide technical advice. In the case that a team derails, the expert group provides the corresponding feedback, so that the team members acquire knowledge and are capable of returning to the correct path. For this purpose, different milestones and meetings are planned throughout the project, so that students can present the work done and compare the results obtained so far.

4. PBL case study in 4th semester of Bachelor's Degree in Industrial Organization Engineering

Mondragon Unibertsitatea has as its goal promoting the improvement and innovation of products, services and technological processes as well as organizational models (Mondragon Unibertsitatea, 2018). To this end, students who take the Bachelor's Degree in IOE acquire skills and knowledge to drive competitive and sustainable industrial activities and services. Specifically, in the 4th semester, the students undertake lessons in the topics of Production Logistics and Management Systems.

In addition to teaching and research, the staff of MGEP provide consultancy services to commercial companies. These collaborations means that the institution is well placed to understand real business needs and can transfer this reality to the classroom or even define multidisciplinary projects based on real cases. In this context, a multidisciplinary project (incorporating the subjects of Production Logistics and Management Systems) was defined and carried out in the 2016-2017 academic year.

At the commencement of the project the students considered that Production Logistics and Management Systems were two completely independent worlds, and that there was no relationship between them. However, in a business context these two fields are quite interrelated since the company uses these internal processes to contribute to the value chain of its customers. In other words, the goal of the Management System is to be able to maximize the contribution of value to customers through the sum and combination of innovation processes, operating processes and after-sales service (Zaratiegui, 1999). Within the operating processes, companies manage indicators such as the percentage of deliveries on time, time of the production cycle, productivity of people and machines, yields and costs (Zaratiegui, 1999). An efficient management of materials and production is necessary to

improve these indicators and thus the company is able to satisfy the requirements of the internal and external customer gaining competitive advantage (Lutz et al., 2003).

The objective of this project therefore, was to increase knowledge in both fields and to demonstrate how unilateral decisions in one field impact the other.

To this end, the teaching staff defined an industrial environment that provided complete solutions for the automotive sector. To simplify and make it a manageable project for students, the project was focused on a single product. The students had technical drawings of the product, its bill of materials, the detailed description of the companies that supplied each part, the description of the production process, as well as the management of materials that the company made using the Material Requirements Planning (MRP).

The project proposed developing a simulation where the company simulated its supply chain management, upgrading the Manufacturing Planning and Control (MPC) system to Demand Driven MRP (DDMRP). In this way the students could analyze the advantages and disadvantages of managing the flow of materials and information through the supply chain with this methodology, and analyze its impact on the Management System. At the conclusion of the project, the students had to decide if it was worth upgrading to DDMRP and justify the decision.

The project milestones were defined as follows:

- First the students defined the strategic objectives based on the strategic map, developed the processes map of the organization and established the objectives. Once all tasks were undertaken, the students defined the quality policy of the organization.
- Secondly, the students designed different process files as well as supplier/customers tracking records.
- In parallel, the students designed a simulation that allowed them to analyze the flow of materials and information of the defined industrial environment, using MRP and DDMRP, to make a comparison of the obtained results.
- To finish the project, the students ran the simulation for a specific period of time. Thus, they were able to model and manage daily demand, compare this with forecast demand and propose purchasing orders according to the available inventory. In addition, they were able to see the impact of the uncertainty created by forecast in the supply chain.

Considering the results of the simulation, students had to 1.- fill in the records of suppliers / customers, 2.- feed the indicators of different processes, and 3.- propose improvements in line with the previously defined strategic map.

5. Results

Once the project was completed, the knowledge that the students had acquired with this project as well as their perception of the concepts learned was analyzed and measured.

The analysis was carried out based on the methodology used by Ibáñez et al. (2017). Two aspects were considered: general aspects of the PBL (Section A) and developed skills (Section B). The aspects of section A are the following:

- A1: The project was adapted to the competences.
- A2: The students required technical concepts to develop the project.
- A3: The project added value to the knowledge acquired in the classroom.
- A4: The duration of the project was adequate.
- A5: The available materials and resources were adequate

As can be seen in Table 1, the students positively valued the general aspects related to the PBL since all aspects are above the mean. A1 and A3 received a particularly positive assessment because the project was directly related to the concepts worked on in class.

The students reported that as a consequence of working on this project they were able to understand the relationship between Production Logistics and Management Systems. Moreover, the experience clearly demonstrated the importance of defining processes and indicators well to define actions aligned with strategy.

A2 and A5 were also well-valued however some areas for improvement were identified. In particular students had difficulties developing the simulation model due to lack of experience. In future projects this issue should be addressed.

Aspects of section B were also assessed between 1 and 5:

- B1: Achievement related to teamwork.
- B2: Achievement in terms of continuous learning of technical concepts.
- B3: Achievement relative to autonomous work.
- B4: Achievement related to communication (reports and presentations).
- B5: Achievement related to the ability to plan.
- B6: Level of motivation during the project.
- B7: Level of satisfaction with the attention provided by the teaching staff.
- B8: Level of recommendation for this type of experience for the learning process.

Table 1: Results of the survey regarding general aspect of the PBL (Section A).

Question	Mean	Question	Mean	Question	Mean
A1	4.11 ±0.48	A3	4.05 ±0.90	A5	3.29 ±0.92
A2	3.35 ±1.05	A4	3.41 ±1.06		

Table 2: Results of the survey regarding the developed skills in the PBL (Section B).

Question	Mean	Question	Mean	Question	Mean
B1	3.71 ±1.05	B4	3.82 ±0.80	B7	3.59 ±1.17
B2	4.12 ±0.78	B5	3.53 ±0.80	B8	4.06 ±0.96
B3	3.71 ±0.92	B6	3.29 ±1.21		

As shown in table 2, the mean of all aspects are between 3 and 5. The score given to the aspects B2 and B8 indicated that students prefer this type of teaching method. However, points to improve are also identified. B6 assesses the motivation of the students during the project, and although the mean is 3.29 its deviation is quite high. In future projects therefore, actions during the definition of the project as well as in its development should be considered to increase motivation.

6. Conclusions

Since 2002 MGEP has based its teaching methodology on PBL. This methodology involves considerable effort however, as teachers require specialize training and need to interact at all times with the students to reach the course objective. In addition, PBL is an active learning methodology that must adapt to the needs of the environment, and thus is necessary to implement a continuous improvement process, in which the teaching model is updated.

PBL methodology is quite well consolidated in MGEP and to date several research works have been carried out in this field. We are well aware however, of the necessity to continuously work on our teaching methodologies and improving our model so as to prepare profiles with a markedly professional character for the industrial sector.

The results obtained in the survey demonstrate that students positively value this teaching model. A further benefit of this methodology it that it places students center stage, and promotes active and dynamic participation in the classroom. Students acquire the skills

required to solve real world problems autonomously, searching for different alternatives/solutions, analyzing them and choosing the most appropriate in a well-argued manner. PBL can therefore be considered an appropriate strategy in the training of engineers, working on both transversal and technical competences through active methodologies. MGEP remains committed to pursuing a strategy of continuous improvement in this field.

References

- Arana-Arexolaleiba, N., & Zubizarreta, M. I. (2017). PBL Experience in Engineering School of Mondragon University *PBL in Engineering Education* (pp. 89-102): Springer.
- Castells, M. (1996). El surgimiento de la sociedad de redes. *La era de la información, Economía, Sociedad y Cultura, 1*.
- Century, I. C. o. E. f. t. T.-f., & Delors, J. (1996). *La Educación encierra un Tesoro: Informe a la UNESCO de la Comisión Internacional sobre la Educación para el Siglo XXI. Compendio*: Santillana.
- EUROPEIA, C. (2014). EACEA/EURYDICE. *Modernisation of Higher Education in Europe: Access, Retention and Employability. Eurydice Report*.
- Gallo-Martinez, R., & Alarcón-del-Amo, M.-d.-C. (2015). *Students' perception of competences development in an undergraduate university environment*. Paper presented at the 1ST INTERNATIONAL CONFERENCE ON HIGHER EDUCATION ADVANCES (HEAD'15).
- Green, A. M. (1998). Project-based Learning: Moving Students through the GED with Meaningful Learning.
- Ibáñez, C., & Hernández-Figueirido, D. (2017). *Project Based Learning experience with engineering students for the design of steel structures*. Paper presented at the 3rd International Conference on Higher Education Advances, HEAD'17, Universitat Politècnica de València, València,.
- Krajcik, J. S., & Blumenfeld, P. C. (2006). *Project-Based Learning*. New York: Cambridge University Press.
- Laffey, J., Tupper, T., Musser, D., & Wedman, J. (1998). A computer-mediated support system for project-based learning. *Educational Technology Research and Development, 46*(1), 73-86.
- Lutz, S., Löedding, H., & Wiendahl, H.-P. (2003). Logistics-oriented inventory analysis. *International Journal of Production Economics, 85*(2), 217-231.

- Mondragon Unibertsitatea. (2018). Engineering in Industrial Organisations - Mondragon Unibertsitatea Retrieved 02 February 2018, 2018, from <https://www.mondragon.edu/en/bachelor-degree-industrial-organisation-engineering>
- Pozo, J. I. (2006). *La nueva cultura del aprendizaje en la sociedad del conocimiento*. Paper presented at the Nuevas formas de pensar la enseñanza y el aprendizaje: las concepciones de profesores y alumnos.
- Thomas, W. R., & MacGregor, S. K. (2005). Online project-based learning: How collaborative strategies and problem solving processes impact performance. *Journal of interactive learning research*, 16(1), 83.
- Zaratiegui, J. (1999). La gestión por procesos: Su papel e importancia. *Economía industrial*, 330, 81-88.

Effects of Mobility Programmes on University Students' Academic Performance

González-Baixaui, Cristóbal^a; Montañés-Brunet, Elvira^b and Pérez-Vázquez, Pedro José^c

^aFaculty of Economics, University of Valencia, Spain, ^bIULMA, University of Valencia, Spain, ^cMC2, University of Valencia, Spain,

Abstract

The number of students participating in mobility programmes has increased enormously over the years. The reasons are diverse and may range from personal growth to better employability prospects, together with improvement in foreign language skills and intercultural awareness. Mobility programmes receive generous funding from the European Commission, therefore their outcomes should be measured and evaluated. This paper focuses on a specific one: the academic effects of mobility programmes. We analyse whether there is an improvement in the academic performance of the students who participate in mobility programmes and, if this is the case, whether it is sustained over time. We use a broad dataset of students from the Faculty of Economics of the University of Valencia over a period of thirteen academic years. The results indicate that students participating in a mobility programme experiment a marked improvement in their scores at the host university, but this upgrading: a) is not homogeneous across the mobility programs or geographical areas considered; and b) partially vanishes off when the students come back to their home university.

Keywords: *Academic performance; mobility programmes; international student mobility; grade point average; Economics degree; Business Administration degree.*

1. Introduction

Student mobility programmes in tertiary education supports the EU's strategic framework for education and training, promoting growth and equality, better job opportunities and cooperation among countries. The number of university students taking part in mobility programmes has risen dramatically over the last decades. Its benefits may range from personal growth to professional development: it enhances students' foreign language and intercultural competence, their self-confidence and their future employability prospects.

The potential benefits of a mobility programme cannot be underrated; however, to prevent students from using it as "sponsored vacations" (Juva & Lesjak, 2011) and assess its effectiveness and usefulness, the academic performance of mobility students should be measured and evaluated; nevertheless, this specific field of research has not received much attention. Many studies analyze the effects of mobility programmes [Maiworm & Teichler 2002; Williams 2005; Messer & Wolter 2007; Crossman & Clarke 2010; Wiers-Jenssen 2011; or Di Pietro 2013, amongst others], but these studies almost rely entirely on students' self-assessment of their stay abroad and their probability of employability in a foreign country without analysing the influence of the mobility experience on the students' academic performance. The aim of this paper is to fill this gap in the literature: to the knowledge of the authors, besides the work of Sanz & Roldan (2005), Meya & Sutheim (2014) and Pérez-Vázquez *et al.*, (2014), this is one of the first attempts to assess the effects of the mobility stay on the students' academic performance. Specifically, we address two questions:

- a) Do the students significantly improve their grades *during* their mobility stay? If so, which factors are behind that improvement?
- b) Do the students significantly improve their grades *after* their mobility stay? If so, which factors are behind that improvement?

An extensive dataset of students from the degrees of Economics and Business Administration (BA) at the University of Valencia (UV) has been used, ranging from the year 2001-02 to 2013-14, a larger sample than the ones employed in the aforementioned analogous studies.¹

This paper is structured as follows. After the introduction, section two describes the dataset and shows some summary statistics. The econometric analysis is carried out in section

¹ The authors wish to thank Dr. José Manuel Pastor (Dean of the Faculty of Economics) and Dr. Guillermo Palao (Vice Chancellor of Internationalization and Cooperation) for their involvement and assistance in obtaining the data. They also wish to thank Mr Vicent Girbés and Mrs Elena Barea for their help in the management process thereof.

three. Section four closes the paper indicating the main conclusions obtained from the results found.

2. Data set and preliminary results

The original sample is broad in scope and time, as it covers thirteen academic years (from 2001-02 to 2013-14). The database includes anonymous information about 15,333 students. Table 1 contains part of the available information per student used in this paper, indicating original data (Panel A) and new variables created from the original database (Panel B)².

The quantity and quality of the data sample for each student is quite heterogeneous. Since we need to measure the students' GPAs at different stages of their academic life, we have screened the data, applying several filters. The aim is to work with a sample rich enough in terms of data by individual, and homogeneous enough in terms of type of individuals to obtain sufficiently robust results. This selection procedure has led to restrict our sample to a figure of 6,387 students. Table 2 shows the main features of the sample used.

The most striking result is the difference between the average GPA for mobility and non-mobility students during their university studies. On average, there are 0.42 points of difference between their respective GPAs [6.82 vs 6.40]. However, some questions about this result can be raised, such as: To which extent this difference is statistically significant? Does it come from the fact that the best students are the ones who join academic mobility programmes? Or does the mobility period help to improve their GPA? ³ These are the questions addressed in the paper.

² Some of these variables have been created from the academic record of each student i (i.e., a list with all the subjects passed, plus the corresponding grade points and the dates when they were obtained). The global figure of academic records is 772,114; i.e. on average, the database contains around 50 academic records per student. For the sake of space, only the variables used in this paper have been included in the table.

³ Notice that their GPAs' difference when they did join the UV was 0.41 points greater on average [6.88 vs 6.47], so it is practically the same than the one existent when they finish their studies at the university. In this sense, Meya & Suntheim (2014) find that the final university grade is 0.2 grades better for those who count the grades obtained at the foreign university towards their degree in contrast to those who do not transfer any grades.

Table 1: Variables used in the analysis

Panel A: Original data in the sample

Notation	Description of the variable
$Gender_i$	Gender of the student i (1: male; 0: female);
FS_i (MS_i)	Level of academic studies of the student i 's father (mother);
FE_i (ME_i)	Economic status of the student i 's father (mother);
$Degree_i$	Degree of the student i ; (1: Economics; 0: BA);
$Dest_Univ_i$	University of mobility destination of the student i ;
GPA_0_i	Grade Point Average (GPA, hereafter) of student i to access to the UV;

Panel B: Additional variables created from original database

GPA_UV_i	GPA at the University of Valencia obtained by the student i ;
GPA_b_i	GPA obtained by the student i at the UV <i>before</i> his/her mobility period;
GPA_d_i	GPA obtained by the student i at the host university <i>during</i> his/her mobility period;
GPA_a_i	GPA obtained by the student i at the UV <i>after</i> his/her mobility period;
GPA_Univ_i	GPA at the university obtained by the student i ; ⁴
Mob_i	Mobility student (1: yes; 0: no).
$Geog_zone_i$	Geographical area of mobility;
UF_i (UM_i)	Unemployed father (mother) (1: yes; 0: no)

⁴ For non-mobility students $GPA_Univ_i = GPA_UV_i$ whereas for mobility students GPA_Univ_i is a weighted average of GPA_UV_i and GPA_d_i ; i.e., a weighted average of the GPA obtained at the UV and the GPA obtained at the host university. Note also that for mobility students GPA_UV_i is just a weighted average of GPA_b_i and GPA_a_i .

Table 2 Basic features of the final sample (6,387 students)

	Mobility students (N =1,333)				Non mobility students (N=5,054)			
% Women	50.41%				50.17%			
% BA degree	65.79%				52.63%			
	Business Adm.		Economics		Business Adm.		Economics	
	Females	Males	Females	Males	Females	Males	Females	Males
Average GPA ₀	7.12	6.84	6.84	6.55	6.78	6.53	6.35	6.16
	6.88				6.47			
Average GPA _{Univ_i}	6.94	6.80	6.76	6.65	6.53	6.35	6.42	6.28
	6.82				6.40			

3. Factors affecting the academic performance

Our goal is to detect whether the fact of joining an academic mobility programme has a direct effect on the student performance. To do so, we carry out a regression analysis. Specifically, the model to be estimated is specified in [Eq.1].⁵

$$GPA_{Univ_i} = \beta_0 + \beta_1 \cdot GPA_{0_i} + \beta_2 \cdot Degree_i + \beta_3 \cdot Gender_i + \beta_4 \cdot FS_i + \beta_5 \cdot MS_i + \beta_6 \cdot UF_i + \beta_7 \cdot UM_i + \beta_8 \cdot Mob_i + \varepsilon_i \quad [Eq.1]$$

where ε_i is an stochastic term distributed $N(\mathbf{0}, \sigma_\varepsilon^2)$

The results obtained (see Table 3) seem to indicate that both the GPA when joining the UV and the participation in a mobility programme play a direct and leading role in the explanation of the GPA obtained by the student at the university. Thus, not surprisingly, the better the performance before entering the UV, the higher the GPA at the university; but also the fact of spending part of their university life in a host university contributes to enhance their GPA. Both variables are statistically significant at 99%. Interestingly, it also seems that other factors such as the gender of the student and, to a lesser extent, the degree studied and the academic level of the student’s mother can contribute to explain the student’s GPA. This finding is in line with previous literature [see Garbanzo (2007) or Parveen & Alam (2008)].

⁵ Recall that the endogenous variable in Eq. 1, GPA_{Univ_i} for a non-mobility student is just the GPA obtained at the UV whereas that for a mobility student is a weighted average of the GPA obtained at the UV *before* and *after* the mobility period and the GPA obtained at the host university.

To gain some insight on the effects of mobility on students' academic performance, Table 4 shows the averages of the students' GPA at three different stages: before (*GPA_b*), during (*GPA_d*), and after (*GPA_a*) their mobility period. The results indicate that women do better than men in all stages of the university years considered and BA students have a slightly better academic performance than their Economics counterparts do. More interestingly for our purposes, it can be seen that *for the four groups of students considered* -after a decrease in their GPA compared to the one with which they accessed the university ($GPA_b < GPA_0$)- the mobility period contributes to an improvement in their academic performance ($GPA_d > GPA_b$). This upgrading is especially relevant for BA students, since near 0.7 points (out of 10) of improvement are obtained.

Table 3: Factors affecting *GPA_Univ*

Variable	Coefficient value	Std. Error	t value
<i>Intercept</i>	3.4874 ^a	0.0949	36.744
<i>GPA_0</i>	0.4371 ^a	0.0127	34.326
<i>Degree: Economics</i>	0.0495 ^c	0.0218	2.274
<i>Gender: Male</i>	-0.0549 ^b	0.0213	-2.583
<i>FS</i>	-0.0145	0.0089	-1.629
<i>MS</i>	0.0191 ^c	0.0097	1.971
<i>UF</i>	0.0383	0.0264	1.449
<i>UM</i>	-0.0238	0.0242	-0.983
<i>Mob</i>	0.3185 ^a	0.0253	12.601
R ² : 0.345		F-statistic : 220.4	

Note: superscripts a, b and c imply statistical significance at 99.9%, 99%, and 95% levels, respectively.

Table 4: Academic performance throughout different academic stages

Degree	Gender	Students	Average academic performance			
			<i>GPA_0</i>	<i>GPA_b</i>	<i>GPA_d</i>	<i>GPA_a</i>
BA	All	877	6.99	6.60	7.30	6.88
	Females	468	7.12	6.67	7.35	6.94
	Males	409	6.83	6.53	7.24	6.82
Economics	All	456	6.68	6.55	6.96	6.72
	Females	204	6.84	6.62	7.00	6.82
	Males	252	6.55	6.49	6.93	6.64
Total students		1,333	6.88	6.58	7.18	6.83

Source: own calculations from data provided by the University of Valencia

Possible explanations for the improvement may be due to either a less strict grading system at the host university and/or the student's own maturity. Therefore, it is relevant to check whether the improvement is maintained or not when the students come back to their home university. Figures presented in Table 4 indicate that, although the upgrading is not completely maintained ($GPA_a < GPA_d$), there is an effect that contributes to slightly increase their GPAs with respect to the ones before joining the host university ($GPA_a > GPA_b$). These results are consistently analogous for the four clusters of students considered.

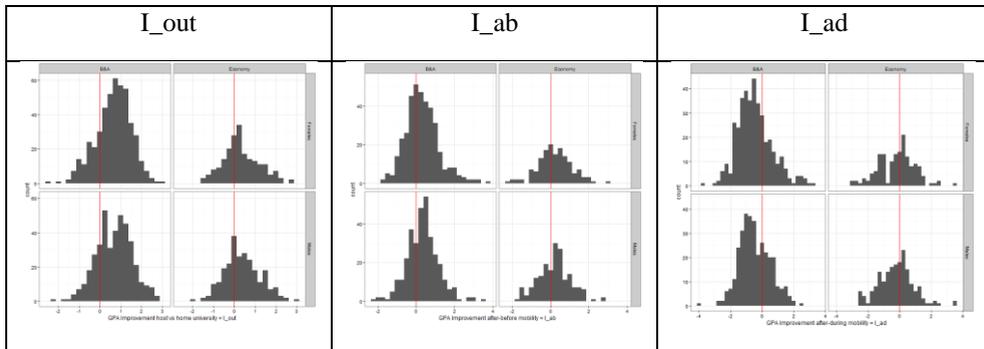
Both the figures in Table 4 and the results obtained from the estimation of Eq.1 confirm the influence of the mobility period on the students' academic performance. To delve further into this issue, we have created the following three variables, which indicate a GPA variation:

- $I_{out_i} = GPA_{d_i} - GPA_{UV_i}$;
- $I_{ab_i} = GPA_{a_i} - GPA_{b_i}$;
- $I_{ad_i} = GPA_{a_i} - GPA_{d_i}$;

The variable I_{out} can be used as a proxy to measure the improvement of the students' grades during their mobility period –question a) in section 1– whereas the other two variables can be used as proxies to measure the academic improvement after coming back from their mobility period –question b) in section 1– with respect to either their previous academic performance at the UV (I_{ab}) or the host university (I_{ad}). In our opinion, I_{ab} constitutes the variable that better helps to measure the contribution of the mobility period to the improvement of the academic performance of the student. In turn, I_{ad} helps to interpret and modulate the results obtained with I_{ab} , since it checks how permanent the

mobility benefits are (in case there are any) or if they vanish when students come back to their home university.

Graph 1 shows the histograms of the three aforementioned variables whereas Table 5 shows their descriptive statistics and also the percentage of students who improve their performance (i.e., percentage of cases in which the GPA increment is positive).



Source: own calculations from data provided by the University of Valencia. Each of the figures has four panels; top panels refer to the female students and left panels refer to the BA students.

Graph 1: Histograms of the variables indicating GPA variation

Table 5: Descriptive statistics for the three endogenous variables

Variable	Mean	Median	St. Dev.	% cases the variable takes positive values	Student's t-test statistic
I_{out_i}	0.57	0.59	0.86	74.57%	34.442 ^a
I_{ab_i}	0.29	0.28	0.85	64.05%	7.058 ^a
I_{ad_i}	-0.36	-0.43	1.09	35.95%	-10.014 ^a

Source: own calculations from data provided by the University of Valencia. Note: superscripts a, b and c denote statistical significance at 99.9%, 99% and 95% levels, respectively.

Both Graph 1 and Table 5 seem to suggest that for a typical student, the mobility period contributes to increase her/his GPA but when s/he comes back to her home university, part of the increment disappears. In this sense, the fourth column of Table 5 is especially enlightening: (i) almost 75% of the students have better marks at the host university than at the UV; (ii) in many cases there is a setback in their grades at the UV when they come back from their mobility period; and (iii), almost two thirds of the students (64.05%) improve their GPA when only the periods after and before the mobility are considered, using the same grading system at the UV. The latter is the most striking result in our research.

To check if the variations of the GPAs at the diverse stages are statistically significant a t-test has been used, in which the test statistic follows a Student's t-distribution under the null hypothesis that two sets of data are not significantly different from each other. Table 5 shows that in all cases this null hypothesis is clearly rejected with a significance level of 99.9% so indicating that the GPAs at different stages are statistically different. Our results are totally in line with Sanz & Roldan (2005) who show that Socrates/Erasmus students' results obtained during the mobility period are significantly higher than the ones they had previously, and with Meya & Suntheim (2014) who conclude that a temporary study-related visit abroad significantly improves the final university grade.

4. Conclusions

This paper empirically analyses the effect that the mobility period has on the academic performance of university students who enjoy a mobility grant. To do so, using the academic records of each student we compute his/her GPA at three different stages of his/her university studies (before, during and after the mobility period) and compare them. The data employed for the empirical study comes from a large sample of students from the Economics and Business Administration degrees of the Faculty of Economics (University of Valencia) during thirteen academic years (from 2001-02 to 2013-14).

The main result of our study indicates that the mobility period significantly contributes to improve the academic performance of the students. On average, the typical GPA per student during the mobility period is consistently higher than his/her prior GPA at the University of Valencia. This result is valid for all groups of students, regardless of the gender or the degree considered. More importantly, even though the improvement is not totally maintained when the students come back to their home university after the mobility period –it partially vanishes off–, at least there exists an effect that contributes to increase their GPAs with respect to the ones before joining the host university. Therefore, the answer to the two questions pointed out in the introduction (Do the students improve their grades *during / after* their mobility stay?) is affirmative in both cases. Our results are totally in line with previous literature.

Our findings have clear education policy implications; besides the commonly accepted benefits of mobility programmes at different levels, our research highlights the academic side of the exchanges, stressing the need to maintain the scheme of mobility grants for university students since their academic grades are positively affected by the mobility experience.

References

- Crossman, J.E., & Clarke, M. (2010). International experience and graduate employability: stakeholder perceptions on the connection. *Higher Education*, 59(5), 599–613.
- Di Pietro, G. (2013). Do Study Abroad Programs Enhance the Employability of Graduates? *Discussion Paper No. 7675*, Bonn: Institute for the Study of Labour.
- Garbanzo, G. (2007). Factores asociados al rendimiento académico en estudiantes universitarios, una reflexión desde la calidad de la educación superior pública. *Educación*, 31(1), Universidad de Costa Rica, 43-63.
- Juva, E., & Lesjak, M. (2011). Erasmus Exchange Program: Opportunity for professional growth or sponsored vacations? *Journal of Hospitality & Tourism Education*, 23, 23-29.
- Maiworm, F., & Teichler, U. (2002). The Student's Experience, in: U. Teichler (Ed) *ERASMUS in the SOCRATES Programme* (Bonn, Lemmens), 83-116.
- Messer, D., & Wolter, S.C. (2007). Are Student Exchange Programmes Worth it? *Higher Education* 54, 647-663.
- Meya, J., & Sutheim, K. (2014). The second dividend of studying abroad: The impact of international student mobility on academic performance. *Discussion papers, Center for European Governance and Economic Development Research*, No. 215.
- Parveen, A., & Alam, M. (2008). Does Mothers' Education Influence Children's Personality Factors and Academic Achievement? *Bulletin of Education and Research*, 30(2), 1-6.
- Pérez-Vázquez, P., González-Baixauli, C., & Montañés-Brunet, E. (2014). Do Erasmus Students Get Academic Paybacks from Their Stay Abroad? An Empirical Analysis of Students' Academic Performance. *Proceedings of INTED14. 8th International Technology, Education and Development Conference*. Valencia (Spain), 2680-2687.
- Sanz, I., & Roldan, I. (2005). Academic Performance of the English Department Students at the University of Granada and its relation with the Socrates/Erasmus Mobility (1997/2000). *International Journal of Learning*, vol. 12, num. 9, 215-222.
- Wiers-Jenssen, J. (2011). Background and Employability of Mobile vs.Non-Mobile Students, *Tertiary Education and Management*, 17(2), 79-100.
- Williams, T. R. (2005). Exploring the Impact of Study Abroad on Students' Intercultural Communication Skills: Adaptability and Sensitivity. *Journal of Studies in International Education*, 9 (4), 356-371.

Social class and university graduates' overqualification: testing two mediated relationships

González-Romá, Vicente^{a,b}; Hernández, Ana^{a,b}; Gamboa, Juan P.^b and Tomás, Inés^a
^aIDOCAL, University of València, Spain, ^bOPAL, Universitat de València, Spain

Abstract

University graduates' overqualification (i.e., having more education, qualification and/or skills than one's job requires) has important negative consequences. However, much less is known about its antecedents. This represents an important gap in the literature. In order to fill this gap, the goal of this study is to test a mediational model on the antecedents of university graduates' overqualification (OQ). We posit that social class is negatively related to OQ through two mediational links: a) via social capital, and b) via social capital and tolerance towards OQ. The results obtained in a sample of 144 university graduates provided support for the second mediational link, so that social class was positively related to social capital, which in turn was negatively related to tolerance towards OQ, which in turn was positively related to graduates' OQ. The results obtained uncover some of the antecedents of OQ and suggest that increasing social capital may be a way to decrease graduates' OQ.

Keywords: *overqualification; social class; social capital; tolerance towards overqualification*

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1. Introduction

Overqualification (OQ) (i.e., having more education, qualification and/or skills than one's job requires; Maynard et al., 2006) has negative effects for individuals, organizations and society (e.g. Bolino & Feldman, 2002; García-Montalvo & Peiró, 2009; Maynard et al., 2006). For university graduates, OQ is a special concern because of the scarcity of qualified jobs in a labor market that has not evolved fast enough to meet graduates' job needs in times of economic crisis (CIPD, 2015; Vedder et al., 2013). Thus, in some countries the percentage of overqualified graduates is high. For instance, the Growth and Development Foundation (2014) reported that in Spain 33% of young graduates were overqualified.

Research on OQ has focused on its consequences. OQ is negatively related to organizational commitment, wellbeing and job and career satisfaction, and positively related to job stress, counterproductive work behaviors, and turnover intentions (see for example Johnson & Johnson, 1992, 1996; Liu et al., 2015; Luksyte et al., 2011; Maynard et al., 2006; McKee-Ryan & Harvey, 2011). However, much less is known about the antecedents. This represents an important gap in the literature that needs to be addressed for both theoretical and practical reasons. From a theoretical perspective, research aimed at identifying antecedents of OQ can contribute to extending its nomological network and uncovering the mechanisms that link hypothetical antecedents and OQ. From a practical perspective, the identification of OQ determinants can be used to design strategies for preventing OQ.

Previous studies have suggested that social class is related to graduates' OQ (Tomlinson, 2012), but the specific mechanism that links both variables is not clear. Therefore, the goal of this study is to test a mediational model on the antecedents of OQ. We posit that social class is negatively related to OQ via social capital and tolerance towards OQ. We focus on these variables because previous (different) studies have suggested that social class is related to social capital (Pichler & Wallace, 2009) and social capital is related to OQ (González-Romá et al., 2018) and tolerance towards OQ (Gamboa et al., 2016)

1.1. Hypotheses

We posit that the negative influence of graduates' social class on OQ is firstly transmitted via social capital (i.e., access to networks that provide individuals with interpersonal relationships that can offer career-related information and the possibility of identifying and fulfilling career opportunities; Seibert, Kraimer, & Liden, 2001). Graduates belonging to higher classes have more resources to access formal social networks (e.g., clubs, voluntary and professional associations). Once in these formal social networks, they can establish informal contacts with other people linked to different network members. As a result, those graduates in upper classes will have more social capital (Pichler & Wallace, 2009). Social capital will provide graduates with career-related information (e.g., job offers) and social

of 1,087 students responded to the survey at T1, and 503 of them also responded at T2. After discarding graduates who were unemployed at T2 or had obtained their jobs before graduation, 158 participants were kept. Finally, we discarded 14 participants that showed careless response patterns to two out of three instructed response items presented at each time. Thus, the final study sample was made of 144 graduates. Among them, 61.8% completed a bachelor degree and 38.2% a Master degree. The average age was 24.9 (SD = 5.04) and 72.2% were female. Most of them (53.5%) completed their degrees in social sciences, followed by health sciences (29.2%), humanities (11.1%), natural sciences and mathematics (4.8%), and engineering (1.4%).

2.2. Measures

Social class, social capital, and tolerance towards OQ were measured at T1. OQ was measured at T2. Specifically, *social class* was measured by asking students to choose among five possible ranks: 1 (lower) to 5 (upper). *Social capital* was measured by means of a 4-item scale based on González-Romá et al. (2018) (e.g., “I have an extensive network of friends who will help me to find job opportunities”). Items were responded by means of a 6-point Likert scale (1. Totally Disagree, 6. Totally Agree). Cronbach’s alpha was .87. *Tolerance towards overqualification* was measured by means of a 3-item scale (Gamboa et al., 2016) (e.g. “I would be willing to accept a job that requires less education than I have”). Items were responded by means of a 6-point Likert (1. Totally Disagree, 6. Totally Agree). Cronbach’s alpha was .95. Finally, *overqualification* after graduation was measured by means of Maynard et al.’s (2006) 9-item scale (e.g., “My job requires less education than I have”). Items were responded by means of a 6-point Likert (1. Totally Disagree, 6. Totally Agree). Cronbach’s alpha was .95.

2.3. Analysis

The mediating hypotheses involved in our model were tested using multiple regression by means of the PROCESS macro for SPSS (Hayes, 2015). Specifically, PROCESS estimated three regression models: 1) social capital was regressed on social class; 2) tolerance towards overqualification was regressed on social capital controlling for social class; and 3) overqualification was regressed on tolerance towards overqualification, controlling for both social class and social capital. In the last case, because there is evidence that the degree field, level of studies, gender and age are related to overqualification (Nunez & Livanos, 2010; Prause & Dooley, 2011; Weststar, 2011), we controlled for these variables. Following scholars’ recommendations (e.g., Hayes, 2009; MacKinnon, 2008) the significance of the two hypothesized indirect effects [(Social class T1 → Social capital T1 → OQ T2) and (Social class T1 → Social capital T1 → Tolerance towards OQ T1 → OQ T2)] were tested by means of bootstrapping. Specifically, 10,000 samples were bootstrapped.

Table 1. Descriptive and correlations among variables in the research model.

	Mean	SD	Correlations			
			1	2	3	4
Social Class (1)	2.67	.75	--			
Social Capital (2)	2.70	1.14	.16*	(.87)		
Tolerance towards OQ (3)	4.16	1.26	-.14*	-.30**	(.95)	
OQ (4)	3.73	1.50	-.14*	-.24**	.26**	(.95)

Note. OQ: Overqualification. * $p < .05$; ** $p < .01$ (one-tailed tests). Scale reliabilities are shown in the diagonal

Table 2. Regression Analysis.

Equation	B	SE	R ²
1. Social capital (T1)			.15#
Social class (T1)	.24*	.12	
2. Tolerance Towards OQ (T1)			.31**
Social Class (T1)	-.17	.13	
Social Capital (T1)	-.31**	.09	
3. Overqualification (T2)			.50**
Age (T1)	-.06**	.03	
Health Sciences (T1)	-1.05	.40	
Social Class (T1)	-.20	.16	
Social Capital (T1)	-.13	.10	
Tolerance towards OQ (T1)	.19**	.09	

Note. Regression coefficients are unstandardized; SE: Standard Error; # $p < .10$; * $p < .05$; ** $p < .01$ (one-tailed tests for regression coefficients). For the sake of clarity, only control variables that show significant effects are included

3. Results

Correlational analysis showed that social class was negatively related to overqualification after graduation ($r = -.14$; $p < .05$) (see Table 1).

Regression analysis supported only one of the mediation chains hypothesized: the one proposed in Hypothesis 2 (Social class T1 → Social capital T1 → Tolerance towards OQ T1 → OQ T2) (see Table 2). Specifically, social class was positively related to social capital

($B = .24$; $p < .05$) which, in turn, was negatively related to tolerance towards OQ ($B = -.31$; $p < .01$), which, in turn, was negatively related to OQ after graduation ($B = .19$; $p < .05$). The indirect effect of social class on OQ via social capital and tolerance towards OQ (i.e. the product of the B coefficients involved in the mediating path) was .014. The bootstrapped 90% confidence interval ranged from -.049 to -.002. Thus, because this interval did not include zero, we concluded that the indirect effect was statistically significant.

Regarding Hypothesis 1, even if the bivariate relationship between social capital and OQ after graduation was negative and statistically significant ($r = -.24$; $p < .01$) (see Table 1), when we regressed OQ on social capital, after partialing out the effects of the control variables as well the other antecedents of OQ, the relationship between OQ and social capital was not significant ($B = -.17$, $p > .05$) (see Table 2). The corresponding indirect effect was -.031, which was not statistically significant. Specifically, the 90% Confidence Interval ranged from -.108 to .002.

4. Discussion

The results obtained in the present study supported one of the two mediating mechanisms proposed to explain the negative relationship between social class and OQ. This has important theoretical and practical implications that we discuss below.

4.1. Theoretical implications

We have uncovered one of the mechanisms by which social class is negatively related to university graduates' OQ. According to our results, social class is positively related to social capital, which in turn is negatively related to tolerance towards OQ, which in turn is positively related to OQ. Our findings suggest that graduates in the lower social classes have a lower access to formal and informal social networks (Pichler & Wallace, 2009), which results in a lower social capital. Because these graduates are aware of the limitation this represents in order to get a fitted job, they will be more tolerant towards OQ, which will translate into a trend to obtain jobs below their qualifications. These findings contribute to improving our understanding about the antecedents of graduates' OQ and the mechanisms linking social class and OQ, expanding its nomological network. Our study also contributes to filling a gap in the literature about the antecedents of OQ.

4.2. Practical implications

Our results suggest that increasing university graduates' social capital may be a way to decrease graduates' overqualification. In order to strengthen social capital, a number of strategies can be implemented. Graduates can attend professional meetings organized by professional and industry associations, join professional networks on the Internet, and

inform their contacts (friends, acquaintances, and relatives) about their career goals (González-Romá et al., 2018). In addition, universities can organize meetings between students and recent graduates, on the one hand, and professional associations, on the other, as a way to facilitate contacts between the former and active professionals (González-Romá et al., 2018). Universities could also organize employment fairs in which firms go to university campuses to meet students and graduates and offer their job vacancies. These events represent a good opportunity to establish contacts with firms willing to hire university graduates.

4.3. Limitations

The present study has a number of limitations that we have to bear in mind when interpreting the results. First, all the variables were measured by self-reported scales and the data were provided by a single source (graduates). This might have inflated the observed relationships due to common-method variance. Second, although we collected data at two time points, the predictor and the two mediators were measured at Time 1. It would have been better to measure all these variables at different time points considering their causal order. Finally, the participants are not a representative sample, which limits the generalizability of our findings.

4.4. Conclusion

Despite these limitations, our study helps uncover one of the mechanisms explaining why social class is negatively related to university graduates' OQ.

References

- Bolino, M. C., & Feldman, D. C. (2000). The antecedents and consequences of underemployment among expatriates. *Journal of Organizational Behavior*, 21(8), 889-911.
- CIPD (2015). *Unlocking workplace skills: What is the role of employers?* Policy Report. London. Retrieved from <https://www.cipd.co.uk/knowledge/work/skills/workforce-skills-report>
- Gamboa, J.P.; Hernández, A. & González-Romá, V. (2016) *Higher education orientation and students' attitudes towards entering the labour market: the mediator role of employability* Paper presented at the 31st International Congress of Psychology (ICP2016). Yokohama, Japan.
- García-Montalvo, J. & Peiró, J. M. (2009). *Análisis de la sobrecualificación y la flexibilidad laboral [Overqualification and job flexibility]*. Valencia, Spain: IVIE
- González-Romá, V., Gamboa, J.P., & Peiró, J.M. (2018). University Graduates' Employability, Employment Status, and Job Quality. *Journal of Career Development*, Advance online publication. <https://doi.org/10.1177/0894845316671607>.

- Hayes, A. F. (2009) Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs* 76 (4): 408-420.
- Hayes, A. F. (2015) An Index and Test of Linear Moderated Mediation. *Multivariate Behavioral Research* 50 (1): 1-22.
- Johnson, G. J., & Johnson, W. R. (1992). Subjective underemployment and psychosocial stress: The role of perceived social and supervisor support. *Journal of Social Psychology*, 132(1), 11-21.
- Johnson, G. J., & Johnson, W. R. (1996). Perceived overqualification and psychological well-being. *Journal of Social Psychology*, 136(4), 435-445.
- Judge, T. A., & Kammeyer-Mueller, J. D. (2012). Job attitudes. *Annual Review of Psychology*, 63, 341-367.
- Liu, S., Luksyte, A., Zhou, L., Shi, J., & Wang, M. (2015). Overqualification and counterproductive work behaviors: Examining a moderated mediation model. *Journal of Organizational Behavior*, 36(2), 250-271.
- Luksyte, A., Spitzmueller, C., & Maynard, D. C. (2011). Why do overqualified incumbents deviate? Examining multiple mediators. *Journal of Occupational Health Psychology*, 16(3), 279-296
- MacKinnon, D.P. (2008). *Introduction to Statistical Mediation Analysis*. New York: Taylor & Frances Group.
- McKee-Ryan, F., & Harvey, J. (2011). "I Have a Job, But...": A Review of Underemployment. *Journal of Management*, 37(4), 962-996.
- Maynard, D. C., Joseph, T. A. & Maynard, A. M. (2006), Underemployment, job attitudes, and turnover intentions. *Journal of Organizational Behavior*, 27(4), 509–536.
- Nunez, I., & Livanos, I. (2010). Higher education and unemployment in Europe: an analysis of the academic subject and national effects. *Higher Education*, 59(4), 475-487.
- Pichler, F., & Wallace, C. (2008). Social capital and social class in Europe: The role of social networks in social stratification. *European Sociological Review*, 25, 319-332.
- Prause, J., & Dooley, D. (2011). Youth Underemployment. In D. Maynard, & D. Feldman (Eds.), *Underemployment: psychological, economic, and social challenges* (pp. 59-80). Springer: New York, NY.
- Seibert, S., Kraimer, M., & Liden, R. (2001). A Social Capital Theory of Career Success. *The Academy of Management Journal*, 44(2), 219-237.
- Vedder, R., Denhart, Ch., & Robe, J. (2013). *Why Are Recent College Graduates Underemployed? University Enrollments and Labor-Market Realities*. Washington, DC: Center for College Affordability and Productivity.
- Weststar, J. (2011). A Review of Women's Experiences of Three Dimensions of Underemployment. In D. Maynard, & D. Feldman (Eds.), *Underemployment: psychological, economic, and social challenges* (pp. 105-125) Springer: New York, NY.

Web visibility of Romanian universities – an analysis based on website analytics and social media data

Mirică, Andreea ^a; Toma, Iulia Elena ^b

^aDepartment of Statistics and Econometrics, Bucharest University of Economic Studies, Romania, ^aDepartment of Statistics and Econometrics, Bucharest University of Economic Studies, Romania.

Abstract

There are many aspects that influence the importance of a university. Among these, web visibility is taking advantage of available technology, focusing on the benefits of internet and social media. This paper provides an analysis of the Romanian public and private universities websites, using alexa.com, a tool for website traffic analysis. Moreover, the official social media accounts of universities (Facebook, Twitter, Google+, Flickr, YouTube and Instagram) were analysed, collecting several data such as: the number of likes and followers, the number of subscribers and the number of posts. The analysis was performed using ANOVA and Nonparametric Test for the presence via websites and Spearman and Pearson correlation to assess the correlation between social media and website traffic. In general, public universities from Romania have more visibility and a higher number of links to their websites compared to private ones. Based on the fact that Facebook and site content are often related, it should be noted that activity on Facebook may improve website rankings for Romanian universities.

Keywords: *web visibility; social media; university; ANOVA; correlation.*

1. Introduction

Thelwall (2002) argues that analysing the impact a university website produces is equally important as analysing the impact of scientific research through citations, although the impact is not the same as stated by Jeyshankar and Ramesh Babu (2009). Moreover, Thelwall and Harries (2003) conclude that there is a strong connection between web presence of an university and research quality. Also, McNutt and Marchildon (2009) show that web presence is a crucial factor in increasing internationalisation. Furthermore, according to Kretschmer and Aguillo (2004), web visibility is essential in enhancing transnational collaborations in research.

In this context, this article aims to analyse the web visibility of Romanian universities from two perspectives: website traffic analytics and social media presence. The research is particularly important for university management in this country.

2. Data

A list of Romanian universities that are authorised for functioning or fully accredited is provided by The Romanian Agency for Quality Assurance in Higher Education at the following link <http://www.aracis.ro/en/eval-results/institutional-evaluations/> (accessed 30 January 2018). For each university the website was analysed using the facilities provided by alexa.com, one of the most powerful tools for website traffic analysis. It should be noted that alexa.com only measures traffic for domains (<https://support.alexa.com/hc/en-us/articles/200461930-Subdomains-Where-do-visitors-go> accessed 30 January 2018). Several indicators were collected, as follows: Global traffic rank; Traffic rank in country; Bounce rate; Daily Page views per Visitor; Daily Time on Site; The number of sites linking in; Percentage of visitors from Romania.

Next, for each university the official social media accounts were analysed: number of likes and number of followers (for Facebook); number of likes, number of followers and number of tweets (for Twitter); number of followers (for Google+ and Flickr respectively); number of subscribers (for YouTube); number of posts and number of followers (for Instagram). As one can observe professional networks such as LinkedIn or Research Gate were not included in the analysis. All data were collected on 5th January 2018.

3. Methods

In order to perform the analysis, certain records were first eliminated. Universities that do not have any social media account (5 cases) were not included as the influence of social media on website traffic can't be measured. Universities who do not have a website (3

cases) could not be included either. Universities whose website domain were not registered in Romania (4 cases) were not included as traffic rank in Romania can't be calculated. In the end, 82 universities were analysed.

First, web presence via website and social media presence of Romanian universities are analysed separately, using ANOVA for interval-ratio indicators with enough cases and Nonparametric Test for Median for ordinal indicators. Second, an analysis on how social media is correlated to website traffic will be conducted. For this reason, correlation coefficients between variables describing website traffic and social media activity will be used.

4. Results

Table 1 shows the number of universities reporting for each social media indicator, out of 55 public universities and 27 private universities. As one can observe, almost all the universities have reported Facebook activity while only 34.1% have reported Twitter activity in terms of tweets and followers. It should be noted that only 12.2% have reported likes on Twitter. Moreover, the results are similar for public and private universities.

Table 1. Number of universities reporting for each social media indicator

	Total	Public	Private	As % of total	As % of public	As % of private
Twitter_tweets	28	19	9	34.1	34.5	33.3
Twitter_followers	28	19	9	34.1	34.5	33.3
Twitter_likes	10	7	3	12.2	12.7	11.1
Facebook_likes	80	55	25	97.6	100.0	92.6
Facebook_followers	80	55	25	97.6	100.0	92.6
Youtube_subscribers	34	20	14	41.5	36.4	51.9
Google_followers	6	3	3	7.3	5.5	11.1
Flick_followers	1	0	1	1.2	0.0	3.7
Instagram_posts	2	2	0	2.4	3.6	0.0
Instagram_followeres	2	2	0	2.4	3.6	0.0

Source: designed by the authors, based on collected data

Next, the average values for indicators with regard to social media presence as well as results for the ANOVA procedure by type of university, where applicable are presented (table 2). As one can observe, the Levene Test for homogeneity shows that the ANOVA procedure can be applied successfully. Yet, the results following this procedure show no statistical difference between the means.

Table 2. Average values for indicators with regard to social media presence

	All universities	Public universities	Private universities
Twitter_tweets	1171	1044	1437
Twitter_followers	614	583	679
Twitter_likes	202	285	9
Facebook_likes	11984	13414	8838
Facebook_followers	11893	13320	8752
Youtube_subscribers	149	155	140
Google_followers	67	116	18
Flick_followers	3	Not applicable	3
Instagram_posts	91	91	Not applicable
Instagram_followeres	1278	1278	Not applicable

Source: designed by the authors, based on collected data

Table 3 presents the Average values for indicators with regard to web visibility as well as results for the ANOVA procedure by type of university. As one can observe, only *Percentage_visitors_from_Romania*, *Bounce_rate* and *Daily_time_on_site* meet the homogeneity condition for applying the ANOVA procedure. Out of these, the only statistical difference between the means by type of university is observed for *Bounce_rate*, confirming that public universities have a lower bounce rate compared to private ones. For *Daily_pages_per_visitor* and *Sites_linking_in* the Welch test is interpreted. A statistical difference between the means by type of university is observed for *Sites_linking_in*, confirming that public universities have a higher number of links to their websites compared to private ones.

Table 3. Average values for indicators with regard to web visibility

	All universities	Public universities	Private universities
Bounce_rate	0.59719737	0.570236	0.66781
Daily_pages_per_visitor	2.95134146	3.054727	2.740741
Daily_time_on_site	177.1125	188.9818	151
Sites_linking_in	390.740741	524.6296	122.963
Percentage_visitors_from_Romania	0.66485246	0.6525	0.736222

Source: designed by the authors, based on collected data

Table 4 shows the maximum, minimum and median values for Global Rank and Rank in the country as well as the results for the independent tests for median significance by type of university. As one can observe, there is a statistical difference between the medians by type of university for both variables. This confirms that public universities have more visibility both globally as well as in Romania compared to private ones.

Table 4. Maximum, minimum and median values for Global Rank and Rank in the country as well as the results for the independent tests for median significance.

		Total	Public	Private	Independent test for median significance	Independent test for median result
Max of Global_rank		12215686	7597903	12215686		
Max of Rank_Romania		55372	55372	47497		
Min of Global_rank		46134	46134	325714		
Min of Rank_Romania		464	464	3965		
Median of Global_rank		681371	492059	3646646	0.000	Reject the null hypothesis (The medians of Global_rank are the same across categories of Type_university (public, private))
Median of Rank_Romania		9181	8401	12476	0.026	Reject the null hypothesis

Source: designed by the authors, based on collected data

The next two tables analyse the correlation between certain indicators of website traffic and social media presence on Facebook and Twitter. Interpretations will be made according to Statstutor (2017). As one can observe, there is a weak statistically significant correlation between Daily Page views per Visitor and the number of likes and followers on Facebook respectively. Moreover a moderate correlation can be observed between the number of sites linking in and the number of likes and followers on Facebook respectively.

The results in Table 6 indicate a moderate negative correlation between global rank, rank in the country and the number of likes on Facebook and the number of followers on the same platform respectively. As Facebook and site content are often related, one can conclude that

activity on Facebook may improve website rankings for Romanian universities. This is not applicable to Twitter.

Table 5. Pearson correlation between certain indicators of website traffic and social media presence.

	Facebook number of likes	Facebook number of followers	Twitter number of followers	Twitter number of tweets
Bounce rate	-.225	-.227	.053	.065
Daily Page views per Visitor	.246*	.247*	.011	.089
Daily Time on Site	.191	.192	-.002	.101
The number of sites linking in	.572**	.569**	.125	.342
Percentage of visitors from Romania	.082	.083	-.115	-.073

**results significant at 1% level; *results significant at 5% level

Source: designed by the authors, based on collected data

Table 6. Spearman correlation between certain indicators of website traffic (global rank and rank in the country) and social media presence.

	Facebook number of likes	Facebook number of followers	Twitter number of followers	Twitter number of tweets
Global rank	-.591**	-.593**	-.284	-.206
Traffic rank in the country (Romania)	-.495**	-.496**	-.356	-.296

**results significant at 1% level

Source: designed by the authors, based on collected data

5. Conclusions

Alguillo (2009) stresses the importance of increasing the web audience in the case of universities and proposes several approaches: electronic journals, raw material publication,

information resulting from more informal activities, creating open access repositories. Our findings suggest that in the case of Romania, Facebook helps in increasing the web visibility of the universities. Therefore, we suggest creating such repositories and promoting them via Facebook.

The research is a good starting point for university managers in charge of designing communication strategies. Yet, the analysis should be extended to the website and social media content. This analysis should first address language. One interesting finding of Aminpour et al. (2009) who conclude that creating content in English can significantly improve web visibility. Also, our findings suggest that Twitter does not help in increasing web visibility of universities. This may be due to improper use of this social media channel, as Linvill et al. (2012) point out, for only one way communication.

References

- Aguillo, I. (2009). Measuring the institution's footprint in the web. *Library Hi Tech*, 27(4), 540-556.
- Aminpour, F., Kabiri, P., Otraj, Z., & Keshtkar, A. A. (2009). Webometric analysis of Iranian universities of medical sciences. *Scientometrics*, 80(1), 253-264.
- Jeyshankar, R., & Ramesh Babu, B. (2009). Websites of universities in Tamil Nadu: a webometric study. *Annals of library and information studies*, 56(2), 69-79.
- Kretschmer, H., & Aguillo, I. F. (2004). Visibility of collaboration on the Web. *Scientometrics*, 61(3), 405-426.
- Linvill, D. L., McGee, S. E., & Hicks, L. K. (2012). Colleges' and universities' use of Twitter: A content analysis. *Public Relations Review*, 38(4), 636-638.
- McNutt, K., & Marchildon, G. (2009). Think tanks and the web: Measuring visibility and influence. *Canadian Public Policy*, 35(2), 219-236.
- Romanian Agency for Quality Assurance in Higher Education. (2018). Retrieved January, 30, 2018, from <http://www.aracis.ro/en/eval-results/institutional-evaluations/>
- Statstutor. (2017). Retrieved February, 5, 2018, from <http://www.statstutor.ac.uk/resources/uploaded/spearmans.pdf>
- Thelwall, M. (2002). The top 100 linked-to pages on UK university web sites: high inlink counts are not usually associated with quality scholarly content. *Journal of Information Science*, 28(6), 483-491.
- Thelwall, M., & Harries, G. (2003). The connection between the research of a university and counts of links to its web pages: An investigation based upon a classification of the relationships of pages to the research of the host university. *Journal of the Association for Information Science and Technology*, 54(7), 594-602.

Cities for Learning – Gentlestudent The City as a Medium for Acquiring 21st Century Skills

Vanacker, Dries; Demedts, Lore and Van Puyenbroeck, Hilde

Office of Educational Development and Internationalisation, Artevelde University College,
Belgium.

Abstract

Students are inextricably linked to life in a city, where they face challenges during their study period and often take their first truly independent steps in life. The city is not only an important 'living' environment for students on their way to adulthood, but can also be considered as a dynamic learning centre where they can seize many learning opportunities. Various community service learning projects show that enrolling students in authentic community projects is not only enriching for the city, but for the professional development of students as well. Such projects promote in-depth learning, but also require a great deal of coordination and support from educational institutions and the professional field.

In the design study 'Cities for learning - Gentlestudent', we investigate how digital technology can connect the talents, ideas and knowledge of students with the needs of the community without direct intervention of the educational institution. Secondly, we explore how students can be encouraged to work more autonomously, starting from their own learning questions. Finally, we examine how we can valorise experiences from the informal curriculum in the formal curriculum and in function of lifelong learning by using microcredentials in the form of open badges.

Keywords: *Community Service Learning; Open Badges; Beacon Technology; 21st Century Skills; Cities for Learning; Lifelong Learning*

1. Introduction

Artevelde University College focuses on meaningful and in-depth learning and does this in constant dialogue with the students themselves. It believes in the growth potential of its students and wants to encourage them to act professionally, to think critically and to become the person in the world that they can and want to be. (Educational concept, 2015).

In order to provide future-oriented education to students, Artevelde University College defined five strategic Artevelde-wide learning outcomes (Demedts & Van Puyenbroeck, 2016): digital literacy, sustainability, global citizenship, entrepreneurship and research skills. These learning outcomes are linked to 21st-century skills which we believe every professional will need in the future.



Figure 1. Overview of the Artevelde-wide learning outcomes

Between 2016 and 2020, the generic learning outcomes will be permanently integrated in all curricula of Artevelde University College through learning pathways, learning objectives, educational practice and assessment. We have already observed that the risk of overloading the formal curriculums is never far away. With the introduction of a self-directed and self-regulated curriculum (Winne, 1995; Schunk & Zimmerman, 2008) we try to deal with this in a constructive and creative manner. Instead of offering all learning opportunities in a controlled manner, we place more emphasis on the personal initiative of the students. The emphasis is more on 'how students learn' than on 'what students learn'. For example, a student in the teacher training programme will, on his own initiative, develop an internship assignment with sustainable materials. In this way, he will not only work on didactic competences, but also on the competence of sustainable development.

2. Cities for Learning

A next step in this thinking process is to examine how students cannot only work on these generic learning outcomes within an educational context, but also in an informal setting, e.g. the city where they study.

There is no clear definition of the concept City for Learning or learning city. However, what different definitions do have in common with each other is that learning cities want to

make an effort to highlight innovation and learning in terms of the further development of the city. The term learning "(...)" covers both individual and institutional learning. Individual learning refers to the acquisition of knowledge, skills and understanding by individual people, whether formally or informally. It often refers to lifelong learning, not just initial schooling and training" (Larssen, 1999). In addition, UNESCO (2017) states that cities are "(...)" on the frontline of the battle for sustainable development. (...) They are also sites of continuous exchange of knowledge and ideas; places where people live, work and learn. As such, every city has the enormous potential to stimulate and support learning among their inhabitants in ways that can help tackle existing issues, strengthen social cohesion and solidarity, and transform the prospects of urban communities for the better". The city can thus be seen as an environment where formal and informal learning can contribute to the further development of the city. Because of the enormous potential offered by these authentic learning opportunities, it is therefore extremely important that such forms of learning are made possible to allow the city and its inhabitants to develop further in order to make an active contribution to society.

Students can find many learning opportunities within the dynamic context of the city, as a result of which the link with the concept of Community Service Learning (CSL) can be made. CSL is an experiential educational form that links academic learning content to a social commitment and which students then critically reflect on. CSL is therefore an added value for students, the city and the educational institution. Students learn to adopt a critical and problem-solving thinking attitude in an authentic context, the city and its residents find an answer to their needs, and the educational institution creates sustainable local networks. Nonetheless, there are also disadvantages, such as the large time investment for the coordination and supervision by the educational institution and the professional field. Moreover, the degree to which students are motivated for this type of project varies, especially if they are obliged to take on a commitment. Finally, these learning experiences are often also difficult to evaluate. The learning contexts differ so much that it is not always easy to determine whether a competence is acquired at beginner, intermediate or expert level.

3. Research questions

In the design study 'Cities for learning - Gentlestudent', we first want to study (1) how digital technology can connect the talents, ideas and knowledge of students with the needs of the community without direct intervention of the educational institution. Secondly, (2) we will explore how students can be encouraged to work more autonomously, starting from their own learning questions. Finally, (3) we want to examine how we can valorise

experiences from the informal curriculum in the formal curriculum and in function of lifelong learning by using microcredentials in the form of open badges.

4. Design study methodology

In the spring of 2017, the Office of Educational Development and Internationalisation of Artevelde University College started with the development of an internally funded educational innovation programme called Gentlestudent. The project consists of two phases. The first phase is the design phase consisting of five different work packages. The second phase is the pilot phase in which students from the above-mentioned departments will start working in Gentlestudent and during which we will conduct evidence-based research into the effectiveness of our approach.

4.1 Work package 1: Development of the stakeholder network

In order to use the city as a learning centre, an exploratory analysis was carried out with various stakeholders in the context of the development of Gentlestudent. Together with the City of Ghent, library De Krook, experts from Lab9K, Foresight Digipolis and internal stakeholders (students, lecturers, departments, staff members), possibilities were explored for using beacon technology to provide students with learning opportunities which refer to the five generic learning outcomes, at various locations in the city.

4.2 Work package 2: Exploration of beacon technology

Beacons serve as digital transmitters to which a concrete learning opportunity can be linked. As soon as a smartphone comes close to this beacon, the signal can be picked up via Bluetooth and a push notification of a learning opportunity can then be displayed on the user's device. These beacons are placed in accessible places in the city so that Artevelde University College students receive a notification of the initiatives in a certain neighbourhood via the app on their smartphone. The use of this technology was further developed and refined together with students from the Graphic and Digital Media programme at Artevelde University College.

4.3 Work package 3: Discourse analysis of learning outcomes

Within an interdisciplinary working group at Artevelde University College, a discourse analysis was held on the different learning outcomes (see figure 1); (1) entrepreneurship, (2) digital literacy, (3) global citizenship, (4) research attitude and (5) sustainability. Learning objectives were linked to these learning outcomes in a subsequent phase. These serve as inspiration for the various departments and stakeholders that help shape Ghent into a City for Learning through Gentlestudent. External stakeholders are involved in this phase via a resonance group that keeps track of the entire development process. During a first

recruitment phase, the resonance group develops a number of concrete learning opportunities that are linked to beacons (see work package 1). For each learning outcome a number of learning opportunities are formulated at every level (beginner, intermediate, expert). Within Gentlestudent, we distinguish three levels that are inspired by Miller's model of competence (1990): know, know how, show and do.

Expert: within this level, the learning opportunity describes an expected behaviour in which the student has to take on a high degree of autonomy and is expected to start working independently in an authentic context.

Intermediate: within this level, the learning opportunity formulates an expected behaviour in which the student works with a lesser degree of autonomy.

Beginner: within this level, the learning opportunity focuses more on objectives that are characterised by the acquisition of knowledge and insight.

Thanks to Gentlestudent, Artevelde University College students can find the learning opportunities collected by the professional field and select learning opportunities in order to make a positive and social contribution to the quality of a community or existing initiative. For the (Gentle)students, the platform also offers an opportunity to make their social engagement and professional identity visible.

4.4 Work package 4: Development of the app, website and open badges

A team of students of the Graphic and Digital Media bachelor programme, was assembled and consists of: developers, photo designers and graphic designers under the supervision of a lecturer. Together they are responsible for the technical and graphical development of the app, website and open badges (see work package 5). In the meantime, there are sufficient moments during which the technical development and substantive needs are attuned to each other, taking into account the input from various stakeholders.

4.5 Work package 5: Development of the didactic principles and the assessment

Gentlestudent works according to the principles of gamification in which game design elements are used in a non-game context (Deterding et al., 2011). This form of gamification is made possible thanks to the use of open badges¹ which function as microcredentials. Such a credential illustrates and confirms the acquisition of a specific skill and the successful application of a 21st-century skill in a specific context. Such an open badge, also includes the concrete description and achieved objectives that are linked to a specific learning opportunity.

¹ More information about open badges via <https://openbadges.org>

The value of an obtained badge can be compared to obtaining a paper certificate, but in a digital form that is unique and which is provided with the necessary metadata so that the uniqueness of the badge can be ensured. Furthermore, there are two possibilities for obtaining a badge. (a) A badge can be awarded to a student by an external stakeholder when the intended objective has been achieved. However, (b) a badge can also be claimed by a student. Students may already have demonstrated in a different setting, which differs from the learning opportunity described via Gentlestudent, that they have acquired a certain skill. When students subsequently wish to claim the badge without using Gentlestudent, they only have to add an artefact confirming that the skill has already been acquired. This can then be confirmed by Artevelde University College and the badge can be awarded to the student.

This allows students to collect various badges that can be claimed or awarded via Gentlestudent or other initiatives. The earned badges, which are based on open standards, can be gathered on various platforms. The Mozilla Backpack² environment is a platform on which such open badges can be collected in order to keep an overview of the acquired skills in various settings and through a diverse range of initiatives.

5. Vision and hypotheses

Our vision on learning in the city is represented in the figure (figure 2) below. Learning opportunities in the city can be organised via the formal curriculum and via informal opportunities offered by stakeholders in the city. In both settings a student is working on different competencies and 21st century skills and these could be recognized and valued either via open badges or more traditional ways such as certificates or diplomas. These credentials create the potential to be acknowledged and can then form the bases of lifelong learning via an increased level of self-directed learning and participation in professionalization activities.

² More information about Mozilla Backpack can be found via <https://backpack.openbadges.org>.

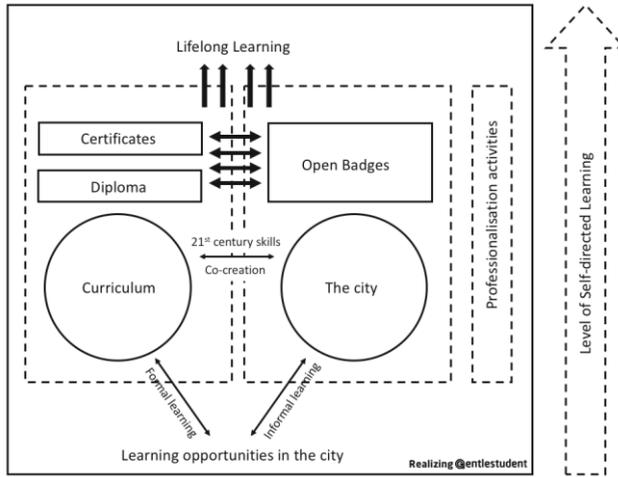


Figure 2. Model for the realisation of Gentlestudent in a City for Learning

Moreover, UNESCO (2017) states that a City for Learning promotes lifelong learning and describes the learning city as a city which:

- effectively mobilises its resources in every sector to promote inclusive learning from basic to higher education;
- revitalises learning in families and communities;
- facilitates learning for and in the workplace;
- extends the use of modern learning technologies;
- enhances quality and excellence in learning; and
- fosters a culture of learning throughout life.

This description makes it clear that when a city wants to be a City for Learning, it must meet the above requirements. Artevelde University College wants to meet these requirements through Gentlestudent by promoting learning as mentioned above, involving various stakeholders and responding to the needs of the residents in Ghent.

Hypothesis 1: By using modern learning technologies and platforms, Gentlestudent wants to make informal learning unambiguous and tangible without requiring involvement of the educational institution at the level of every student.

Hypothesis 2: By giving students a choice between learning opportunities, by offering these in an authentic context and by incorporating an element of gamification, we believe that the motivation of students to work autonomously will increase.

Hypothesis 3: Through the use of microcredentials in the form of open badges, experiences from the informal curriculum will be valorised in the formal curriculum and the professional growth in function of lifelong learning.

After the pilot phase has been completed, we will be able to evaluate the extent to which our hypotheses are confirmed or not.

6. Discussion

The involvement and commitment of the external stakeholders should not be underestimated. How can we define the learning opportunities in such a way that they allow students to get to work in the most autonomous manner?

We suspect that many students already assume tasks in a youth movement or that they volunteer for a good cause. We need to question whether Gentlestudent will not create a Matthew effect. Perhaps the strong students with sufficient self-directed learning and self-regulated learning skills in particular will focus on the learning opportunities of Gentlestudent. While students with fewer opportunities or students who have to combine their studies with work or a family are not in a position to take on this additional task.

The use of microcredentials in the form of open badges has the potential to be very valuable in the Open Recognition approach that is currently being explored (MIRVA, 2018). Furthermore open badges are nowadays still very innovative in Europe. As a result, the support base for the recognition of the value is still minimal. Further research outside of Europe needs to be taken into account in order to gain insight in lessons learned. Sensitisation and clear visions supported by good practices can ensure that open badges issued by recognised institutions become meaningful for society and the employers of tomorrow. It is therefore important that the valuation of certain acquired skills is done correctly so that the value of the badge is not an overestimation or underestimation of reality. Monitoring quality and ensuring that microcredentials can add value to society still needs to be determined.

References

- Artevelde University College Ghent. (2015a). Strategisch plan. Onderwijs- en studentenbeleid 2015-2020. Ghent: Artevelde University College Ghent.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9-15). ACM

- Demedts, L. & Van Puyenbroeck, V. (2016), Nieuwe Generatie curriculumdesign. Introductie van een zelfsturend curriculum om 21^{ste} eeuwse vaardigheden te bereiken in verschillende curricula. Onderzoek Van Onderwijs
- Office of Educational Development and Internationalisation. (2015). Onderwijsconcept Arteveldehogeschool [Unpublished internal document]. Ghent: Artevelde University College Ghent.
- Larsen, K. (1999). Learning cities: the new recipe in regional development. Organisation for Economic Cooperation and Development. The OECD Observer, (217/218), 73.
- Miller, G.E. (1990). The assessment of clinical skills/competence/performance. Acad Medicine; 65(9) Suppl 63-9.
- MIRVA (2018) accessed on April 13, 2018 via <http://mirva.openrecognition.org/>
- Schunk, D., & Zimmerman, B. (2008). Motivation and self-regulated learning: Theory, research, and applications. Mahwah, NJ: Erlbaum.
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3-11.
- UNESCO (2017). accessed on January 31, 2018 via: <http://learningcities2017.org/learning-cities/what-is-a-learning-city/>
- Van der Veen, T., & van der Wal, J. (2012). Van leertheorie naar onderwijspraktijk. Groningen: Noordhoff Uitgevers.
- Winne, P. (1995). Inherent details in self-regulated learning. Educational Psychologist , 173-187.

Strategic Plan of Graphic Expression to implement BIM on a Degree in Technical Architecture

Bernal, Amparo^a and Rodriguez, Ángel^b

^aDepartment of Graphic Expression, University of Burgos, Spain, ^bDepartment of Architectural Constructions & Construction Engineering and Land, University of Burgos, Spain

Abstract

Architectural and engineering studies in Higher Education Institutions face the challenge of modifying their teaching programmes, so that students acquire the competences linked to the new methodological techniques of Building Information Modelling (BIM) during their academic training. The experience of its adaptation at the Higher Polytechnic School of the University of Burgos is described in this paper, where the implementation of this methodology on collaborative work and integral project management has begun in the Knowledge Area of Architectural Graphic Expression with the teaching of its disciplines. The project has the strategic end-purpose of transferring these experiences to the other subjects on the Degree in Technical Architecture. A preliminary analysis of the human and material resources available in the Knowledge Area was performed and a Strategic Methodological Plan was drafted, to ensure the success of its implementation, establishing the lines of action to implement BIM methodology within a time period of eight semesters following its start-up.

Keywords: *Building Information Modelling, Strategic plan, Graphic Expression, Higher Education Institutions, Digital graphic tools*

1. Introduction

In 2016, a program report was presented at the Conference of Directors of the Schools of Technical Architecture and Building Engineering. The report contained a proposal to adapt the Degree Programmes in Technical Architecture-Building Engineering to the new competences in design, construction, maintenance, and management of buildings that are defined in the Building Information Modelling (BIM) methodology. The document had as its main reference the Doctoral Thesis of Professor Inmaculada Oliver, entitled: "Integration of the BIM Methodology in the curricular programming of the Degree studies in Technical Architecture / Building Engineering. Design of a proposal", the defence of which took place at the Technical School of Building Engineering at the Polytechnic University of Valencia, in December 2015 (Oliver, 2015).

In her Doctoral Thesis, she proposed the strategic modifications that should be introduced in the Degree Program in Technical Architecture-Building Engineering, to guarantee the training competencies of the graduates in BIM Methodology. Thus, it was argued that the future Technical Architects and Building Engineers should be able to apply the BIM Collaborative Methodology to all the objectives defined in ECI Order ECI/3855/2007, for the verification of the University Degrees that accredit the professional status of Technical Architects in Spain (Gobierno de España, 2007)

The implementation of BIM Methodology in all the disciplines of the Degree in Technical Architecture-Building Engineering must be done from the First Year (Sacks and Barak, 2010), because it constitutes in itself a competitive advantage to guarantee the successful employment of graduates. In this way, new professionals come on stream for companies who are capable of successfully confronting modern-day technological challenges (Arbués, 2016). Moreover, the implementation of BIM will create numerous opportunities for academic and research collaboration, the offer of services, and technological transfer that improve University indicators of competitiveness (CODATIE, 2016).

The modification of the degree programmes is a challenge for the universities that is not without its difficulties, such as having teaching staff with acceptable training in BIM Methodology, and material and technological resources that guarantee the success of its implementation (Gallego and Huedo, 2015) (Pomares et al., 2017).

The Higher Polytechnic School of the University of Burgos, with proven experience of over fifty years in the training of Technical Architects-Building Engineers, has assumed the commitment of implementing BIM Methodology in the Technical Architecture Degree. It has done so by drafting a Strategic Methodological Plan in the Area of Architectural Graphic Expression, the experience of which will be transferred to the other subjects on the Technical Architecture Degree and, subsequently, to all the Degrees of the Polytechnic School.

2. BIM Strategic Plan and selection of the Teaching Organizational Unit

Within the teaching structure of the Technical Architecture Degree, the field of Architectural Graphic Expression has its own identity, directly related to the disciplines of representation. It is therefore a reference area to become the Teaching Organizational Unit responsible for the process of implementing BIM Methodology. The subjects imparted in this Knowledge Area are directly focused on the application of digital tools for graphic design in two and three dimensions and are, in addition, distributed over the eight semesters of the Degree course.

2.1. Development of the Strategic Plan in Architectural Graphic Expression

The implementation of Digital Tools and Information and Communication Technologies is one of the main improvement actions in the new university context of the European Higher Education Area (Esteve, 2016), both for administration and management and for its inherent functions, such as teaching, research, and knowledge management (Becerik-Gerber et al, 2011). However, the integration of these tools is not always supported by a Strategic Plan that ensures the proper functioning and the achievement of the changes that its authors might wish to promote in the universities (Ángeles, 2012).

The drafting of a Strategic Plan offers us a standardized working document with a vision of the future in the medium to long term (Martelo, 2015). In it, the current situation is analysed, the objectives are defined, resources are assigned and the strategies to achieve them are programmed over time (Fuster, 2008). In addition, a Strategic Plan is a living document that has control and feedback systems that ensure compliance with its contents. In this sense, the academic managers of the Higher Polytechnic School of Burgos considered the drafting of a Strategic Plan in the Area of Architectural Graphic Expression as an opportunity to discover its potential and to understand both its strengths and weaknesses, as well as to assess the strategic position of the School before assuming responsibility for the start-up and implementation of BIM methodology.

The educational strategy developed by the Professor Antonio Fernández Coca (2012), widely disseminated in conferences and publications, was in fact a precedent in the academic field of Technical Architecture, and more specifically in the disciplines of Graphic Expression.

Finally, the Strategic Plan must be the result of the collective commitment of the Professors of the Graphic Expression Area involved in its development. In order to reinforce its effectiveness, it was decided the need for its approval by the Board of Graphic Expression Department in the 2016-2017 academic year and its monitoring and follow up by the Management of the Higher Polytechnic School.

3. Diagnosis of the current situation of teaching

The first development stage of the Plan consisted of preparing a diagnosis of the intrinsic characteristics of the Area of Architectural Graphic Expression and a comparative study of its situation with respect to the other Knowledge Areas that teach on the Degree in Technical Architecture. For that purpose, a situational analysis was performed using the SWOT (Strengths, Weaknesses, Opportunities, and Threats) diagnostic procedure, in order to establish improvement strategies and competitive positioning, thereby guaranteeing the success of the plan (Ponce, 2007) (Mata, 2007).

3.1. Internal analysis: strengths and weaknesses

For the study of strengths and weaknesses, the human and material resources assigned to the course were separately analysed. The main characteristic of its teaching staff is the heterogeneity of qualifications and academic training. Only four of the nine teachers hold doctoral degrees and their training is very diverse, as among them there is an Agricultural engineer, three Architects, four Technical Architects-Building Engineers, and an Architect with a Bachelor of Fine Arts.

In business organizations, heterogeneity can constitute a competitive advantage for a multidisciplinary approach to strategic actions, so this diversity of academic and professional profiles is in itself a great strength and at the same time a weakness of the Area. These differences can be very beneficial if the synergies between colleagues are adeptly harnessed, so that the diversity of teaching profiles will not create imbalance and lose the unity of the group.

Regarding material resources, Graphic Expression Department has fully equipped computer rooms, but not all of them have the hardware required by the BIM software. Therefore, it is necessary to program a Computer Equipment Renewal Plan, a circumstance to be considered in future annual investments for the renewal and replacement of equipment.

3.2. External Analysis: opportunities and threats

The aim of implementing BIM modelling in a pioneering way in the Area of Architectural Graphic Expression was assumed by the professors as a challenge and an opportunity to lead the process of a paradigmatic shift in the teaching of Computer Aided Design (CAD) towards BIM Methodology. An innovation that reminded the most veteran teachers of the upheaval that took place twenty-five years ago when moving from hand-drawing to CAD.

On the other hand, this goal was not considered as an isolated Innovation Line, but it is interrelated with the Teaching Innovation Lines of the other Departments of the School. It was considered so, given that once BIM was incorporated in the subjects of Architectural

Graphic Expression, the experience would be transposed to the other subjects of the Technical Architecture Degree and, subsequently, to the rest of the Degrees of the School.

A critical element of the process is the diversity of learning itineraries available to students in the Study Plan of the Degree Program in Technical Architecture, which sometimes do not correspond to continuous sequential learning of BIM Modelling Methodology.

4. Action lines and sequential distribution of BIM learning

The implementation of the BIM Modelling Methodology has provided an opportunity to organize and to establish the most suitable schedule for instruction in the other digital tools applied in graphic expression subjects, such as 2D and 3D Graphic Design software, the software of Infographics and Virtual Reality, and the specific software of Topography and Photogrammetry. Table 1 shows the list of subjects of the Area according to the natural learning sequence of digital graphic tools, taking the year and the semester in which they are taught as a reference.

Table 1. Teaching schedule of Graphic Design software including BIM modelling.

	Teaching software
	Software application in teaching

Technical Architecture Degree										
Architectural Graphic Expression			Software							
Year	Semester	Subjects	Graphic Design 2D-3D	BIM Modelling	Modeling 3D - Infography	Video-Virtual Reality	Graphic Design 2D-3D Advanced	BIM Advanced	GIS	SFM-Structure from Motion
1°	1°	Descriptive Geometry								
	2°	Architectural Drawing I								
2°	3°	Architectural Drawing II								
	4°	Architectural Drawing III								
3°	5°	Topography								
	Optional	Graphic Representation Techniques								
	6°	Technical Projects I								
	Optional	Interior Design								
4°	7°	Technical Projects II								
	7°	Photogrammetry								
	8°	End-of-degree Project								

BIM teaching began in the second semester of the 2016-2017 academic year, in the Architectural Drawing I programme, with the introduction of the basic theoretical and practical concepts of this methodology, guiding the students through the intuitive study and the philosophical knowledge of BIM techniques and processes (Sacks and Barak 2010).

The temporary sequence of training continues over the following two semesters, in the 2nd year. In this year, the students will be trained in architectural modelling, applying the potential offered by the tool for the development of building constructions.

In the fifth semester, students have the opportunity to choose the optional subject of Graphic Representation Techniques as part of their curricular training, where advanced BIM modelling is taught in architecture, structures, and mechanical, electrical, and plumbing engineering design (MEP). Students who do not choose this optional subject can study advanced BIM modelling in Technical Projects I and Technical Projects II, in the sixth and seventh semesters, respectively.

Following this learning sequence, it is guaranteed that students will reach the End-of-Degree Project in the eighth semester equipped with the skills to develop a Building Project using BIM Methodology.

5. Intervention strategies to achieve the objectives

The timeline for BIM Methodology implementation established in the Strategic Plan has set the pace of change and adaptation the subject Syllabuses. The professors assigned to each subject, in coordination with the drafters of the Strategic Plan, are responsible for defining the specific theoretical contents that should be introduced in the Syllabus and the practical supporting exercises, so that the students can acquire the skills that are detailed in them. In parallel, the academic managers were specifying the measures that, according to the initial diagnosis, should be put into action to reinforce the strong points, to face the threats, to correct the weaknesses, and to exploit the opportunity of actively leading the implementation of BIM Methodology.

The internal improvement actions were aimed at correcting the differences in training among the teaching staff, which was one of the weaknesses detected in the diagnostic phase. The academic managers of the Strategic Plan asked the Institute for Educational Training and Innovation of the University of Burgos to organize BIM Training Modules, to improve teaching skills in BIM. There was massive participation on these training modules among teachers, not only from the Area of Architectural Graphic Expression, but from other Knowledge Areas with training competences in the Technical Architecture Degree.

Moreover, as evidenced in the analysis of the external situation, the process of implementing BIM Methodology represented a great opportunity for qualitative improvement, both in terms of the qualifications of the human team and the availability of technological resources. Hence, the commitment was assumed from the very beginning, to transmit the work done to the University Community, disseminating the actions taken and the results in the different management areas, both at the University of Burgos and the

Higher Polytechnic School and, in addition, at Conferences and Teaching Innovation Congresses, and through specific publications.

6. Monitoring and control for continuous improvement

The monitoring of compliance with the schedule in the Strategic Plan is done annually at the Board of the Graphic Expression Department at the time of approving the Syllabus for the following academic year. Two years into the implementation process that began in 2016/17, we are currently working to adapt the contents of Graphic Representation Techniques and Technical Projects I, in the Third Year of the Degree. The complete integration of BIM Methodology in Architectural Graphic Expression is foreseen in the 2019-2020 academic year, at which time its transversal implementation will begin in the other disciplines of the Degree in Technical Architecture.

Once this stage of the Strategic Plan has been completed, the methodological objectives established in it will remain in force, as they will serve to provide feedback to the system on its practical application to the teaching-learning process, because teaching excellence can only be achieved through the process of continuous improvement (Rodríguez 2003).

7. Conclusions

The imminent need for graduates of Technical Architecture-Building Engineering to acquire professional competences in BIM requires the adoption of specific measures to guarantee their integration in higher level Degree studies. The Strategic Plan of Graphic Expression has been an effective instrument, which has made possible to organize the teaching of the Knowledge Area and establish synergies among its teachers. We are now working on transferring it to other Areas. The success of this experience has encouraged the drafters to develop other Innovation Lines through strategic plans because, in addition, this methodology has achieved the involvement of many people during the process.

References

- Ángeles Mancilla, A. (2012). Planes estratégicos integrales para la incorporación y uso de TIC: claves para administrar el cambio. *Razón y Palabra*, 17 (79).
- Arbués, E. (2016). El desarrollo de competencias en el alumnado universitario. Nuevos retos metodológicos. *Certiuni Journal*, 2, 10-18.
- Becerik-Gerber, B., Gerber, D. J. & Ku K. (2011). The pace of technological innovation in architecture, engineering, and construction education: integrating recent trends into the curricula. *Journal of Information Technology in Construction*, 16, 411-432.

- CODATIE-Conferencia de Directores de Arquitectura Técnica e Ingeniería de Edificación (2016). *Implantación de competencias BIM en los planes de estudio del grado habilitante para la Arquitectura Técnica*, Madrid.
- Esteve, F. (2016). Bolonia y las TIC: de la docencia 1.0 al aprendizaje 2.0. *La Cuestión Universitaria*, 5, 58-67.
- Fernández-Coca, A. (2012). Estrategia docente 4.0 en la enseñanza del dibujo a mano alzada en expresión gráfica: Caso de la Universitat de les Illes Balears y su aplicación a otros centros y materias relacionadas con la expresión gráfica. Educación 4.0. In *Proceedings from XI International Conference Graphic Expression applied to Building*, Valencia: Editorial UPV, 932-943.
- Fuster, J. P. (2008). La planificación estratégica: una propuesta metodológica para gestionar el cambio en políticas de innovación educativa. *Revista Iberoamericana de educación*, 46(1), 3.
- Gallego, T. & Huedo, P. (2015). Introducción del concepto Building Information Modeling (BIM) en el Grado en Arquitectura Técnica de la Universitat Jaume I". *Proceedings from EUBIM 2015*. Valencia: Editorial UPV, 102-112.
- Gobierno de España. Ministerio de Educación y Ciencia (2007). *Orden ECI/3855/2007, de 29 de diciembre, por la que se establecen los requisitos para la verificación de los títulos universitarios oficiales que habiliten para el ejercicio de la profesión de Arquitecto Técnico*.
- Martelo, R.J., Ponce, A.L. & Acuña, F. (2016). Methodological Guide for the Design of and Informatics Strategic Plan in Higher Education Institutions. *Formación universitaria* (on-line versión), 9 (1), 91-97.
- Mata, G.E. (2007). Reflexiones sobre la planificación estratégica. *Revista de economía y derecho*, 4 (16), 45-56.
- Oliver Faubel I. (2015). *Integración de la Metodología BIM en la programación curricular de los estudios de Grado en Arquitectura Técnica/Ingeniería de Edificación. Diseño de una propuesta*. (Unpublished doctoral dissertation). ETSIE- UPV, Valencia.
- Pomares, J.C., Baeza, F.J., Varona, F.B. & Bru, D. (2017) Revisión del uso de Building Information Modeling en la Educación Superior relacionada con la arquitectura, ingeniería y construcción. In *Investigación en docencia universitaria: Diseñando el futuro a partir de la innovación educativa*. Barcelona: Octaedro, 991-1001.
- Ponce Talancón, H. (2007). La matriz FODA: alternativa de diagnóstico y determinación de estrategias de intervención en diversas organizaciones. *Enseñanza e investigación en psicología*, 12(1).
- Rodríguez, R. M. (2003). Reaprender a enseñar: Una experiencia de formación para la mejora continua de la docencia universitaria. *Revista interuniversitaria de formación del profesorado*, 17(2), 79-94.
- Sacks, R. & Barak, R. (2010). Teaching building information modeling as an integral part of freshman year civil engineering education. *Journal of Professional Issues in Engineering Education and Practice*, ASCE, 136 (1), 30-38.

Advanced teaching module for the course "Theory of Probability and Statistics" based on a recurrent test system with an incremental level of complexity and dynamical case studies

Mochalina, Ekaterina Pavlovna; Ivankova, Galina Vladimirovna and Tatarnikov, Oleg Veniaminovich

Department of Higher Mathematics, Plekhanov Russian University of Economics, Russia.

Abstract

This paper presents an innovative approach to teaching the discipline 'Theory of probability and statistics', which based on recurrent test system with an incremental level of complexity and on a dynamic block of case studies generated by information received online (by using Thomson-Reuters informational terminals). The model of the so-called "recurrent testing" allows to increase significantly the student's knowledge level. The idea is to build such a system of successive tests, which takes into account at each subsequent step the results of the previous one, thereby each time modifying the task to the level of the tested and gradually increasing its level of knowledge, and, consequently, the quality of learning as a whole. It is important that, regardless of the starting point the recurrent testing system converges quickly to the trainee's knowledge level. The method is also described by the case study 'Modeling of the stages of development of the company based on real data'. The adequacy of conclusions obtained with this approach have been shown, that is an additional advantage of the proposed model of learning.

Keywords: *Testing, quality of training, estimation theory, case study*

1. Introduction

The traditional approach to testing the student's knowledge level assumes that the quality of the answer to the test task is characterized by a binary value: "correctly – not correct". This approach underlies the classical theory of tests and the modern test theory - IRT (Item Response Theory) (see Neiman (2000)). At the same time, in many cases, the solution of the problem (if it's not about testing when the correct answer is determined unequivocally) is evaluated in full: "solved, but not completely," not solved, but the idea was correct," etc. The demands of modern employers to a young specialist make one think about a more differentiated approach to assessing the level of knowledge. The authors developed a method of recurrent testing, which makes it possible to obtain a differentiated estimation of the level of knowledge. The main result of this part of the work is a constructed mathematical model for assessing the level of student knowledge, the input parameters of which are the volume and complexity of test tasks and a priori estimation of the student's knowledge level. It is assumed that the quality of the test tasks is characterized by a certain continuous indicator. An important, or even the main, aspect is the demonstration that the developed methodology, regardless of the starting point (the primary test), converges quickly to the student's knowledge level. To prove this fact, based on the Birnbaum model (see Sage (1982)), a mathematical model of the process (recurrent testing) is constructed and using Fredholm integral kernels (see Koralov (2007)) can be shown its convergence. The results of this part of the work were first presented at an international conference at the Finance University under the Government of the Russian Federation "Educational programs and professional standards: the search for effective interaction" by a report (01.04.2016), which was later expanded into an article "Step-by-step testing method: joint assessment of the training level and the complexity of the assignment "(see Mochalina et al. (2017-2)).

2. A new course structure and grading system

Currently, there is a full range of opinions regarding the acceptability of testing in the learning process: from complete rejection to total application. Meanwhile, the advantages of such a method of measuring the level of knowledge are already clearly defined: objectivity, speed, technology, coverage of all the teaching material, the possibility to use mathematical methods for processing results, etc. Further work went in the direction of increasing the variability of the task to ensure the possibility of a more differentiated, and therefore more objective estimation while maintaining a recurrent method of testing. Also, the aspect of relevance was added: the tasks should be brought closer to reality (to increase the interest in the subject). And thus, we come to a system of clinging cases, based on real data.

To implement the training module in practice, a computer program was written "A practical simulator with three levels of complexity in the discipline "Probability Theory and Statistics "on the basis of cases with open content." The software product (information system) is designed to test the received theoretical knowledge and the formation of practical work skills (working with data sets, dispersion and correlation analysis, time series analysis) in the discipline " Probability Theory and Statistics" and used to test the quality of training on this discipline. The simulator is an innovative way to apply testing: the test is not a form of control (more precisely, not only as a form of control), but as a way of obtaining knowledge. The underlying test is part of a set of similar ones that are an indicator of learning (with the obligatory condition of the uniqueness of each test). Work is built in such a way that when executed by the student enters the next level of training. The first block of the simulator is the multi-level tests (important(!): without option of choosing the answer, the simulator allows only put it), the results of which are estimated by a binary value ("solved" - "not solved").

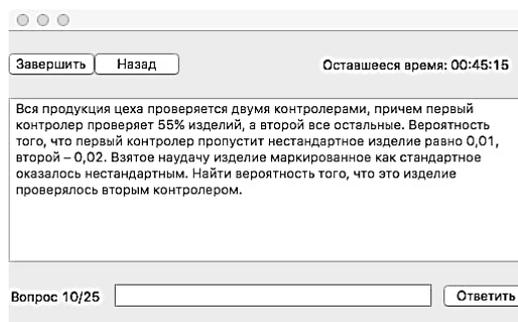


Figure 1. Testing

№	Текст вопроса	Ответ:	Верный ответ:
1	Страховая компания разделяет застрахованных по классам рис	a)0,07; б)0,12	a)0,03; б)0,167
2	Вся продукция цеха проверяется двумя контролерами, причем	0,621	0,621
3	В 1-й урне находится 7 белых и 5 черных шаров, а во 2-й – 4 бе	0,369	0,369
4	Вероятность того, что недельный оборот торговца мороженым	0,4	0,4
5	В коробке находится 4 новых и 2 уже использованных теннисн	0,16	0,16
6	Семь студентов, получив билеты готовятся к ответу экзамена	0,625	0,817
7	Из 1000 ламп 100 принадлежат 1-й партии, 250 – 2-й и остад	0,0445	0,0445

Figure 2. Test results

Further, by summing the results of the test tasks, the student's knowledge level indicator is determined. We also note, that testing is a method that puts all students in equal conditions, virtually eliminating the teacher's subjective assessment. This approach allows to set the level of knowledge of the student on the subject as a whole and on individual sections without additional efforts. Note also that this is gentler tool for assessing the level of knowledge in comparison with traditional control work. The student has the opportunity to choose the time of passing the test conveniently (access to the simulator is open during the

working hours of the university), and also he sets his own the goals and objectives of the training independently: to learn the minimum permissible level, some intermediate level or to progress to a deeper learning of the material (which is achieved by work with the second block of the simulator), thereby ensuring the study of the main trends and methods used in practice. In our case, we are talking about working with large data sets that reflect a specific practical problem and actualize the appropriate range of knowledge, the part of which are probabilistic estimation, forecasting, etc.

The second block is a dynamic case system based on real data. Case study tasks always involve an ambiguous solution. Consequently, we can say that the creation and protection of the project within the framework of the case study will help, first, to identify those students who are ready for further training in magistracy and graduate school, secondly to create conditions closest to reality and thereby such a graduate will most competitive. Thus, we can conclude that the simulator provides the following stages of mastering the competencies necessary for the training of highly qualified specialists: 1) well acquired fundamental knowledge: it is practiced in solving of various tests ranged and estimated on complexity that allows moving to another level; 2) skills of work with analytical packages and programs – is also practiced on a set of various "undergraduate" tasks; 3) at the exit to certain level in the previous conditions, the student is ready to solve the problems which to the maximum are brought closer to reality (working with case study based on real data).

Case study approach allows us to improve the estimation and analytical skills, the skill of finding a rational solution to the existing problem, that is, eliminates the main limitations of the test approach.

3. Results

In the process of studying any discipline the information environment in which necessary skills are gained is important to the student. Electronic Content now - it's convenient and universal. The information is updated in real-time, public and comprehensive. Such material as a basis for learning is new, and, most importantly, it forces us to completely change the approach to the system of knowledge translation. Accordingly, the knowledge gained because of the course, reflecting most trends and methods used in practice, will not be cut off from reality. An innovative approach is to create a dynamic block of case studies based on real data. Within each work, the basic principle of the case study is observed: each subsequent step is based to one degree or another on the results of the previous stage. The most important point is the content of the case study: these are real constantly updated data. Working with case studies thus generated - is the foundation for the creative activity of the student, which allows identifying among them ready for the further education in today's society. We tried to create a training module most appropriate to this requirement. Thus, the

relevance of the theme of this work is due to the fact that modern economic conditions make higher demands on the level of training of qualified personnel, which explains, on the one hand, the need to increase the level of computer literacy of the student, and on the other hand, assumes free knowledge of the analytical apparatus that is acquired only by solving a number of real problems. It is important to note that this is not our first attempt to realize these ideas in practice. We already did the first step. Our previous work was presented at the "8th Annual International Conference on Computer Science Education: Innovation and Technology" in the Singapore (09.10.17-10.10.17) by report (see Mochalina et al. (2017-1)) and more detailed in article (see Mochalina et al. (2017-2)). The developed estimation methodology has found its application partially in the development of working training program on "Financial calculations" (Finance Department). To implement the training module in practice, the computer program "Case-transmitter for the training module" Financial calculations" was developed and implemented. This program doesn't contain test part, only chain of clinging case studies: portfolio theory, forecasting share prices, estimating the option prices and hedging. Many people working with financial instruments know how difficult to teach the graduate to work: theoretical base (see, for example Hull (2014)) and reality are weakly connected. And this training module allows to improve significant the situation. It can be easily seen by the diagrams below (Fig. 3 & Fig.4). The first represents the marks on the course "Financial calculation" in 2016 (before implementing case study method of teaching and in 2017 (the system is implemented) and the second gives the results for graduates in searching job. We also note that in 2016 testing group consist of 260 students, and in 2017 the total number of student was equal to 440.

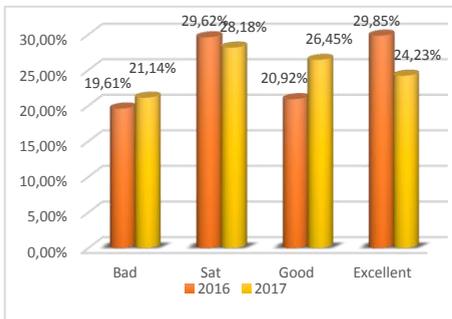


Figure 3. The marks

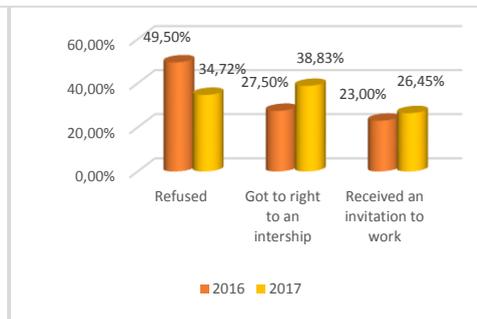


Figure 4. The results on searching the job

A further strategy connecting to these results involves shifting the developed methodology of translation and estimation of knowledge to virtually any mathematical discipline. And we did it and presented simulator above. For clarity, we show here one of our case studies.

4. Example

Case study: Modeling of the stages of development of the company based on real data.

Task: based on empirical data construct the model allowing to determine the place of the company on the market.

Solution. To determine the configuration of the stages of the companies and to construct pre-classification student have selected 73 companies from the food industry (the minimum allowed sample volume is forty companies). To collect data our students, use Thomson Reuters informational terminals. We proud to say that our university (one of two in Russian Federation) has the agreement with **company Thomson Reuters** according to which the university got a special class equipped with Thomson Reuters informational terminals (see Fig.5 below). So, our students have a unique opportunity to work directly with them and they used that during solving this case study. They can collect the data directly from the terminal (Fig.6) or download it (in the format of pdf-file).



Figure 5. Thomson Reuters class

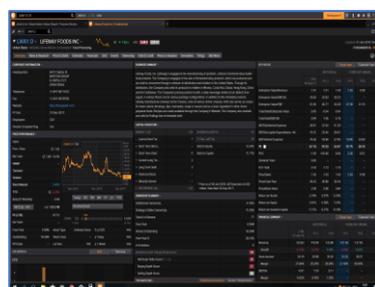


Figure 6. Collecting data from the terminal directly

For the analysis student constructed two types of variables: the cluster and descriptive. It's important to check that variables were picked up correctly: *they don't depend from each other, selections have normal distribution*. And then it is possible to use the apparatus of the cluster analysis. The results of hierarchical clustering are represented as a horizontal dendrogram (see Fig.7).

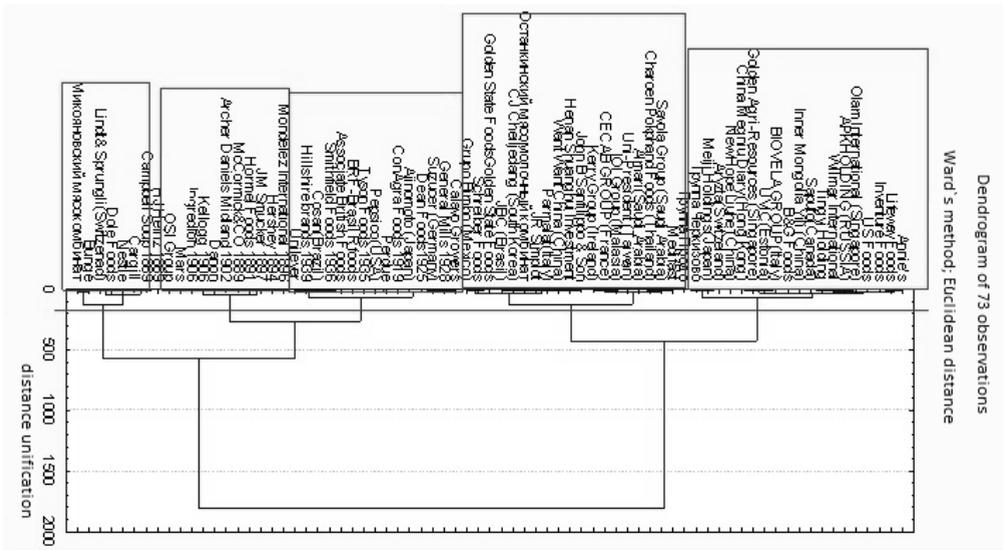


Figure 7. Dendrogram

Then, next step in solution this case study for student is using the apparatus of the discriminant analysis to find out which of the taken variables had provided the separation of one cluster from another and further to be able to describe the situation within each cluster. Each of the constructed by student discriminant functions allows to calculate unit weights of classification (tags) by the formula: $S_i = c_i + w_{i1}x_1 + w_{i2}x_2 + \dots + w_{im}x_m$, $i = 1, \dots, m$. Here the index i - is the number of cluster, c_i - the constants for i -th cluster, m - the quantity of variables, w_{ij} - the coefficients of j -th variable during the calculation of the tag of the classification for i -th cluster, x_j - the observed value for the corresponding object of the selection by j - th variable. So, one need to consider the functions of classification. The object (company) gets into the cluster to which the greatest weight (the maximum tag) corresponds.

Table 1. Functions of classification; grouped by number of cluster

	G_1:1	G_2:2	G_3:3	G_4:4	G_5:5
Age (generation)	0,5369	7,1412	14,398	20,415	30,921
Structure	-32,2490	-31,5612	-29,217	-25,892	-23,957
Size (the natural logarithm of size)	26,9363	27,1208	26,229	23,973	23,422
Constant	-67,9566	-81,2768	-101,494	-116,256	-177,362

It is a very difficult task – to construct the model like in this case study. To do it student should not only be able to work with informational terminals, but also to possess the apparatus of discriminant and correlation analysis, the skills of working with data sets, books (important!) and the *skills of constructing and testing mathematical models*. The

scale of the work done is easy to understand by looking at, for example, the work Hanks et al. (1994) or book Shirokov (2010), whose, in turn, are based on ideas of Adizes (see Adizes (1989,2013)).

Based on the Faculty of Finance, it is planned to test the developed training and practical simulator, which allows not only to obtain an estimation of the level of knowledge of trainees, but also to identify the most capable and ready for further education students (at the following levels: master's and post-graduate courses). The result of the introduction of such an approach to learning will be the formation and development of students' skills in applying methods of qualitative and quantitative analysis using information technologies that corresponds the requirements of a modern employer.

References

- Adizes I. (1989). *Corporate lifecycles: How and Why Corporations Grow and Die and What to do about it*. Prentice Hall: Englewood Cliffs, NJ.
- Adizes I. (2013). *Managing Corporate Lifecycle*. St. Petersburg: Peter.
- Hanks, S.H., Watson, C.J., Jansen, E., & Chandler G.N. (1994). Tightening the Life-Cycle Construct: A Taxonomic Study of Growth Stage Configurations of High-Technology organization. *Entrepreneurship: Theory and Practice*. 18(2), 5-29.
- Hull, J.C. (2014) *Options, Futures and other derivatives*. New Jersey: Pearson.
- Koralov L.B. & Sinai Y.G. (2007). *Theory of Probability and Random Processes*. Springer.
- Mochalina, E.P., Ivankova, G.V. & Tatarnikov, O.V. (2017). Innovative approach for submission of training materials: case study system with open content. *Proceedings of 8th Annual International Conference on Computer Science Education: Innovation & Technology (CSEIT 2017)*, 65-70.
- Mochalina, E.P., Ivankova, G.V. & Tatarnikov. (2017). Adaptation of the educational program for financial calculations to actual economic state. *Vestnik of the Plekhanov Russian University of Economics*. 2, 57-63. (In Russ.)
- Mochalina, E.P., Ivankova, G.V., Tatarnikov, O.V. & Maslyakova I.N. (2017). Step-by-step testing method: joint assessment of the training level and the complexity of assignment. *Vestnik of the Plekhanov Russian University of Economics*. 6, 145-154. (In Russ.)
- Neiman, Yu. M., Khlebnikov, V.A. (2000). *Introduction to the theory of modeling and parametrization of pedagogical tests*. Moscow: Prometheus. (In Russ.)
- Sage E., Melsa J. (1982). *The theory of assessment and its application in communication and management*. Moscow: Radio and Communication. (In Russ.)
- Shirokov G.V. (2010). *Change Management*. Trans. from English. St. Petersburg: Graduate school of management. (In Russ.)

Game-based learning supported by audience response tools: game proposals and preliminary assessment

Cobos, Maximo^a; Arevalillo-Herráez, Miguel^a; de Ves, Esther^a; Roger, Sandra^a; García-Pineda, Miguel^a; Grimaldo, Francisco^a; Fuertes, Ariadna^a; Sanmartín, Isaías S. ^b; López-Iñesta, Emilia^c; Gutiérrez-Soto, Juan^d; Claver, Jose M. ^a; Castaño, Maria Asunción^e

^aDept. d'Informàtica, Universitat de València, Spain; ^bFac. de Veterinaria y Ciencias Experimentales, Universidad Católica de València, Spain; ^cFac. de Ciencias Actividad Física y Deporte, Universidad Católica de València, Spain; ^dDept. de Didàctica de la Matemàtica, Universitat de València, Spain; ^eDept. de Ingeniería y Ciencia de los Computadores, Universitat Jaume I, Spain.

Abstract

The so-called game-based learning strategies are based on introducing games in the classrooms to improve aspects such as student performance, concentration and effort. Currently, they provide a very useful resource to increase the motivation of university students, generating a better atmosphere among peers and between student and teacher, which in turn is generally translated into better academic results. However, the design of games that successfully achieve the desired teaching-learning objectives is not a trivial task. This work focuses on the design of games that allow the assessment of ICT-related university subjects. Specifically, four different games are proposed, all based on student participation in teams. After undertaking a preliminary evaluation of the different games, and observing the results obtained in different subjects taught by different teachers, the advantages and disadvantages of each game are discussed. This preliminary study will thus serve as a starting point for a more exhaustive study on the designed games, by including an statistical analysis considering the time variable (results in different academic courses).

Keywords: *Game-based learning; undergraduate education; game design; online platforms.*

1. Introduction

The use of gamification in the classroom is a key element that has attracted the attention of the University community in terms of educational innovation (Kay and LeSage 2009; Melhuish and Falloon 2010). This concept attempts to incorporate techniques and dynamics of the games to improve the motivation and involvement of students in the teaching-and learning process (Eisele-Dyrli 2011). Such methods include setting challenges and using reward points, levels or rankings, in order to foster self confidence and increase the student's personal effort, involvement and collaboration with classmates. Gamification strategies may be of a very diverse nature, and they aim not only to ease the acquisition of the learning objectives of the course, but also to contribute to the personal and social development of the student. However, we shall differentiate between gamifying a learning process and using games to learn (Connolly et al. 2012; Deterding et al. 2011). Game-based learning consists of using games as a tool to support learning and to the easy acquisition and evaluation of knowledge and skills (Qian and Clark 2016). On the contrary, gamification is based on incorporating game elements (e.g. achievements, points and rankings), mechanics (e.g. challenges, rewards, feedback, competition, cooperation) and dynamics (e.g. emotions, progress) outside a game context.

One major factor that has contributed to the success of game based learning is linked to the existing relation between the factors that cause intrinsic motivation and those that characterize a good game (Connolly et al. 2012). Intrinsic motivation has a positive effect that leads the student to persist, work harder and better retain relevant information. In addition, the introduction of digital tools and the widespread use of mobile devices in the classroom have led to a significant technological change. As a result, new online tools and applications have emerged in an attempt to introduce innovative learning elements (Eisele-Dyrli 2011). Some of these tools not only incorporate audience response capabilities, but they also provide simple ready to use games and modes of use which encourage the use of gamification strategies (Roger et al. 2017; Bergmann and Sams 2014). Among the most popular participation management tools we find Kahoot and Socrative (Fuertes et al. 2016). These tools can be used in classrooms of various sizes and of any educational level. Although the type of user response depends on the activity design, the multiple choice questionnaire is the most popular. These tools allow the teacher to reveal the correct option after students have answered a question, and obtain real-time statistics that help assess the level of understanding of the class.

However, the use of such applications has to be adequately planned and adapted according to the learning objectives, taking into account context-dependent pedagogical considerations. In general, this is a complex task that depends of many factors, e.g. the type of content, the number of students in the group, the complexity of the game, the usage frequency or the time investment required to explain and play it. In addition, there are other

issues that deserve careful thinking, such as question design and the weight that the activity may have on student assessment.

In this paper, we present three different game alternatives. Each of these was developed and tested in a different undergraduate degree related to ICT. They all aim to increase student motivation, but each of them has specific features that make them more suitable for a specific task e.g. continuous evaluation, the review of an specific topic, deepening in some specific content or simply breaking the rhythm of a traditional master class. Although the three games were initially thought, designed and prepared to be used in combination with Socrative or Kahoot, they are also flexible enough to be adapted to other different tools. The structure of the paper is as follows. In section 2, we describe the proposed games. Then, a preliminary assessment of these games is offered in Section 3. This is based on an analysis of their pros and cons, and also of the academic results achieved in the subjects where they were used. Finally, the conclusions of the work are presented in Section 4.

2. Proposed games

2.1. Extinction

This first game was initially designed with the aim of reviewing the contents of an entire subject, and help students establish mental links between concepts. It was applied in the context of a computer science module in a physics degree, a representative case of a foundation subject that students tend to consider outside their main interests and therefore feel less motivated. This game was considered an in-class activity and hence was played by all students in the classroom.

During the preparation phase, students are divided into teams of 5 members. Then, each person in the team receives a sheet of paper with a number written on it, and 2 tearable flaps that represent game lives. Each student in the team receives a different number, covering the full range from 1 to 5. The game consists of a typical Socrative questionnaire, which is launched after the preparation stage. Everytime a new question appears, the lecturer also announces a number in the range 1 to 5 at random. Then, the person in each team who was assigned that number has to answer the question, without the help of his/her fellows. After a reasonable time, the lecturer displays the correct result and all contestants who have failed the question have to tear one life away from his/her sheet of paper. Once a player loses the two lives, he/she becomes "extinct" (is eliminated) and the fellow with the next consecutive number becomes responsible for answering all questions assigned to that number in the future. From here on, this team member assumes a higher risk, as the chance of having to answer a question increases. As the game goes on and incorrect answers are given, group members (and some teams) become extinct. The team that preserves more lives at the end of the game is the winner, and if there is a tie, this is solved by "sudden death".

2.2. Who wants to be an Engineer?

The game presented in this subsection is based on the popular game show of British origin *Who wants to be a millionaire?* (Wikipedia 2018), which has had a large audience and success in its TV format for many years. As the name of the game indicates, it was deployed in Engineering degrees. In particular, it has been used in Computer Engineering and Multimedia Engineering degrees during the academic years 15-16, 16-17 and the current 17-18.

Participation in the game play is proposed as a voluntary activity, and students decide whether they want to participate during the first week of class. The game is run at the end of each of the units that the subject is composed of. The objective of the the game is to review the major concepts learnt in the unit. Once the students have decided if they will participate and communicated their decision to the teacher, n teams of X students are created at random. Each of these teams will play the game once as *contestants*, at the end of one unit which is also randomly assigned to them by the teacher. The rest of the class play the role of the *audience*. All answers (by the team and the audience) are registered. Each game session consists of 10 multiple choice questions of an increasing difficulty level, and the rhythm of the game is controlled by the teacher. The score also increases with the difficulty of the questions, taking values from 1 to 10 that coincide with the number of question. Each time the teacher displays a new question, each student in the class (including the members of the contestant team) has to individually answer it. Once time has elapsed, the contestant team needs to agree and issue a common answer, that will determine whether the score assigned to the question is added to their scoreboard. The contestant team can fail a maximum of one question. If they fail more, the team will no longer rate as a group and only the individual scores are taken into account. To increase gamification, the contestant team can make use of the following wildcards:

- 50 % wildcard: The teacher will eliminate two of the four possible options.
- Audience wildcard: Percentages of responses of the class are displayed.

The team can decide when they use these wildcards, but they can only use each once along the game. The automation of the game is achieved using the tool Socrative, that allows students to answer each question using mobile devices and the lecturer to easily analyze their responses. To give support to the mechanics of the game, each question appears twice. The student will have to answer each question the first time it is displayed on the screen. The second time, the question will only be answered by the contestant team. To encourage participation, students who played the game as contestant team are rewarded with an extra mark of up to one point, which is added to their final mark (on a 0 to 10 scale). This depends on the team's performance on the day they played as contestant (weighted one

third) and the student's performance along the sessions they played as part of the audience (weighted two thirds).

2.3. Teams strategy

The main goal of this activity is to study and get a more in-depth view of all the content of the subject by means of an extensive multiple choice questionnaire. The students must answer the questionnaire using the Socratic tool within a limited amount of time. On the other hand, this activity intends to encourage the students to debate and seek consensus about the different possible answers to the proposed questions, as well as to keep the subject up to date.

Students are randomly grouped in different teams. At the end of each unit, the teams must prepare the contents of the unit so they can answer the questions in the Socratic tool. The statements of the question, without the multiple choices for the answers are provided by the teacher a few days before. Thus, the student-teams can prepare the activity in advance out of the classroom. This strategy helps the teacher to focus the activity on what he/she considers the most relevant aspects of the unit. At the moment of the activity, each team chooses a team-leader. The teacher indicates the beginning of the contest. The members of the different groups discuss the possible answers to each question. For every question, each member of a certain group has one vote in the Socratic tool (i.e. if a group is composed of 4 students, they have 4 votes for each question in the Socratic tool). If all the members of the group reach an agreement about the answer, they choose unanimously the same option. If their opinions about the correct answer differ, they can vote differently in the Socratic tool. Nevertheless, an strategy about the different individual answers can be followed so that the group can maximize the options to increase the final score of the test.

The score of the team is the sum of the correct answers of all its members. At the end of the activity, the score of the students, individually, is the sum of all the correct answers of all the members of his/her team. That is, the score of the student matches the score of his/her team. At the end of the activity, some extra points are assigned to each groups depending on the position in the score ranking. The groups better ranked receive more additional points than the worst. By introducing this gamification strategy, the members of different groups are discouraged to share information about the answers.

3. Preliminary assessment: advantages and disadvantages

This section discusses the advantages (+) and disadvantages (-) that have been identified throughout the approach and implementation of the various games explained above. Note that all are related to the subjective opinions received by the teachers running the games, so special care must be taken when interpreting them. Future work will analyze in more depth the following aspects with the data collected at the end of the course.

For each game, we will specify the considered subjects and degrees where it has been implemented, the degree year and the number of students involved.

3.1 Extinction

The realization of this game in the subject “Computer science” of the first course of the Degree in Physics has been very useful to motivate the students’ learning. The total number of students per class was around 60. As a result of the implementation of the game during two academic years (16-17 and 17-18), the following aspects can be highlighted:

- + The degree of students’ satisfaction and their motivation towards the contents of the subject seems to be increased with respect to their initial perception.
- + The dynamics of the game are easy to explain and have been shown to be suitable for crowded groups (between 40 and 60 students).
- There is a decrease in students’ participation due to early disqualifications, so it is advised to intercalate medium-low complexity questions in order to delay an early extinction.
- It is difficult to keep students’ attention after the correct answer has been revealed by the teacher, since the discussion of answer results among the students causes distraction.

3.2. Who wants to be an Engineer?

This contest-inspired game was held in a first year course of the Degree in Computer Engineering called "Computer fundamentals"; and in the course “Sound systems and music technology”, which is delivered to students in the fourth year of the Multimedia Engineering degree. The number of participants were 60 and 15, respectively. Major aspects to mention are:

- + Team and individual assessment are combined.
- + It was a motivating activity for students in the first year, who explicitly asked to increase the sessions dedicated to contests.
- The applicability of the approach decreases with the size of the group, as deployment time becomes larger.
- Less motivation was observed in the case of more mature students in the fourth year, some of whom reported boredom in the last sessions.
- The teacher needs to invest a large amount of time to prepare the required infrastructure and design the questions which are used through the game.

3.3 Teams strategy

This activity was designed for the subjects “Cellular Biology” and “Virology” of the first and third years, respectively, taught in the Biotechnology Degree of the Catholic University of Valencia in the 16-17 and 17-18 academic years. Some of the positive and negative points of the activity worth highlighting are the following:

- + It develops a sense of responsibility in the student towards his group, as he/she must contribute to the group with meaningful information during the response phase.
- + It encourages students to share and understand better the learnt contents while preparing the set of questions.
- + A suitably chosen set of questions allows to direct students towards the essential contents of the subject.
- + Providing the statements of the questions beforehand prevents the students from considering this type of activities like an excessive work overload during the course.
- The success of the activity depends on an extensive enough set of questions to cover an entire topic, which involves an often great workload for the teacher.
- As the course progresses, the students may stop preparing the topics due to the workload of other subjects. If this may happen, the activity fails to meet the pursued objective.
- The time spent on this type of sessions often makes teachers leave aside other types of activities which may be of higher priority (solving problems, explaining all the contents of the subject, etc.). So its suitability as a learning activity depends a lot on the type of subject.

4. Conclusion

In this paper, we have described three different game proposals to help learning in the classroom. Although the three games have some similarities (e.g., all of them are based on participation by teams), each of them has different characteristics in terms of the type of participation of students, including the interaction among each other and with the teacher. The games have been initially tested in different degrees of three Spanish universities, obtaining a set of considerations to be taken into account before a wide application of them. The three proposals have several advantages and disadvantages that are directly related to the complexity of the rules, the permanence of the teams in the game, the type and number of questions, and their duration over time.

As a general conclusion, we can say that, in its implementation, an improvement in the motivation of the students to learn the contents has been observed. However, this motivation seems to decrease when the game is repeated in too many sessions, especially on students of last courses. The most important drawback, which is common to all games,

is the time to be invested by teachers to develop an extensive battery of questions as well as the time taken to carry out the game itself. This aspect is especially critical in the case of the game *Who wants to be an Engineer?*, since it also requires that the questions have an increasing complexity in order to maintain the philosophy of the original contest. Overall, we can conclude that the initial results of the use of the proposed games have been qualitatively positive, and the future analysis of the results obtained will help us to propose improvements in this kind of activities based on data evidence.

References

- Bergmann J. and Sams, A. (2014). *Flipped Learning: Gateway to Student Engagement*. International Society for Technology in Education (ISTE).
- Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T. and Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers and Education*, 59(2), 661–686.
- Deterding, S., Dixon, D., Khaled, R. and Nacke, L. (2011). From game design elements to gamefulness: defining gamification. In *Proceedings of the 15th International Academic MindTrek Conference*, 9–15.
- Eisele-Dyrli, K. (2011). Mobile goes mainstream. *District Administration*, 47(2), 46–55.
- Frías, M.V., Arce, C. and Flores-Morales, P. (2016). Uso de la plataforma socrative.com para alumnos de química general. *Educación Química*, 27(1), 59 –66.
- Fuertes, A., García, M., Castaño, M. A., López, E., Zacaes, M., Cobos, M., Ferris, R. and Grimaldo, F. (2016). Uso de herramientas de respuesta de audiencia en la docencia presencial universitaria: un primer contacto. In *XXII Jornadas sobre la Enseñanza Universitaria de la Informática (JENUi 2016)*, Almería, Spain, 257–265.
- Kay, R. and LeSage, A. (2009). A strategic assessment of audience response systems used in higher education. *Australasian Journal of Educational Technology*, 25(2), 235–249.
- Melhuish, K. and Falloon, G. (2010). Looking to the future: M-learning with the ipad computers in New Zealand schools. *Learning, Leading, Technology*, 22(3), 1 – 16.
- Qian, M. and Clark, K. R. (2016). Game-based learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, 63, 50 – 58.
- Roger, S., Cobos, M., Arevalillo-Herráez, M., and Garcia-Pineda, M. (2017) Combinación de cuestionarios simples y gamificados utilizando gestores de participación en el aula: experiencia y percepción del alumnado. In *Congreso IN-RED 2017*, Universitat Politècnica de València, Valencia, Spain, 1–12.
- Wikipedia. (2018). Who wants to be a millionaire? Available online at: https://en.wikipedia.org/wiki/Who_Wants_to_Be_a_Millionaire%3F.

Emendo – A Toolchain for Creating Gamified Learning Arrangements for Online Learning Settings

Bartel, Alexander^a; Hagel, Georg^a and Wolff, Christian^b

^aFaculty of Computer Science, Kempten University of Applied Sciences, Germany,

^bFaculty of Languages, Literature, and Cultures, University of Regensburg, Germany.

Abstract

This contribution describes the Emendo toolchain which enables the effective creation and implementation of gamified learning arrangements for online learning settings based on the domain-specific modeling approach. The components of Emendo are a domain-specific modeling language, a generator which transforms models based on the language into source code as well as the embedding of the latter in a learning management system. Scenarios for the usage of Emendo for teaching and learning are presented with respect to the functionalities of the toolchain. In addition, a qualitative evaluation concerning Emendo's goals, concept and insights on the results is given. The evaluation shows that Emendo reaches high acceptance for teaching purposes and can serve as a promising means for the digitisation of teaching and learning.

Keywords: *Gamification; Learning; Learning Tool; Online Learning; Learning Management System, Domain-specific Modeling.*

1. Introduction

Learning and the associated acquisition of skills and competences is possible in many ways. One specific means is the use of online learning platforms or learning management systems (LMS). In order to enhance learning motivation as the central driving force and hence a prerequisite for learning to take place (Smolka, 2004), such platforms often integrate aspects of gamification. Recent studies show that the concept of gamification can successfully increase the learning motivation of individuals if it is integrated in learning management systems (e.g. Ibanez et al., 2014; Bartel & Hagel, 2014; Hakulinen et al., 2015; Hasegawa et al., 2015). According to Deterding et al. (2011), gamification can be generically defined as “the use of game design elements in non-game contexts” (p. 10). In this contribution, gamification is considered in the context of learning, and we will use the following definition: “Gamification is described as a concept which integrates game design elements and processes into learning activities in order to increase learning motivation and thereby changes the behavior of learners” (Bartel & Hagel, 2016, p. 6).

Although various reports exist on how to integrate aspects of gamification in existing LMS, e.g. as plugins into *Moodle* (Roderus, 2015) or as standalone applications (e.g. Hakulinen et al., 2015), researchers (Dicheva et al., 2014; Dicheva & Dichev, 2016) argue that existing learning management systems that integrate aspects of gamification

- are not effective in bringing gamified learning arrangements into practice,
- don't provide an extensible set of elements for creating such arrangements and
- constrain instructors due to an inflexible environment.

1.1. Goals

This contribution demonstrates a novel toolchain called *Emendo* (Bartel et al., 2017) in order to overcome the issues mentioned above. *Emendo* can be effectively used for creating gamified learning arrangements in an online setting, it is extensible with regard to its elements and does not constrain instructors in their definition of gamified learning arrangements. Its basic toolchain structure as well as scenarios of usage for learning purposes are demonstrated. Furthermore an evaluation with lecturers is shown. This contribution complements the work described in Bartel et al. (2017) where *Emendo* was technically detailed.

1.2. Structure

The rest of this contribution is structured into three sections: The following section relates to the descriptions stated in Bartel et al. (2017) and presents an overview of the components of the *Emendo* toolchain. In addition, it shows some scenarios for using *Emendo* and its functionalities in learning contexts. The third section presents the goals, method and results

of an evaluation conducted with lecturers using Emendo. The last section summarizes the findings and gives an outlook on future works.

2. Emendo Toolchain

2.1. Overview

The basic idea of Emendo was to build a system for creating and implementing gamified learning arrangements since researchers argue that there is a lack of tools which efficiently enable the creation of such arrangements for domain experts (Dicheva & Dichev, 2017). For this purpose, the domain-specific modeling (DSM) approach (Kelly & Tolvanen, 2008) was chosen because of the idea that domain experts without the need for technical knowledge should be able to use Emendo and bring their ideas to class. Figure 1 shows an overview of the Emendo toolchain and its components. As already stated in Bartel et al. (2017), currently there is no comparable approach in the educational field.

As documented in Bartel et al. (2017) and as a first step, a domain-specific modeling language (DSML) was created following a literature review considering more than 3600 papers and a domain analysis of 12 gamified learning platforms. More than 91 conceptual requirements (which were aggregated to concepts) for the Emendo DSML were elicited including various types of: game design elements (e.g. Badges, Points, Levels, Leaderboards etc.), tasks (e.g. single choice, multiple choice etc.), learning materials (e.g. texts, videos, podcasts etc.), rules for rewarding game design elements and giving feedback, and elements to arrange them into learning paths. Subsequently the Emendo Designer was created which enables the creation of models of the Emendo DSML by domain experts. These models are instances of the abstract Emendo DSML and bring gamified learning arrangements into practice: A code generator processes the gamified learning arrangements and its output serves as input for the Emendo Learning Management System (LMS). The Emendo LMS allows learners to work with the learning arrangements defined by lecturers. During learners' interaction with Emendo, lecturers can interact with them by discussing questions and giving feedback on learners' answers. Furthermore lecturers can track the individual learning progress of learners with the use of learning analytics the LMS provides.

2.2. Usage Scenarios

Emendo allows various scenarios of usage, depending on educational goals and the context it is used in. This variety of applications is made possible by the design of the system: In contrast to existing learning management systems, Emendo does not aim to provide static heuristics for the modeling of gamified learning arrangements.

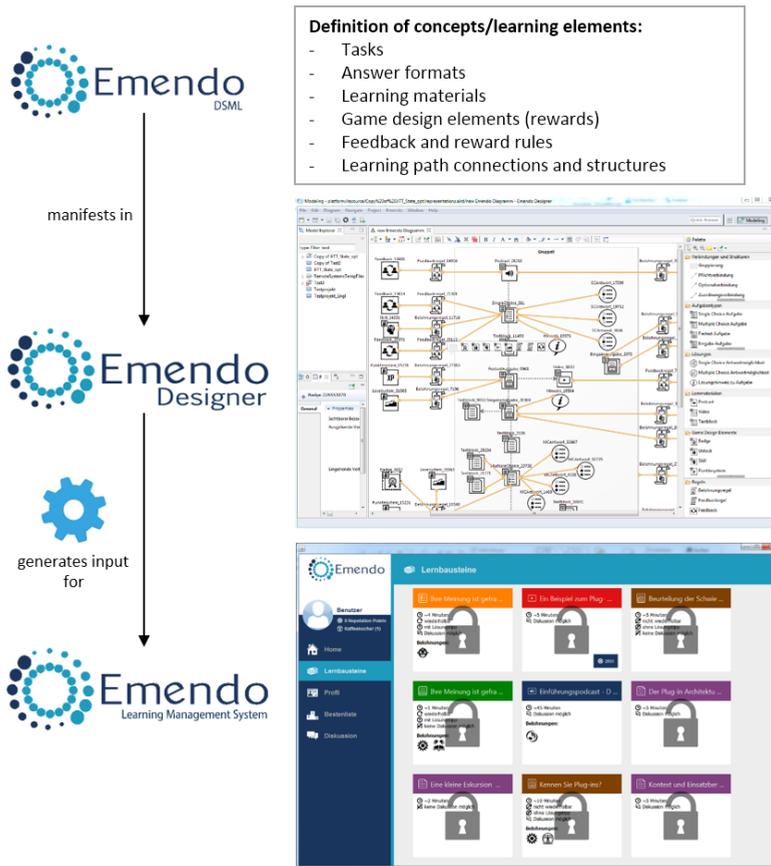


Figure 1. Overview of the Emendo toolchain

Emendo's basic heuristics can be changed and adapted as required and is not limited by a strict corset of building blocks for teaching. For example, if a particular type of learning task or a certain type of feedback is not represented, it can simply be added to the Emendo DSML as well as to the Emendo LMS. Admittedly, this adaptation requires a basic understanding of the technical functionality of Emendo. However, Emendo already provides a wide range of concepts that can be used in gamified online learning scenarios. In parts their use is described in the following from the perspective of lecturers.

Emendo allows the definition of individual learning paths and the structuring according to the learning goals or the educational contents of each path. This gives learners the freedom to choose which learning element they want to deal with according to their personal sense of competence and increases their sense of autonomy – an important influence on learning motivation according to the self-determination theory (Ryan & Deci, 2000). Besides the structuring of learning paths, Emendo also distinguishes between learning elements that are

optional and mandatory to process for learners. Hence, Emendo can be used simply for learning (e.g. reading texts, watching videos) or testing learners' performance (e.g. integrating a quiz consisting of different types of questions in the middle of a learning topic or in order to finalize a whole learning path). According to learners' actions and the progress state of learning elements, lecturers can integrate contextualized feedback. For example, if a learner answered a single choice question, Emendo allows the definition of several feedbacks, e.g. one which is displayed to provide a hint for its correct processing when it was answered incorrectly and another one which is shown when the answer was correct and to show its pedagogical value in the whole context (Nicholson, 2015). Besides feedback, learners can be rewarded with game design elements, like points or badges, which reflects typical elements of game mechanics like achievements or the collection of virtual goods (Werbach & Hunter, 2015). The game design elements not only serve as an external incentive, but also as a means of determining relative progress in comparison with other learners. This leads to social inclusion and comparison which can further drive the motivation to learn (Nah et al., 2013).

Emendo is not only extensible regarding its concepts, it is also scalable in terms of learning units. An entire course covering a whole semester can be defined (e.g. as a blended learning course), as well as a single unit within a course (e.g. as a peer instruction unit). Furthermore, from a students' point of view, the LMS can either be used as a client on computers or mobile devices which allows formal learning in educational institutions and informal learning in their leisure time.

3. Evaluation

3.1. Goals and Evaluation Concept

A first evaluation was conducted that aimed at finding out how lecturers evaluate Emendo. The following research questions guided the evaluation:

- RQ1: How do lecturers judge Emendo regarding its applicability and usefulness for their teaching in general?
- RQ2: How do lecturers judge the modeling experience using the Emendo DSML in the Emendo Designer for creating a gamified learning arrangement?

To answer the research questions a two-part qualitative evaluation concept was developed: As a first step and in order to enhance comparability, a short video was shown to the test persons demonstrating the components and features of the Emendo toolchain, followed by an semi-standardized interview based on the Structure Laying Technique (SLT) according to Scheele & Gröben (1988). In the second part, the test persons received a handout containing a description of the user interface of the Emendo Designer and explanations for the elements of the Emendo DSML. In addition, the handout contained a scenario

describing a gamified learning arrangement as a learning unit for a software engineering course. After the guided application of the Emendo Designer, test persons were interviewed using the SLT. As in the first part of the evaluation, the SLT allows given patterns of actions to be combined with experiments. Additionally, all statements of probands were visualized with flashcards and were adjusted in dialogue with the researcher. Thus, the interviewer can ask for more information on a certain argument.

The sample of this qualitative evaluation includes n=8 (3 female, 5 male) university lecturers who participated voluntarily. Each evaluation had an average duration of 2 hours. To maximize variety, the persons interviewed were chosen according to specific personal criteria (e.g. experience in using gamification, specialist area, experience in teaching etc.). The interviews were recorded and analyzed together with the flashcards regarding the research questions.

3.2. Results

Due to capacity reasons only a small part of the results are demonstrated in this contribution. In general, both research questions can be answered positively. In particular, all participants stated that they would actually integrate Emendo in their teaching since it supports the quick implementation of ideas for teaching. The vast majority (n=7) also stated that they see a high applicability of Emendo for learning because it is not bound to a technical discipline, its learning elements are extendable and it provides the possibility to increase students' learning motivation due to the use of gamification and the way it facilitates adaptive learning facets. Prerequisites for an integration in courses is a fast, intuitive and easy use of the tools, especially concerning the Emendo Designer with its DSML. Furthermore, the integration in existing LMS like Moodle has a high significance for the interview partners. In addition, Emendo needs to provide a solid documentation and support (e.g. automated imports) to keep the effort for switching over from existing course compositions low. Regarding the second research question, figure 2 gives an overview of the aggregated positive (green) and negative (red) statements.

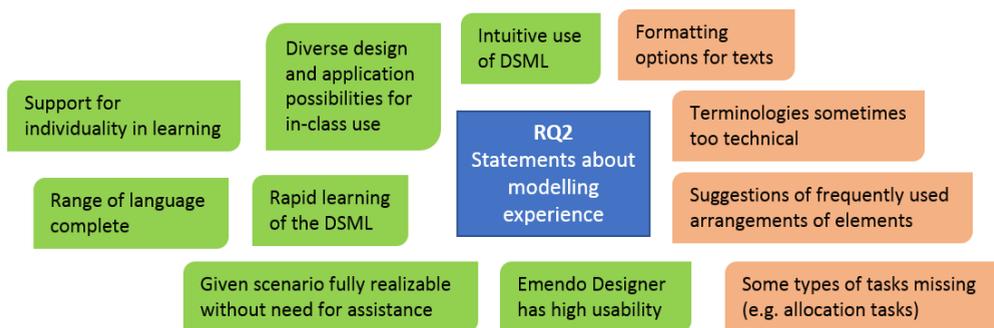


Figure 2. Aggregated result statements regarding RQ2

4. Conclusion and Future Work

This contribution demonstrates the Emendo toolchain, its components and suggestions for scenarios of usage based on its functionalities. A qualitative evaluation of its goals, concepts is shown along with insights on results. Emendo introduces a new type of platform-based and gamified online learning that reaches high acceptance for teaching purposes. However, the evaluation also reveals some issues for improvement. Besides that, another evaluation focusing on learners' needs will be conducted as a next step in order to examine learners' attitudes towards the LMS and this specific way of learning. After that, more studies can follow which should be conducted in different subject areas, but at the same time using comparable designs of gamified learning arrangements.

References

- Bartel, A., Hagel, G., & Wolff, C. (2017). Effective Integration of Gamification and Learning Management Systems for Creating Gamified Learning Arrangements. In J. Domenech, C. M. Vicent-Vela, E. de La Poza, & D. Blazquez (Eds.), *Proceedings of the 3rd International Conference on Higher Education Advances* (pp. 679–686).
- Bartel, A., & Hagel, G. (2014). Engaging Students With a Mobile Game-Based Learning System in University Education. *International Journal of Interactive Mobile Technologies*, 8(4), 56–60.
- Bartel, A., & Hagel, G. (2016). Gamified Just-in-Time Teaching - A Conceptual Approach Based on Best Practices. In G. Hagel & J. Mottok (Eds.), *Proceedings of ECSEE 2016 - European Conference Software Engineering Education* (pp. 1–17). Aachen: Shaker.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. In A. Lugmayr, H. Franssila, C. Safran, & I. Hammouda (Eds.), *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9–15).
- Dicheva, D., & Dichev, C. (2016). An Active Learning Model Employing Flipped Learning and Gamification Strategies. In *Proceedings of first Int. Workshop on Intelligent Mentoring Systems (IMS 2016)*, Zagreb, Croatia (pp. 1–6).
- Dicheva, D., Irwin, K., Dichev, C., & Talasila, S. (2014). A course gamification platform supporting student motivation and engagement. In *2014 International Conference on Web & Open Access to Learning (ICWOAL)* (pp. 1–4). Piscataway, NJ: IEEE.
- Hakulinen, L., Auvinen, T., & Korhonen, A. (2015). The Effect of Achievement Badges on Students' Behavior: An Empirical Study in a University-Level Computer Science Course. *International Journal of Emerging Technologies in Learning (iJET)*, 10(1), 18–29.

- Hasegawa, T., Koshino, M., & Ban, H. (2015). An English vocabulary learning support system for the learner's sustainable motivation. *SpringerPlus*, 4(99).
- Ibanez, M., Di Serio, A., & Delgado Kloos, C. (2014). Gamification for Engaging Computer Science Students in Learning Activities: A Case Study. *IEEE Transactions on Learning Technologies*, 7(3), 291–301.
- Kelly, S., & Tolvanen, J.-P. (2008). *Domain-specific modeling: Enabling full code generation*. Hoboken, N.J.: John Wiley & Sons.
- Nah, F. F.-H., Telaprolu, V. R., Rallapalli, S., & Venkata, P. R. (2013). Gamification of Education Using Computer Games. In S. Yamamoto (Ed.), *Lecture Notes in Computer Science. Human Interface and the Management of Information. Information and Interaction for Learning, Culture, Collaboration and Business* (Vol. 8018, pp. 99–107). Springer Berlin Heidelberg.
- Nah, F. F.-H., Zeng, Q., Telaprolu, V. R., Ayyappa, A. P., & Eschenbrenner, B. (2014). Gamification of Education: A Review of Literature. In F. F.-H. Nah (Ed.), *HCI in Business: First International Conference, HCIB 2014, Heraklion, Crete, Greece, June 22-27, 2014. Proceedings* (pp. 401–409). Cham: Springer.
- Nicholson, S. (2015). A RECIPE for Meaningful Gamification. In T. Reiners & L. C. Wood (Eds.), *Gamification in Education and Business* (pp. 1–20). Cham: Springer International Publishing.
- Roderus, S. (2015). Ein Kurskonzept zur Förderung des kontinuierlichen Lernens durch den Einsatz von Gamification. In Zentrum für Hochschuldidaktik (Ed.), *Tagungsband zum 2. HDMINT Symposium 2015* (pp. 81–86).
- Ryan, R. M., & Deci, E. L. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist*, 55(1), 68–78.
- Scheele, B., & Groeben, N. (1988). *Dialog-Konsens-Methoden zur Rekonstruktion subjektiver Theorien: D. Heidelberger Struktur-Lege-Technik (SLT), konsensuale Ziel-Mittel- Argumentation u. kommunikative Flußdiagramm-Beschreibung von Handlungen*. Tübingen: Francke.
- Smolka, D. (2004). *Schülermotivation: Konzepte und Anregungen für die Praxis* (2., durchges. Aufl.). München, Neuwied: Luchterhand.
- Werbach, K., & Hunter, D. (2015). *The Gamification Toolkit: Dynamics, Mechanics, and Components for the Win*. New York: Wharton Digital Press.

Identifying the effectiveness of e-learning platforms among students using Eye-Tracking technology

Chivu, Raluca-Giorgiana ^a; Turlacu, Luiza-Maria ^b; Stoica, Ivona ^c; Radu, Andra-Victoria ^d

^{ab}Department of Marketing, The Bucharest University of Economic Studies' Romania,

^c"Dimitrie Cantemir" Christian University, ^dUniversity of Medicine and Pharmacy "Carol Davila"

Abstract

The emergence of computers has led to a rapid evolution of the learning environment. In recent decades, new information and communication technology tools have contributed to major changes in learning. In this way, new forms of learning have emerged, such as learning in the virtual environment (e-learning). To support online education, it was necessary to develop a whole industry. Today there are a lot of products and services on the market from which you can choose the optimal solution. In this article were analyzed two of the elearning platforms within prestigious universities in Romania, in order to identify students' opinions about their existence, the degree of utility and usability they feel, and the possibilities for their improvement for a more good absorption among beneficiary students. The results have shown that elearning platforms are seen as a plus for the student, but there are still possibilities for improvement to catch up on the technologically advanced level.

Keywords: *E-learning; eye-tracking; higher education.*

1. About E-learning

There are many answers to the question "What is eLearning?" Some common answers would be: Internet, network or CD-ROM education; electronic transfer of skills and knowledge, a distributed learning component that includes digital content and is experienced through an kind of interface created with the latest technology available through the Internet. With the increase in Internet coverage and the evolution of gadgets, the education system has adapted to new media, helping to attract students and young people to the Internet by creating and delivering e-learning platforms, recognized as the online basis of courses taught in the classroom. About eLearning we can say that it has its starting point in the desire for effective communication between student and teacher. The basics of eLearning reflecting and summing up both the principles of teaching and teaching (Hubackova, 2014). In other words, through eLearning in a broad sense, we can understand a distance learning teaching process achieved through computer and communication technologies that allow the elimination of geo-spatial boundaries between teacher and student. The development of eLearning is closely related to the development and improvement of technology, increasing the usability and accessibility of computers or other electronic tools that can easily access learning platforms online (Hubackova, 2014).

Specialists believe that with the proper use of eLearning technologies or learning through the online environment, the learning environment of students can be enhanced, giving them the chance to gather information when they feel they are ready or when they feel it is needed, without being suppressed under the space and time limit, as is the case with the classical teaching process (Lam, et al., 2014). Also, another advantage of using electronic forms of teaching is the degree of permissiveness of the author or the creator of the course who can adapt teaching methods so as to best fit the learning style adopted by the student, precisely because in the classical teaching process learning, this is known to be one of the main obstacles to the transmission of information (Hubackova, Klimova, 2013).

On the other hand, however, within the techniques and tools used, the teacher / author has a lower control over the degree of access, or use of the information provided by the students. In this manner, the only possible assessment of the efficiency of using eLearning techniques is to undergo a form of examination of the beneficiary students. However, even under these conditions, the use of e-learning methods and platforms has become a trend especially in higher education institutions, where there is a common interest in their use, both on the part of teachers who are easier to communicate with the course holders or other organizational or administrative information, as well as for students, who are easily able to access whenever they consider necessary course support or information received. Another essential utility is found in non-frequent or distance education, where it is almost impossible to have direct communication between a professor and a student, which is why the eLearning platforms represent a real advantage, especially if most students think they

have a medium-high experience of using a computer or laptop, or other gadgets through which they can access e-learning resources and / or e-learning platforms (Popovici and Mironov, 2015).

2. Eye-tracking, modern method of research

In terms that are easy to explain, Eye-Tracking is the technique of measuring eye activity. What are we looking at? Where do we look? What are we ignoring? The reason we blink? How does the pupil look at different stimuli? All of these answers can be found through this neuromarketing tool. Data provided by Eye-Tracking can accurately provide information about where consumers are interested in an image (Fen, et al., 2018)

According to Jacob and Karn (2003, p.574), computer-based studies of eye movements date back more than 100 years. To observe the movements, the initial methods of determining the ocular position were quite invasive, invoking a direct contact between the mechanical instrument and the cornea. In 1901, the first non-invasive method of observing eye movements through the corneal reflection was developed, but at that time it was possible only for horizontal movements and without the subject being allowed to move his head. It was not until 1930 that scientists began to apply the methods until then, developing them and managing to perceive eye movements in all directions at the time of reading. In 1948, Hartridge and Thompson created the first eye-observation device attached to the head of the subject. Of course, with the passage of time things have evolved more and more, reaching today, with a gadget that we can see where the subject looks, what attracts more attention, why, s.a.m.

In order to determine all of these indicators, a device called eye tracker is required. "Eye tracker is a piece of hardware that recognizes eye movements at the computer screen, or on an object, or the environment in general" (Bojko, 2013, p.6). There are several types of eye trackers: some are attached to a pair of glasses or a special hat that bears the subject of the research, others are attached to computer monitors. Their mechanism of operation is based on a transparent, infrared light beam, pointing to the human face, which recognizes two standard elements: reflection of the retinal light, which contributes to the centering of the pupil and the reflection of the light in the cornea.

3. Research

Research is based on identifying the degree of accessibility of elearning platforms among students through Eye-Tracking tools. Thus, by displaying images, screenshots from various elearning platforms, and through the device, I have an observer that was the most attractive area for the student, and how intensely or quickly they read the information in the picture.

Basically, to obtain additional information, an experimental "Before-After Without Control Group" experiment was used, in which, the previously measured variable was the level of notoriety and usability of the Elearning platforms, the experimental treatment consisted of displaying E-learning platforms for people in the target group, after which an interview guide was made as a measurement after, from which we tried to highlight the differences.

3.1. The study

The images used were taken from the two e-learning platforms of prestigious universities in Romania, namely the Bucharest University of Economic Studies and the Polytechnic University of Bucharest, to perform both a comparative analysis of the two possibilities of the user interface, and to identify what points of interest the student is and what improvements or recommendations he / she would bring to increase traffic on the platforms. Basically, to obtain additional information, an experimental "Before-After Without Control Group" experiment was used, in which, the previously measured variable was the level of notoriety and usability of the Elearning platforms, the experimental treatment consisted of displaying E-learning platforms for people in the target group, after which an interview guide was made as a measurement after, from which we tried to highlight the differences.

3.2. Methodology of research

The study was led by the formation of a group of participants, a student, composed of 35 persons, an interview guide on the knowledge, awareness, interest, attitude and usage of the eLearning platforms was applied to the charity, to be given an experimental treatment (pictures with the interfaces of the two eLearning platforms analyzed), where responses, attention levels and eye movements were observed with the Eye-Tracking device.

3.3. Developing the interview guides

The interview applied before the experimental treatment made reference to the degree of use and the reputation of the eLearning platforms as well as to the students' attitude towards them, while the interview applied after viewing the images was more practical, referring more to the subjective opinion towards the eLearning platforms analyzed in the research.

3.4. Interpretation of results

In the interview before the platforms, the conclusions obtained from the respondents' answers showed that "most of the interviewed students stated that eLearning platforms are a great addition to their evolution in the university environment by allowing them to access and read the materials curriculum at any time, and anywhere, and that they no longer feel connected with this obligatory physics during the classroom, managing to combine studies with a job.

We were also interested at what time of day the students use the eLearning platforms, and the responses were grouped according to Fig.1, the students motivating the choices made in terms of the available time allocated for the hours spent at work or other daily activities.

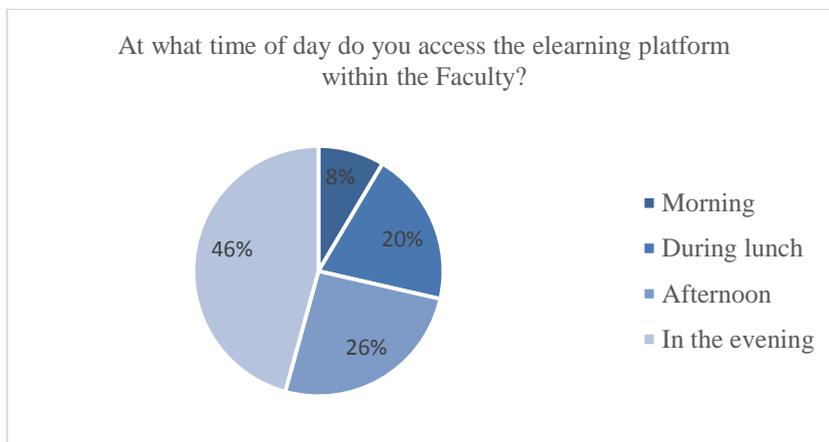


Fig.1. The moment when elearning platforms are accessed. Source: made by the author in the research

Another question relevant to this research was the question of how often students access the elearning platforms of the faculties, the results showing according to Fig. 2, the participating students motivating that they use the elearning platform more often during the exams during the semester.

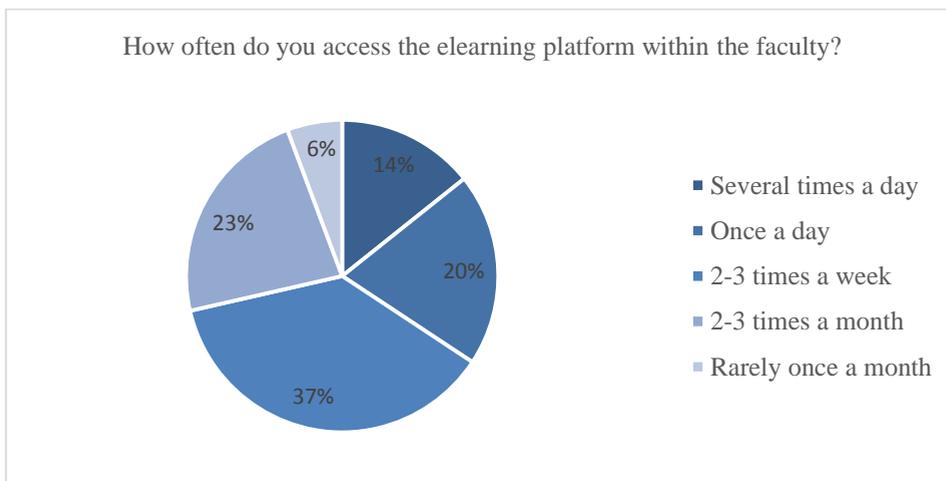


Fig.2. Frequency of access to elearning platforms. Source: made by the author in the research

Subsequently, the participants showed the pictures with the two platforms, and before interpreting the results obtained during the interview after this experimental treatment, we discussed the ways of observing and focusing on the platforms, as follows:

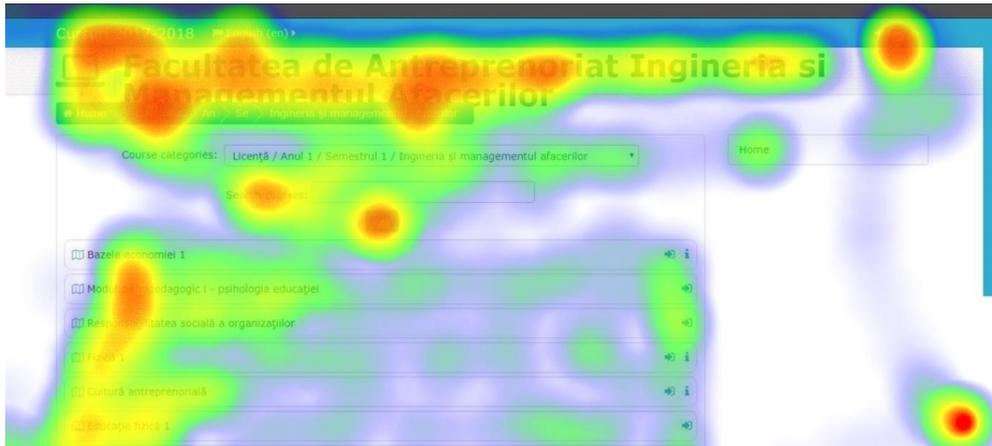


Fig. 3. Heat map of the eLearning platform ASE Bucharest. Source: made by the author in the research

In the case of the elearning platform at the Bucharest Academy of Economic Studies, we can see from the heat-map analysis that the students' attention was focused more on the menu on the left and on the course names, while still looking at the edges of the screen in search of additional information or instructions for use.

As mentioned, the eye-tracking device measures and monitors both eye movements, indicating the locations and areas in which the participant looks, as well as the intensity and duration of staying on a visual element. In the attached picture, we can see that the more pronounced red shades highlight the points of interest for the participants, such as the platform's use menu and course names.



Fig. 4. Heat map of the e-learning platform Politehnica Bucuresti. Source: made by the author in the research

In the case of the e-learning platform at the Politehnica University of Bucharest, it is highlighted by the heat map that the students attended more attention to the name of the faculty. Subsequently, when asked why they thought they paid more attention to that area on the web page, most of the papers were related to the font and dimensions used for editing, and the absence of a menu visible directly on the homepage platform. Also, in the case of the same image, the participating students looked both at the course names and in the free spaces until the logs, search and home buttons were identified.

Finally, the participating students were asked what improvements they thought could be brought to eLearning platforms, and their responses indicated a more user-friendly interface that would not look outdated, and maybe a better organization of courses and seminars, grouped by years study, disciplines, etc.

4. Conclusions

In the research, we have seen that elearning platforms are useful and effective tools for higher education, with a high degree of notoriety. On the basis of the experiment I have obtained information on the degree of use of such platforms, the frequency of use and the possible improvements that could be made to them. Through the Eye-Tracking measurement tool, we have obtained relevant insights into the positioning of menu items within elearning platforms to make them more user-friendly and user-friendly, as well as on the elements and spaces on the web page students and / or users pay attention. Thus, we can easily identify where we can place a general interest announcement on platforms to be seen by users.

References

- Bojko, A., (2013). *Eye Tracking the user experience- A Practical Guide to Research*, New York: Rosenfeld.
- Fen, X., Liangchan, P., Gao, L. and Xieping, G., (2018). Salient object detection based on eye tracking data, *Signal Processing*, 144(392-397) .
- Hubackova, S., (2014). Pedagogical Foundation of Elearning, *Procedia - Social and Behavioral Sciences*, 131(May)(24-28).
- Hubackova, S., (2015). History And Perspectives Of Elearning, *Procedia - Social and Behavioral Sciences*, 191(1187 – 1190).
- Hubackova, S., and Klimova, B.F., (2013). Pedagogical Aspects of eLearning. Language On-line Course and Issues of Learning Styles, *Procedia - Social and Behavioral Sciences*, 93(1095 – 1098).
- Jacob, R.J.K. and Karn, K.S., (2003). Eye Tracking in Human–Computer Interaction and Usability Research: Ready to Deliver the Promises, *Mind*, 2.3 :4.

- Lam, P., McNaught, C., Lee, J., and Chan, M., (2014). Disciplinary difference in students' use of technology, experience in using eLearning strategies and perceptions towards eLearning, *Computers & Education*, 73(111-120).
- Popovici, A., & Mironov, C., (2015). Students' perception on using eLearning technologies, *Procedia - Social and Behavioral Sciences*, 180(1514 – 1519).

Who is even studying journalism to become a journalist?

Prandner, Dimitri^a and Moosbrugger, Robert^a

^aDepartment for empirical Social Research, Johannes Kepler University Linz, Austria.

Abstract

The paper addresses the question why people are entering training programs which disseminate knowledge necessary for becoming part of the journalistic profession and how these motives go along with the intention to become a member of the profession. Therefore it draws on data collected among students in journalism related programs in Austria in 2015 (n=352) and tests the linkage between socioeconomic background of the students, their motives for entering a program and how these affect the intention to work in the field of journalism. Factor analysis allowed the identification of four main motives: political and social agency; employment driven; social benefits; and calling/talent. Results show that a) motives for entering a program differ according to the socioeconomic background of the respondents. And b) the intention to work in the field is higher if motives tied to the ideas of agency and calling are reported and lower if employment driven motives are predominant. This leads to the conclusion that the motivation of students to join the journalistic profession is deeply related to beliefs and normative aspirations of individuals.

Keywords: journalism; higher education; profession; motivation.

1. Journalism as profession

The two most general ideas underlying professionalism are the belief that certain work is so specialized as to be inaccessible to those lacking the required training and experience and the belief that it cannot be standardized (Freidson 2001, p. 17).

Freidson (2001) identifies professionalism as a specific form of social coordination. A profession draws on “a body of knowledge and skills ... based on abstract theories”; an “occupationally controlled labor market requiring training credentials”; as well as “an occupationally controlled training program ... associated with ‘higher learning’” and shared codes of conducts (Freidson 2001, p. 180). What makes belonging to a profession so appealing is the image and prestige associated with the members of the collective (Evetts, 2011). This paper addresses the question why people are entering training programs which disseminate knowledge necessary for becoming part of the journalistic profession and how these motives go along with the intention to become a member of the profession. According to Hanusch et al. (2016, p. 102) *understanding why students choose journalism, and what career expectations they hold, is important not only for educators but also for wider society and public debates about the future of journalism and the value of tertiary journalism education.*

1.1 Journalism and Journalism Education in Austria

The case study in this paper is tied to Austria, a western democracy that is renowned for its highly concentrated media market, as well as the fact that the legislature offers no strict path to become a journalist, e.g. dedicated schools of journalism (Kirchhoff & Prandner, 2016). The reason for this specific situation is tied to the professionalization process, that happened over the last 70 years and can be roughly divided into three waves. The first phase is tied to the aftermath of World War 2 when the intention was to establish vocational orientated training programs, which failed and thus may be the primary reason why there are no dedicated J-schools today (Hummel et al., 2012, p. 6). The idea of journalism as a vocation founded in talent and calling was strong at this time. It was not until the late seventies – as a consequence of the then newly established press-subsidies-law, which also provides money for journalism education – that both, university level education as well as practice orientated training programs found traction (Hummel et al., 2012, p. 7). This split happened as young journalists were primarily interested in practical training, but not in theoretical backgrounds, which are at the center of the curricula of Austrian universities (Pürer, 1981). The vast majority did not judge university degrees as useful for a career in journalism. The third phase began with the establishment of Universities of Applied Sciences (UAS) in Austria in 1993. Further training programs were created, as the demand from people interested in getting a training in the journalistic craft rose. Despite the

industry not having the capacity to absorb the high number of graduates, coming from all the different programs that tie to journalism (Dorer et al., 2009; Kirchhoff & Prandner, 2016, p. 95; similar for UK, compare Frith & Meech, 2007).

Macro-analytical studies between 2007 and 2011 show that the Austrian journalist-population consists of approximately 6.000 professionals (Hummel et al., 2012; Kaltenbrunner et al., 2007). While it has to be noted that macro studies that map the field are missing since 2011, evidence suggests that those numbers have proven to neither decrease nor increase in any significant way (Kirchhoff & Prandner, 2016). Yet the number of individuals with university degrees in the field continues to rise and currently a third of the professionals finished university level education (ibid.). This makes us go full circle to the quote by Hanusch et al. (2016) that concluded the first part of this paper: Why do students enroll communication studies – by extension journalism studies? Why do they chose the program and do they at all intend to become part of the journalistic profession?

1.2 Entering the field: In-between expectations and reality

Studies among students asking for motives for studying journalism or for intentions to work in the field overall identify two main motives: conversion related (e.g. appealing working conditions) and interest related (e.g. pleasure for writing). However, their importance differs according to context (e.g. country) and population (e.g. print vs. broadcast). Hanusch et al. (2016) report that the most dominant motivations for studying journalism are hopes for a varied lifestyle and opportunities to express creativity. Less important are public service ideals and financial concerns. Pjesivac (2017) found that both, intrinsic and extrinsic motivations have a significant impact on the willingness to work in journalism. However, Madison et al. (2017) conclude that among majors in mass communication the perceived ability to satisfy intrinsic needs leads to higher satisfaction with the chosen major. Bjornsen et al. (2007) investigated, beneath motivations for studying journalism, the socio-economic background of becoming journalists over time and what difference J-schools make by shaping becoming journalists. Specific expectations of what makes a good journalist prevail. Those expectations are embedded into the field as both, part of the *doxa* – understood as central believes – and *illusio* – understood as central reasons – that govern the how and why individuals intend to participate in a given field. Yet those expectations are shaped by the participants within a field, they are also influenced by entities outside the field as people are exposed to different socialization instances (Bourdieu 1998). According to Bourdieu and Wacquant (1996) a field is an agglomeration of relations between positions. Its structures are a result of the distribution of power within the field. Each field follows an own logic and implicitly evolves codes of conducts (*doxa*). To participate in a field individuals have to possess specific capabilities and be aware of the applicable codes of

conduct. Individuals decide to participate in a certain field – e.g. journalism and therefore attend a certain education – if they believe they will benefit from participation. This is what Bourdieu calls *illusio*. It describes the interests as well as meanings and values associated with the field. Participating also means accepting the *doxa*. Nevertheless participants enter with a certain *habitus* which is the incorporation of socialization experiences. However, although the *habitus* is an individual trait it changes over time as individuals interact in certain fields (Bourdieu, 1987). This leads to the following questions (see also figure 1):

What are the motives for entering a training program related to journalism? How are these motives influenced by the socioeconomic background?

How are these motives associated with the intention to work in the field of journalism? How does the institution of training and the progress in study influence this intention?

2. Methodological design

The data used for the analysis is based on the national dataset of the “Journalism Students across the Globe”-project (JSAG, 2015), which collected data on Austrian journalism students in 2015 via pen and paper survey at all three Austrian universities that offer communication studies and three universities of applied sciences that offered journalism related programs. The survey included background information on the students, as well as their values, aspirations and attitudes. As there are no programs that lead to the job title of journalist, the field team selected the largest lectures in both Bachelor and Master programs on the topic of journalism at a given semester and distributed the survey directly to the students. Opting out was possible. This can be described as a multi-stage sampling process that was guided by the conscious decision to recruit individuals that have at least somewhat of an interest in journalism. This resulted in a sample size of 352 individuals. While not a random sample, it offers relevant insights into the structure of students and helps identify core issues tied to the field of journalism studies and journalism education. The analyses were calculated via IBM SPSS V24 and AMOS V23.

2.1. Description of variables

Table 1 shows the means of the items regarding the motivations of the respondents for entering a program. Most agreeable motivations are having a *varied and lively work, being able to be creative* and the *chance to meet different people*. Prospects for a *dynamic lifestyle, pleasure of writing* and *the amount of autonomy one has* are important as well. This goes along with findings of Hanusch et al. (2016). Of less importance is the *prestige of journalism as a profession, helping the government to achieve its goals* and *being famous*.

Table 1. Descriptive statistics motivations and component analysis

Variable	Loadings	Communalities	N	Mean	SD	
Component 1: political and social agency (Var. explained: 34,8%; Cronbachs Alpha: 0,890)						
work for freedom and democracy	,853	,819	349	2,49	1,308	H
fight injustice	,852	,775	351	2,54	1,269	H
hold people in power accountable	,827	,718	349	2,25	1,191	H
help in nation-building	,753	,637	351	2,69	1,227	H
chance to influence public	,748	,589	350	2,13	1,123	H
help government achieve its goals	,684	,478	351	1,71	0,867	H
help people in their everyday life	,576	,396	350	2,80	1,131	H
Component 2: employment driven (Variance explained: 15,1%; Cronbachs Alpha: 0,666)						
secure job	,892	,820	350	2,34	1,251	L
income	,829	,723	348	2,85	1,172	L
autonomy one has	,500	,467	346	3,35	1,112	
Component 3: social benefits (Variance explained: 9,4%; Cronbachs Alpha: 0,593)						
travel	,783	,663	353	2,58	1,351	
meet different people	,681	,495	352	3,85	1,013	
dynamic lifestyle	,660	,463	350	3,42	1,104	
Component 4: calling/talent (Variance explained: 8,0%; Cronbachs Alpha: 0,820)						
talent for	,868	,838	350	2,56	1,246	H
pleasure of writing	,866	,861	351	3,36	1,299	H

Descriptive statistics Motivations (Mean: Scale 1 – 5): low score equals low impact on motivation
H: sig. higher scores from people who aspire to be journalists; L: sig lower scores; sig <= 0,005 / MW-U-Test
Excluded items: varied and lively work (N=349;Mean=4,44;SD=0,747); be able to be creative
(N=350;Mean=4,05;SD=1,013); hold people in power accountable (N=349;Mean=2,25;SD=1,191;H); prestige of
journalism (N=352;Mean=1,89;SD=0,998;H); being famous (N=349;Mean=1,53;SD=0,866;H)

On the basis of an exploratory factor-analysis four components were extracted. *Component one* is named political and social agency as it is associated with items like work for freedom and democracy, fight injustice etc. *Component two* was deemed to be employment driven, as it includes the aspiration for a secure job and high income. *Component three* describes

expected social benefits that go along with working in journalism (e.g. the opportunity to travel). Finally, *component four* is associated with the idea of journalism as a calling, indicating that the profession and thus the programme just fits the talents of the respondents. As indicators for the socioeconomic background the *education of the parents* (1=at least one parent has completed tertiary education – 32,6%; 0=no parent with tertiary education) and the *economic conditions when growing up* (Scale 1 – 5: 1=well below average; 5=well above average) were included in the model. To estimate the effects of the training process the variables *university* (1=public university – 71%; 0=university of applied science) as well as *master* (1=postgraduate – 15,5%; 0=undergraduate) were included. Control variables are *sex* (1=female – 81,4%; 0=male) and *age in years* (Mean: 23,4). Dependant variable is the intention to work in the field (1=journalism – 23,4%; 0=others).

3. Results

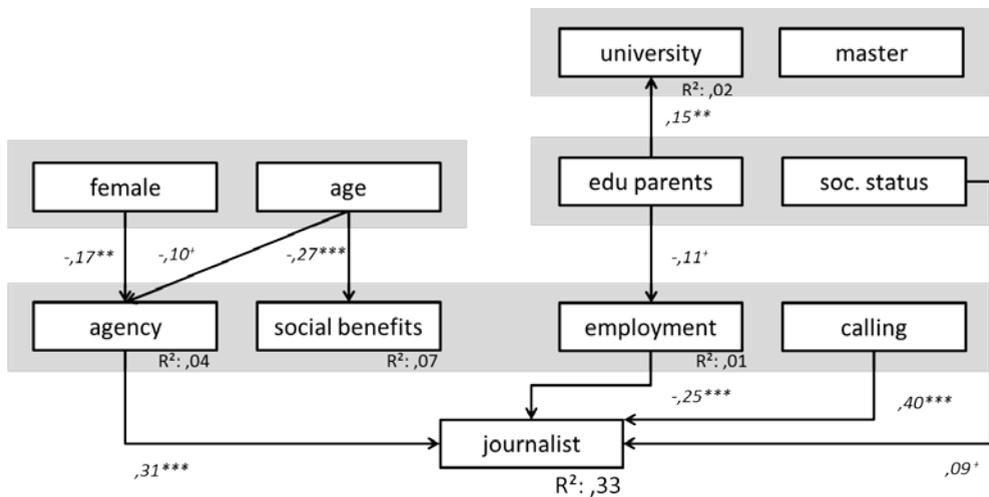


Figure 1. Trimmed model (+ $p < 0,1$; * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$) arrows indicate direction of influence; Aspiring to be a journalist is the dependent variable for the model (1 = yes / 0 = no)

Taking a look at the trimmed path model (figure 1) it becomes obvious that the education of the parents has a significant influence regarding the importance of employment related issues. It also influences whether a program at a public university or a university of applied sciences is chosen. Individuals coming from parents without a university background tend to favor universities of applied sciences as well as regard employment associated gratifications of more importance. Yet the socioeconomic status when growing up

influences the intention of working in the field of journalism. The better the conditions when growing up are rated the more likely the individuals are to intend to work in journalism. The motives are most strongly tied to the sociodemographic control variables (sex and age). Men are more interested to work on the political and social agenda setting. The older the respondents are the less interested they are to work on those issues and the less important the social benefits going along with the profession are. The intention to work in the field of journalism is dependent on the motives *agency*, *employment* and *calling*. Someone reporting the motive of agency is more likely to intend to work in the field. The same is true for those who think journalism is their *calling*. Those focusing on *employment* related issues rather do not intend to work as journalists. Those seem to be individuals interested in the field but well aware of the struggles in the job market. Yet the context of where someone studies and how far he or she has progressed in his or her studies does not make any difference on their aspiration to work as journalists.

4. Conclusion

Our results show that the motivation to join the journalistic profession is deeply related to beliefs of individuals. Those who study journalism related subjects at the tertiary educational level have normative aspirations like a political or social agenda and interpret journalism as a calling. Understandably so as those ideas are deeply ingrained into the doxa as well as the *illusio* of the field (Kirchhoff & Prandner, 2016). Journalism is framed as a profession that strives to challenge the mighty, where those who think they have the talent to be a wordsmith aim to make their mark, as the term the *fourth estate* so vividly illustrates (McQuail, 2013) and makes interested individuals endure in a dire job market (Dora et al., 2009). Yet those fundamental underpinnings are not the primary concern for many who study journalism. Those who are focusing on employability are less likely to aspire to be journalists, even if they study a subject with close ties to the field. For educators this heterogeneity in higher education has to be seen as challenge, as the field of journalism studies is highly normative and tied to the concept of the fourth estate and civil sphere. The discrepancy between curricular focus and students aspirations makes it necessary to rethink how core concepts of journalism related education can be framed in a broader context. That the education of the parents is a deciding influence on the reasons why someone aspires a profession and how someone chooses which university he or she visits matches with former empirical findings. In Austria education is still strongly tied to family background and people from families with lower education are more likely to search for education that brings more tangible results and increases their employability. Even as more employment driven training and education programs are offered, journalism remains a field that is governed by the aspirations and beliefs of individuals and the *illusio* individuals bring with themselves.

References

- Bjornsen, G., Hodven, J. F., & Ottosen, R. (2007). Journalists in the Making. Findings from a longitudinal study of Norwegian journalism students. *Journalism Practice*, 1(3). 383-403.
- Bourdieu, P. (1987). *Sozialer Sinn: Kritik der theoretischen Vernunft*. Frankfurt: Suhrkamp.
- Bourdieu, P. (1998). *Praktische Vernunft. Zur Theorie des Handelns*. Frankfurt: Suhrkamp.
- Bourdieu, P., & Wacquant, L. J. (1996). Die Ziele der reflexiven Soziologie. In P. Bourdieu & L.J. Wacquant (eds.). *Reflexive Anthropologie* (pp. 95 – 249). Frankfurt: Suhrkamp.
- Dorer, J., Götzenbrucker, G., & Hummel, R. (2009). The Austrian journalism education landscape. In G.Tetzis (ed.). *European Journalism Education* (pp. 1296-1550). Chicago: University of Chicago Press.
- Evetts, J. (2011). A new professionalism? Challenges and opportunities. *Current Sociology*, 59, 406-422.
- Friedson, E. (2001). *Professionalism. The Third Logic: On the practice of knowledge*. Chicago: University of Chicago Press.
- Frith, S. & Meech, P. (2007). Becoming a journalist. Journalism education and journalism culture. *Journalism*, 8(2), 137-164.
- Hanusch, F., Clifford, K., Davies, K., Englisch, P., Fulton, J., Lindgren, M., O'Donnell, P., Price, J., Richards, I., & Zion, L. (2016). For the lifestyle and a love of creativity: Australian students' motivations for studying journalism. *Media International Australia*, 160(1). 101-113.
- Hummel, R., Kirchoff, S., & Prandner, D. (2012). *Journalismus im Wandel* (Forschungsbericht für die RTR). University of Salzburg.
- JSAG (2015). *Journalism Students Across the Globe*. Retrieved from <http://www.jstudentsproject.org/>
- Kaltenbrunner, A., Karmasin, M., Kraus, D., & Zimmermann, A. (2007). *Der Journalisten-Report*. Vienna: Facultas.WUV.
- Kirchhoff, S., & Prandner, D. (2016). Bausteine des journalistischen Selbstbilds. In *Medien-Arbeit im Wandel* (pp. 93-114). Wiesbaden: Springer VS.
- Madison, E., Hopp, T., Santana, A. D., & Stansberry, K. (2017). A Motivational Perspective on Mass Communication Students' Satisfaction With Their Major: Investigating Antecedents and Consequences. *Journalism & Mass Communication Educator*, D.O.I.: 1077695816687408.
- McQuail, D. (2013). *Journalism and society*. London: Sage.
- Pjesivac, I. (2016). What moves young people to journalism in a transitional country? Intrinsic and extrinsic motivations for working in journalism in Serbia. *Journalism*, D.O.I.: 1464884917738428.
- Pürer, H. (1981). Journalistenausbildung im Urteil von Presse Entscheidern. Ergebnisse einer Umfrage des „Kuratorium für Journalistenausbildung“. *Medien Journal*, 7(4), 9-15.

Location Based Mobile Games as educational means.

The case of The Fellowship of the Umbrella

Sciannamè, Martina^a; Mariani, Ilaria^a and Spallazzo, Davide^a

^aDepartment of Design, Politecnico di Milano, Italy.

Abstract

The paper discusses how Location-Based Mobile Games can successfully support informal educational activities. Looking at them as meaning-making tools, the paper frames the field of action and then explains the peculiarities that make such games powerful means for informal learning: the different levels of learning conveyed by the activity of designing and playing LBMGs; their communicative nature; the implication of being situated and of including physical/spatial activities in the process of interiorizing the experience and realising its sense in a personal way; the meaningful relationship among the game magic circle, the fictional world, and the situated space; the open and free state of mind of the learners-players coming from wearing a mask and hence play a role during the game; and the effectiveness of stealth approaches to foster engagement and, therefore, deeper understanding. The value and opportunities coming from such features in terms of both design and learning are presented and discussed through a case study: The Fellowship of the Umbrella, a LBMG developed during the academic course of Augmented Reality and Mobile Experience at Politecnico di Milano.

Keywords: *Game-based learning; LBMGs; active pedagogy; informal learning; situated experiences; meaningful play.*

1. Introduction

The paper discusses Location-Based Mobile Games (LBMGs henceforth) as informal educational means moving from a case study born in a formal educational context. LBMGs are games that rely on geo-localization to provide contextual play activities. Frequently mentioned with other names, such as mixed-reality games (Montola, 2011) or hybrid-reality games (de Souza e Silva & Delacruz, 2006), LBMGs have the ability to modify the gameplay according to players' current location, mixing a digital experience, provided through a mobile device, with a physical one, performed in the real world. Born in the early years of the new millennium with experimental games such as *Botfighters* and *Mogi*, LBMGs are coming of age and recently reached the wide public with titles like *Pokémon Go*, by Niantic and Nintendo, with billions in revenues. Since their early beginnings, LBMGs have been employed for informal educational purposes, capitalizing on their ability of enhancing the physical play experience with digital layers of information, therefore conveying knowledge while entertaining. Games such as *Environmental Detectives* (Klopper, Squire, & Jenkins, 2002) paved the way to several experiences aimed at fostering learning through located play. *The Fellowship of the Umbrella* (Sciannamè & al., 2014) sets in this context as a LBMG aimed at sensitizing players on the issue of disabilities. It stemmed from the didactic course *Augmented Reality and Mobile Experience* at Politecnico di Milano. The first author of the paper was involved in the design of the game, while the other authors were teachers of the course, therefore the paper essentially brings two perspectives: that of the designer who crafted the game, and that of the researchers who firstly mentored and then analysed the experience it generated.

In particular, the results here discussed are drawn following a mixed methods approach that allowed to collect data applying a triangulation on the qualitative data culled, facilitating their validation through cross-verifying different sources. During the iterative cycles of design that ran over three consecutive months, we conducted interpretive ethnography and participant observation, while shadowing and informal interviews with students were carried out during and after the playtests.

2. Meaning-making by designing and playing LBMGs

From literature to first-hand experience, it can be stated that games are powerful triggers to stimulate a learning process. As a matter of fact, they are able to foster engagement and implicitly elicit serious learning through fun and participatory activities (Prensky, 2001). Moreover, due to their location-based nature, those games embed learning in an actual and situated context, nurturing informal education as well as supporting the formal one (Huizenga et al., 2009). In this regard, different levels of learning emerge around the development of a LBMG, as it has been proved in the course *Augmented Reality and*

Mobile Experience, held in Politecnico di Milano by Spallazzo and Mariani. Specifically, three ways of learning can be pointed out: (1) *learning to design* for mobile experiences, as a result of formal education; (2) *learning by designing games*, where education is both formal (attaining the aim of the course) and informal (through the research about related topics that students had to understand and transpose into game elements (Mariani & Spallazzo, 2016)); (3) *learning by playing games* that provides informal education (Prensky, 2001; Gee, 2007; Salen et al., 2011) about the developed topics through a “hands-on, first-perspective and moving experience” (Mariani & Spallazzo, 2016). Moreover, as stated by Avouris and Yiannoutsou (2012), games can be classified as (i) ludic, (ii) pedagogic or (iii) hybrid, according to their purpose to make players enjoy, learn or both. Still, the learning process can be activated by all of these typologies.

Games are *communicative tools*. As many other products of human intellect, they can be ascribed to the field of design and, starting from here, multiple authors state the fact that *design communicates* (among others Dourish, 2001; Antonelli, 2011; Kolko, 2011). It is an activator of dialogue (Redström, 2006), wherein the designer represents the sender of a message that may be comprehended, accepted, refused or modified by the receivers in relation to their context and personal background. In Jakobson’s Theory of Communication (1966), it is important to underline the function of the physical channel and/or psychological connection in allowing the sender and the receiver to establish and maintain communication as *contact*. Consequently, oral speech, books or films are not exclusive means for education. A conversation – considered as the main resource involved in a learning activity (Sharples et al., 2005) – may arise from spaces, objects, and even games.

Since when they were first investigated, games have been depicted as conveyors of meaning, deeply entwined with the human process of interpretation of the world (Huizinga, 1938), and as contexts of representation (Frasca, 2003; Salen & Zimmerman, 2004) wherein meanings are embedded. Games are complex, dynamic systems of communication (Mariani, 2016) able to produce knowledge, understanding, comprehension and awareness (Spallazzo & Mariani, 2017). Also referring to important topics, they can result in questioning, affecting, challenging or even disrupting one’s attitudes and behaviours.

Another important feature, stressing LBMGs peculiarity of stimulating learning, is the *active involvement* of the player’s situated body, as frequently discussed for cultural learning (Hooper-Greenhill, 2007). Either from the educational and the design field, it can be inferred the importance of actions and active participation. From the beginning of the 20th century, theories about *active pedagogy* spread out in opposition to traditional and superimposing methods, sustaining a more intimate system of education based on personal experiences (Dewey, 1938). This attitude also affected creative fields. Bruno Munari, for instance, used to quote an old Chinese proverb which states: “If I hear I forget, if I see I remember, if I do I understand”. Embracing this philosophy, he organized laboratories in

which experimentation and discovery brought to self-learning. Further systematization leads to the scientific field of Activity Theory. It is sufficient to mention that at first even calculation, one of the most abstract human activities, passes through one's fingers or the interaction of the body with small objects (Kaptelinin & Nardi, 2009).

Therefore, designers need to encourage activity in their users (Kolko, 2011): empowering players to have active roles means to give them the opportunity to question their own ideas on the ground of the experience made (Mariani & Spallazzo, 2016), enabling a process of actual learning, awareness and, possibly, change. Hence, the *specificity* of LBMGs turns out to be fundamental in a model of learning that distances itself from reported testimonies (as in textbooks or vertical lessons) in favour of contextual experiences. Learners (players) are transported into a fictional world superimposed on the actual, surrounding reality, which they can even obliterate. Yet, it is in the physical space that the learning-by-experiencing process takes place. In fact, while experiencing LBMGs, players are *immersed* in a *magic circle*, a safe place that can be described as a membrane in between the physical world and the game itself (Montola et al., 2009), but they do interact with concrete boundary objects (Star & Griesemer, 1989). At the same, time these objects may nurture players' awareness of being involved in the game world (McMahan, 2003) and maintain a contact with reality (Spallazzo & Ceconello, 2015), fostering the interiorizing of the first-hand experience. Thus, they stand as activators and influencers of behaviours and, in addition, triggers of meaning-making: in *transferring and translating* practice, they can convey metaphorical significance that requires interpretation to be understood (Spallazzo & Mariani, 2017).

In this regard, Kaufman and Flanagan (2015) suggest a 'design embedded approach' which consists in stealthily or covertly delivering the game real aim (educating in our case) by directing the player's attention to other fictional worlds and issues, in favour of a more engaging and enjoyable playing experience. Indeed, openly declaring the educational purpose of the game induces players to raise psychological defenses, while being in an elseworld and wearing a mask is an act of freedom and openness (Mariani, 2016) that generates the conditions for players to set their own mental frames (Bertolo & Mariani, 2013; Bogost, 2007; Gandolfi & Mariani, 2014), modify their usual way of thinking and acting, making them interpret the world with fresh eyes, without worrying about protecting their ego (Csikszentmihalyi, 1990). In this sense, the playing experience can truly be meaningful and effective as a tool to foster learning.

3. The Fellowship of the Umbrella: a case study

The Fellowship of the Umbrella (Sciannamè & al., 2014) introduces four players into an ironic fantasy world, asking them to bring back to light the forgotten Source of the Truth, once protected by the Naiads. To complete the mission they have to solve different quests

playing the roles of a *powerful magician*, a *manufacturer dwarf* and a *wise elf* (respectively the magician's trusted alchemist and advisor), and an *atavistic beech* (a primordial creature immune to magic). The magician is the guide of the fellowship, s/he knows the path as s/he found the way to connect with the Naiads. However, to do that, the magician has to enter in a parallel aquatic dimension that implies difficulties in communicating and interacting with the surrounding world. That is the reason why the magician has to gather the group and the player has to wear a diver's mask and a snorkel. The magician is also the bearer of a geolocalized smartphone showing the map of the game. Then, the dwarf is the artifacts keeper, carrying all the useful objects for the mission. Being used to live in the underworld, s/he needs to wear a fold to protect his/her eyes from the sun. The elf, instead, is the narrator. S/he possesses the knowledge to read the useful words of wisdom contained in the ancient papers of his/her people, to whom s/he is still heavily connected – actually, the elf continuously hears their voices (physically through loud headphones). Finally, the beech: resilient to any curse, it is the one who can recover fundamental *leaves* of information spread along the path. Yet, it is a very old tree, and its trunk is not always the best mean for ambulation. The game is composed of four quests. Each of them is designed to be completed by the cooperation of all the players, exploiting their *different abilities*. Thanks to their peculiarities, every player will succeed in one quest, while having difficulties in all the others. Finally, when the fellowship reaches the Source, the companions are once again tested, being asked to perform a votive act, described in the keys that each of them collected after completing their quests. If faced as it is, each task seems unreachable for the poor players; the only way to get through them is figuring out that they can be swapped with each other. Just by doing that they can successfully complete the mission.

With the finale of the game, it comes the moment of the closing revelation, when the Source unveils the great truth. Players, aware of experiencing the mission in someone else's shoes, find out the real metaphorical meaning of their roles: the magician is a dumb, the dwarf is visually impaired, the elf is deaf while the beech has a motor disability. Thus, they also get to grasp that the structure of the entire game is designed to convey multiple levels of meaning, that players can elaborate only once the game has ended. Among them, more evidently, the players are led to experience the daily struggles caused by visual, motoric, auditive and expressive impairments. In consequence, they are also led to experience situations that foster to empathiseing with people affected by such impairmentsthem. Then, two different interpretations are suggested: on the one hand they can positively look at the experience in the light of Einstein's quote «If you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid» and deeply understand the sense of being *differently-able*. On the other hand, they are provocatively asked to question their sincere morality reflecting about their usual attitude towards people with handicaps, by reflecting on the feelings they felt during the quests, especially referring to their mates who were unable to attain their tasks and about whose *disability* they were not aware.

4. Discussion

The Fellowship of the Umbrella is a LBMG designed for sensitising people on the topic of disabilities. Particularly, it aims to induce reflection about the way able-bodied individuals usually behave towards differently abled. On the one hand, it underlines the concept of different ability, showing that impaired people are not completely unable, but have the potential of being successful. On the other hand, it stresses the fact that they do not need to be continuously judged as ‘different’.

In order to facilitate the learning-by-experiencing process to be activated with open mind and no psychological barriers, a stealth approach (Kaufman & Flanagan, 2015 – even if the case predates their formulation) has been adopted. Players are immersed into a fictional world by means of an ancient book narrating the background story and the characters, who are presented providing even the most thorough detail to nurture empathy. Further identification is conveyed on the one side by asking players to wear actual props that put them into their character’s skin, on the other by the game mechanics through limits and behaviour rules. This introductory phase is crucial for the success of the educative purpose of the game as it is the means to let the players dive into the magic circle. It is key to construct a coherent metaphor that allows players not to doubt the fictional world but just feel to be part of it. In this case, during post-game informal interviews, players affirmed that, while playing, they did not suspect the covered meaning of the experience, even though they were conscious of the social content of the academic course.

Furthermore the game kit and clothing demonstrated their efficacy as they allowed to attest players’ inclusion into the fictional world: the objects helped them perceive the abilities and the role of their character – e.g., the mobile device represented the whimsical guidance of the magician. And, after the plot twist, the props enhanced the meaning of the whole experience. Specifically, the relevance of these objects is connected to the hindrances they actually imply within a situated space. As a matter of fact, in LBMGs the physical context can play a leading role in the learning process. The heroes’ path is tough and tricky, several architectural obstacles interfere with the game, and even if it is possible to recognise the ludic and ironic sense in the diverse meaningful situations, it is essential for players to endure the physical fatigue of accomplishing the quests in order to trigger the final first-hand awareness. Indeed, it is just after the revelation concluding the game that the process of re-examination and re-attribution of sense, on the ground of the learning activity, begins. As confirmed by informal interviews, through their actions, feelings and thoughts players ultimately make their own sense of the experience and transpose what they directly assimilated to the stock of knowledge that affects their daily lives and behaviours.

To conclude, the field observations as well as the interviews conducted reinforced the communicative purpose and narrative role that spatial architectural elements served. The

gamespace resulted to be a further obstacle to overcome, being perceived as an additional element with a significant role in transferring the overall meaning of the game, by moving the player's attention on what it takes to accomplish specific activities under certain conditions. The various constraints, forced by the gameplay itself, in combination with an engaging and fascinating narrative, contributed to producing a relevant emotional climax. Explicative was the way in which players supported themselves while moving in space – forming a compact group with strong mutual dependencies –, as well as the awareness of not being able to rely just on themselves. This feeling was one of the most frequently reported by the players, underlining the strong communicative value.

References

- Antonelli, P. (2011). *Talk to Me: Design and Communication between people and objects*. New York: MoMa.
- Avouris, N., & Yiannoutsou, N. (2012). A Review of Mobile Location-Based Games for Learning across Physical and Virtual Spaces. *Journal of Universal Computer Science*, 15, 2120–2142.
- Bertolo, M., & Mariani, I. (2013). Meaningful Play: Learning, Best Practices, Reflections Through Games. In K. Mitgutsch, S. Huber, H. Rosenstingl, M. G. Wagner, & J. Wimmer, *Context Matters! Proceedings of the 7th Wien Games Conference 2013: Future and Reality of Gaming*. Vienna: New Academic Press.
- Bogost, I. (2007). *Persuasive Games: The Expressive Power of Videogames*. Cambridge: MIT Press.
- Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. New York: Harper Collins.
- de Souza e Silva, A., & Delacruz, G. C. (2006). Hybrid Reality Games Reframed: Potential Uses in Educational Contexts. *Games and Culture*, 1(3), 231–251.
- Dewey, J. (1938). *Experience and Education* (1997th ed.). New York: Touchstone.
- Dourish, P. (2001). *Where the Action Is. The Foundations of Embodied Interaction*. Cambridge, Massachusetts: MIT Press.
- Frasca, G. (2003). Simulation Versus Narrative. In M. J. Wolf & B. Perron, *The Video Game Theory Reader*. New York/London: Routledge.
- Gee, J. P. (2007). *What Video Games Have to Teach Us About Learning and Literacy*. New York: Palgrave Macmillan.
- Gandolfi, E., & Mariani, I. (2014). The Game as Social Activator, Between Design and Sociology. A Shared Framework to Analyse and Improve the Ludic Experiences and Their Social Impact. In *STS Proceedings*. Milano: STS Italia Publishing.
- Hooper-Greenhill, E. (2007). *Museum and Education*. Abingdon: Routledge.
- Huizenga, J., Admiraal, W., Akkerman, S., & Dam, G. T. (2009). Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game. *Journal of Computer Assisted Learning*, 332–344.

- Huizinga, J. (1938). *Homo Ludens*. London: Routledge & Kegan Paul.
- Jakobson, R. (1966). *Linguistica e poetica*. In *Saggi di linguistica generale* (pp. 181–218). Milano: Feltrinelli.
- Kaptelinin, V., & Nardi, B. A. (2009). *Acting with Technology*. Activity Theory and Interaction Design. Cambridge, London: MIT Press.
- Kaufman, G., & Flanagan, M. (2015). A psychologically ‘embedded’ approach to designing games for prosocial causes. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 9(3).
- Klopper, E., Squire, K., & Jenkins, H. (2002). Environmental Detectives: PDAs as a window into a virtual simulated world. In *IEEE International Workshop on Wireless and Mobile Technologies in Education Proceedings* (pp. 95–98).
- Kolko, J. (2011). *Thoughts on Interaction Design (Seconda Edizione)*. Burlington, Massachusetts: MK Publications.
- Mariani, I. (2016). Meaningful Negative Experiences within Games for Social Change.
- Mariani, I., & Spallazzo, D. (2016). Empowering Games. Meaning Making by Designing and Playing Location Based Mobile Games (Vol. 28).
- McMahan, A. (2003). Immersion, engagement and presence. In M. J. Wolf & B. Perron, *The Video Game Theory Reader* (pp. 67–86). New York/London: Routledge.
- Montola, M., Stenros, J., & Waern, A. (2009). *Pervasive Games. Experiences on the Boundary Between Life and Play*. Burlington,: Morgan Kaufmann Publishers.
- Montola, M. (2011). A Ludological View on the Pervasive Mixed-reality Game Research Paradigm. *Personal Ubiquitous Comput.*, 15(1), 3–12.
- Prensky, M. (2001). *Digital Game-Based Learning*. New York: McGraw-Hill.
- Redström, J. (2006). Persuasive Design: Fringes and Foundations. In *Lecture Notes in Computer Science* (Vol. 3962, pp. 112–122).
- Salen, K., Torres, S., Wolozin, L., Rufo-Teppe, R., & Shapiro, A. (2011). *Quest to Learn: Developing the School for Digital Kids*. Cambridge: MIT Press.
- Salen, K., & Zimmerman, E. (2004). *Rules of Play: Game Design Fundamentals*. Cambridge: MIT Press.
- Sharples, M., Taylor, J., & Vavoula, J. (2005). Towards a Theory of Mobile Learning. In *Proceedings of mLearn* (Vol. 1, pp. 1–9).
- Spallazzo, D., & Ceconello, M. (2015). Design Tales. Mobile Technologies Supporting Informal Learning in the Urban Space. In *Didamatica 2015*.
- Spallazzo, D., & Mariani, I. (2017). LBMGs and Boundary Objects. Negotiation of Meaning between Real and Unreal.
- Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, ‘Translations’ and Boundary Objects: Amateurs and Professionals in Berkeley’s Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19(3), 387–420.

Graphical enhancements of the Virtual Programming Lab

Mooney, Aidan and Hegarty Kelly, Emlyn

Department of Computer Science, Maynooth University, Ireland.

Abstract

It is generally recognised that providing consistent, meaningful written feedback is not an easy task, especially when dealing with large classes. Feedback does needs to be effective, meaning it has to be appropriate and timely and needs to be individual, where possible. Automated feedback within Computer Science has been around since the 1960's with the main goals in relation to computer programming being to implement an automatic assessment tool to provide consistent feedback and to alleviate examiners' workloads. The Virtual Programming Lab, a plugin for the Virtual Learning Environment Moodle, is one such tool that allows for Automated Feedback on computer code.

This paper presents enhancements to the Virtual Programming that have been developed to make interacting with the tool more user-friendly and provide more graphical feedback to teachers. The enhancements developed provide in-depth graphical feedback on assessment grades within a class and also teacher focused graphical views which provide more in-depth analysis of assessment submissions. Discussed feedback shows that the enhancements developed were all positively received with feedback highlighting the benefits of each.

Keywords: *Automated Assessment, Virtual Programming Lab, Timely Feedback.*

1. Introduction

Computer Science is often a new discipline for students entering third level education. In Ireland, for example, Computer Science will only become an examinable secondary level state subject from 2020. Computer Science has a notoriously low progression rate at the end of first year into second year, with programming modules seen as a major stumbling block (Quille et al., 2015). Programming tends to be an individual task at third level and one which can be very frustrating with struggling students feeling isolated and often embarrassed to ask questions. For novice programmer's multiple errors in code can be demoralising and frustrating with feedback from traditional compilers tending to be high level and confusing. Computer Science classes tend to be large and with this comes the problem of lecturers and demonstrators having to spend an increasing amount of time grading students work.

This paper looks at the Virtual Programming Lab (VPL) and enhancements that have been added to it. VPL is an automated feedback system which allows for tailored feedback that gives an automatic grade even if a program does not compile. VPL is a Moodle plug-in allowing for the integration of the automatic grading feature with a popular Virtual Learning Environment. In addition to the tailored feedback already featured in the VPL this paper presents enhancements that will allow teachers to get details of overall class performance in a quick easy to read format.

2. Literature Review

Within education there are many ways to provide students with feedback on their work, be it in the form of summative or formative assessment. This could range from verbal feedback to a class or an individual, to written or commented feedback. However, no matter what kind of feedback we provide it is generally recognised that providing consistent, meaningful written feedback is not an easy task, especially when dealing with large classes (Biggam, 2010). Feedback needs to be effective, i.e., it has to be appropriate and timely (Poulos & Mahony, 2008). A generic form of feedback is through assessment which is specifically intended to provide feedback on the students' performance with the goal of improving and accelerating their learning (Sadler, 1998).

According to Brookhart (2008) feedback needs to come while students are still mindful of the assessment they have completed. It needs to be presented to the student while they still think of the learning goal as a learning goal, not something they already did. Automated assessment within computer programming has been around since the 1960's. The main goals of automated assessment with programming are to implement an automatic assessment tool to provide consistent feedback and to alleviate examiners' workloads. The basic requirement for automated assessment of programming tasks centre around the comparison between a submitted student program and a supplied model solution by the

teacher (Gupta & Dubey, 2012). Additionally, some automated systems attempt to test internal data representation of programs to assess their quality (Saikkonen & Korhonen, 2001).

One automated assessment solution for analysing computer programs is Junit (Tahchiev et al., 2011; MoodleDocs, 2018). Using Junit lecturers can provide a code base for students and then a test class to test the submitted work. Another notable software assessment solution is HackerRank (2018) which is a software system hosted online that provides casual and competitive programming questions for individuals and businesses. For lecturers, they can create, manage and grade programming assignments. However, HackerRank is more suited to non-educational purposes as it is not tied in with an Virtual Learning Environment and any assessment scores need to be manually imported to Moodle (or equivalent) at a later stage.

The Virtual Programming Lab (VPL) was developed at the University of Las Palmas de Gran Canarias in Spain (Rodriguez-del-Pino et al., 2012). Using VPL lecturers can manage and receive data from VPL's reporting function on those assignments, such as, the amount of times a program was run for submission, the amount of time that was spent on the assignment and a record of all individual attempted submissions. VPL is a Moodle plug-in allowing for the easy integration of grades in to Moodle from assignments.

3. Methodology

VPL was piloted in the Computer Science department at Maynooth University during the second semester of the academic year 2015-2016. The feedback was very positive from the teaching staff and students. It was decided to continue using VPL and incorporate in to the lab sessions as the core method of assessment of programming assignments. Lecturers observed the many benefits from VPL such as being able to write scripts to check for errors in student's assignments upon submission and automatically award a grade.

Since VPL was first trialled a number of projects have been undertaken to enhance VPL and make it an even more useful system for lecturers in terms of feedback. This paper will look in detail at some of these projects and highlight the enhancements delivered.

4. Enhancements

4.2. Enhancement 1

The first enhancement was the addition of more detailed graphical feedback on grades. In the standard Moodle build, grading feedback is only given as a table of scores as shown in Figure 1, which can make it difficult to quickly survey a large set of results.

Surname	First name	Email address	Hello World	Lab testing	Assignment 2	Two Questions	Two Questions
s 4		s4@email.com	-	-	-	9.00	-
s 5		s5@email.com	-	-	-	10.00	-
s 6		s6@email.com	-	-	-	0.00	-
Student One		one@test.com	100.00	60.00	10.00	1.00	-

Figure 1: Sample Moodle Grade Table.

It was decided that the graphs would be added to the grading pages by editing the source code of the PHP grading pages. Implementing the graphing capability involved a number of steps including adding JavaScript graphing scripts, creating PHP files needed for graphing and connecting to the database and adding styling features to the graphing capabilities. A sample created graph and user interface is shown in Figure 2. A bar chart was chosen as you can quickly compare information, revealing highs and lows at a glance.¹

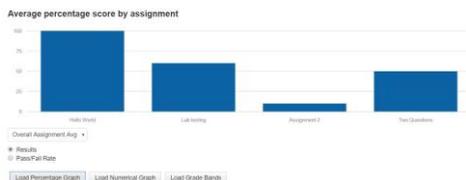


Figure 2: Sample graph showing average percentage scores by assignment.

To ensure that these graphs are only available to teaching staff additional PHP checks were performed that loaded the graphs and graphing elements just for teaching staff. These graphs allow for a birdseye view of the assignments allowing staff to focus on any badly answered.

4.3. Enhancement 2

The next enhancement developed were teacher graphical views. The goal of this enhancement was to create a visualisation engine for VPL. Specifically using web development libraries and tools, a front-end framework would be developed that provides an instant overview of high-level metrics on student performance. This enhancement attempted to re-represent data in a more creative, comprehensive and user-friendly manner.

¹ <http://theathenaforum.org/sites/default/files/WHich%20chart%20is%20right%20for%20you.pdf>

With this re-representation of data, it will provide lecturers with a new level of analysis that can be carried out on their students' performance. Figure 3(a) shows the view with the current VPL submission page while Figure 3(b) shows the created user interface for the submission page. It can be observed that the standard VPL submission list provides only a list of the data. The new adaption (Figure 3(b)) displays data on all 226 students about a single VPL activity (in this case, a particular lab question) in a much more convenient manner.

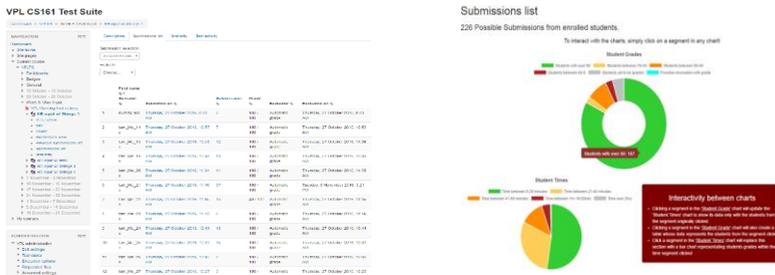


Figure 3 (a): VPL Submission Page, and, (b): Created User Interface of the Submission Page.

The 'Student Grades' graph is a doughnut chart that has six grade categories for student grades for that particular lab question. A teacher can hover over a segment to find out the exact number of students within that segment. The 'Student Times' graph is a pie chart displaying similar data but based on the time taken by students on the lab question. The 'Interactivity between charts' list briefly explains how the interaction between different charts works, and what outcomes will be seen from this interactivity. Doughnut charts and pie charts were chosen here as they show relative proportions of information

Clicking a segment in the 'Student Grades' causes two things to happen. Firstly, the 'Student Times' will be updated according to the segment clicked. For example, if the 'students with over 80%' was clicked then the 'Student Times' would update and display the times taken only by those 187 students who got over 80%. Secondly, a table will be dynamically generated to contain students only from the segment clicked. Clicking a segment in the 'Student Times' causes the 'Interactivity between charts' list to disappear, and a bar chart displaying grades of the students within the time segment specified will appear - Figure 4. A bar chart was chosen here as they are especially effective when there is data that splits nicely into different categories allowing you can to quickly see trends in the data.¹

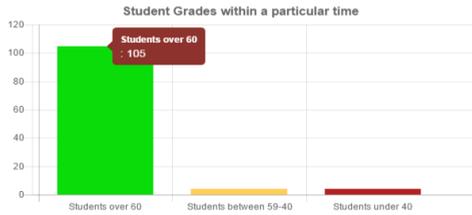


Figure 4: Bar chart for student grades generated by clicking within the Student Times chart.

Additionally, this application allows for users to retrieve data from one or more VPL activity; in this case, lab questions. Every lab question has a unique ID associated with it assigned by Moodle. Once the user has inputted the required IDs, the specified data will be retrieved and presented. Firstly, two pie charts are shown upon retrieval (see Figure 5). These two charts present the average grade and time of students over the lab question IDs specified. Clicking on a segment in the charts will dynamically generate a html table. Again pie charts were chosen here to show the relative proportions of the data.¹

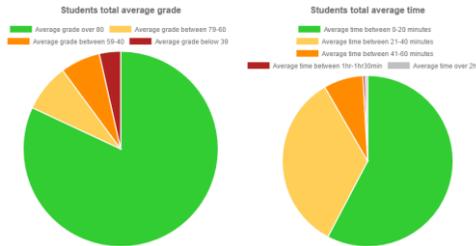


Figure 5: Pie charts showing students average grade and time.

In addition, a modified box plot for student times is generated. This modified box plot, shown in Figure 6, provides the user with the information that a traditional box plot would, like the max/min values, the median and upper/lower quartiles but supplemented with an additional two pieces of information. Firstly, there is a scatter plot-like graph that sits beside the box plot that shows the exact spread of student times. Secondly, an untraditional presentation of the Gaussian model is represented by the dotted lines forming a diamond like shape. It shows the mean and standard deviation of the data. When the box plot is hovered over, it provides exact details of the data presented. Box plots were chosen here as they are suitable for comparing range and distribution for groups of numerical data.¹

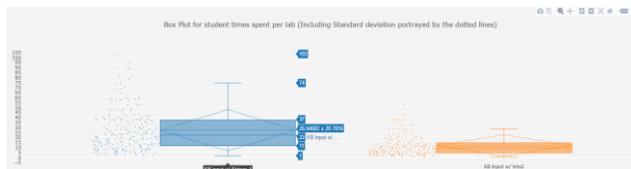


Figure 6: Box plot of the student times in the retrieval page.

5. Feedback / Assessment

5.1. Enhancement 1

The ability to group items in VPL within a particular section was solved using the Flexible Sections Format plugin. This allowed for the nesting of section topics and the ability to freely move VPL activities between topics. Labs and activities would be hidden when placed inside a hidden topic and shown otherwise. Unit testing was carried out to confirm that all implemented changes worked and the outcomes were as expected as the enhancement was being developed. Each graph that was developed was compared against the results in the database to ensure no data has been misrepresented.

Once the enhancement was completed a group of testers tested the system and provided results to a survey. These testers were lecturers and other teaching staff and they were provided with dummy data from a submitted assignment in a VPL activity to test the system. Due to the rigorous nature that the enhancement was created under the results of the survey were very positive. In relation to the question relating to the ease of use of the graphs, 70% of the respondents said they were extremely easy to use with 30% saying they were very easy to use. When asked if the displayed information was useful for lecturers and course managers, 50% replied that it was extremely useful with the other 50% replying they were very useful. In relation to how useful they felt the changes were overall to VPL, 50% of the respondents said that they were extremely useful while the remaining 50% said they were very useful.

5.2. Enhancement 2

To measure how effective the visualisation engine was as a solution to the problems identified in the current version of VPL, a questionnaire was distributed to users while they interacted with the submission and retrieval page. The testers of these enhancements were lecturers, students and technical staff. We now provide feedback to a number of the questions asked.

When asked if they were able to tell what data each of the charts represented, 87.5% of them could identify & understand what each chart represented as seen in Figure 7(a). In relation to whether the new page provided an overall better “experience & representation of data” compared to the same page in the original VPL 100% of the respondents agreed that it did as seen in Figure 7(b).

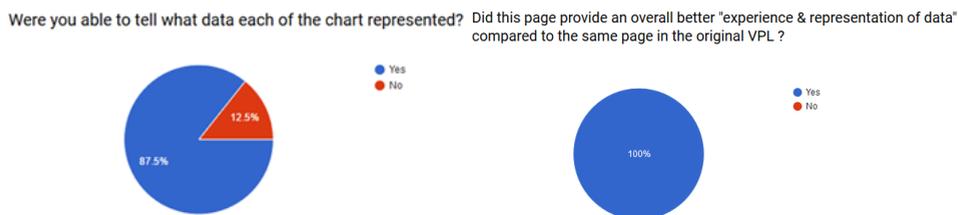


Figure 7: Pie chart results for the questions: (a): "Were you able to tell what data each of the charts represented?", and, (b): "Did this page provide an overall better "experience & representation of data" compared to the same page in the original VPL?"

The testers were then asked about what they liked best about the new system. Some of the responses were:

"The use of graphs to visualise the data is a much more efficient approach than the previous project. The system has a nice flow to it and has a simple yet attractive interface."

"Graphing facility on page one."

"The graphical visualisation of the data."

"Informative graphs that you can click on to obtain individual and group specific data."

"I like all the colours, updated in real time, offered pointers."

It can be seen from these responses that there was significant mention of the visualisation engines graph capabilities. This is quite an important result as it was felt that the question proved that the main aim in implementing this enhancement was achieved.

6. Conclusion and Future Work

Timely feedback on assessments is vital for successful learning and no matter what kind of feedback is provided it is generally recognised that providing consistent, meaningful written feedback is not an easy task, especially when dealing with large classes. Automated feedback, if targeted and individualised has been shown to be very effective. The Virtual Programming Lab allows for just such feedback. This paper looks at a number of enhancements to the Virtual Programming Lab to allow for more detailed graphical feedback on grades and teacher graphical views providing more detailed information regarding some assessment with in depth analysis provided. All of these enhancements were tested and all feedback for extremely positive highlighting the benefits of including such enhancements into the Virtual Programming Lab.

Further enhancements being developed include incorporated JFLAP in to the Virtual Programming Lab, developing a system to allow for easier creation of bash scripts for VPL

and the development of a GUI to allow for customisation of the VPL system to allow all users get a positive experience using it. All of these enhancements will further improve VPL and make it easier for people to integrate it into their courses.

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References

- Biggam, J. (2010). Using automated assessment feedback to enhance the quality of student learning in universities: A case study. *Technology Enhanced Learning. Quality of Teaching and Educational reform*. Springer.
- Brookhart, S. M. (2008). *How to give Effective Feedback to your students*. Alexandria, Virginia, USA: Association for Supervision and Curriculum Development
- Gupta, S. & Dubey, S. K. (2012). Automatic assessment of programming assignment, *Computer Science & Engineering*, vol. 2, no. 1, pp. 67.
- HackerRank (2018), <https://www.hackerrank.com/>. (Accessed: 8th February 2018).
- MoodleDocs (2018), Junit Question Type. https://docs.moodle.org/20/en/Junit_question_type. (Accessed: 8th February 2018).
- Poulos, A., & Mahony, M. J. (2008). Effectiveness of feedback: the students perspective. *Assessment & Evaluation in Higher Education*, vol. 33, no. 2, pp. 143-154.
- Quille, K., Bergin, S. & Mooney, A. (2015). PreSS#, A Web-Based Educational System to Predict Programming Performance. *International Journal of Computer Science and Software Engineering (IJCSSE)*, 4 (7). pp. 178-189. ISSN 2409-4285.
- Rodríguez-del-Pino, J. C., Rubio-Royo, E., Zenón, & Hernández-Figueroa, J. (2012). A Virtual Programming Lab for Moodle with automatic assessment and anti-plagiarism features. *Proceedings of WorldComp12*, Las Vegas, USA.
- Sadler, D. R. (1998). Formative assessment: revisiting the territory. *Assessment in Education: Principles Policy & Practice*, vol. 5, no. 1, pp. 77-84.
- Saikkonen, R., Malmi, L. & Korhonen, A. (2001). Fully automatic assessment of programming exercises. *ACM Sigcse Bulletin*, ACM, vol. 33, no. 3, pp. 133-136.
- Tahchiev, P., Massol, V., Leme, F. and Gregory, G. (2011). JUnit in action. 2nd ed. Greenwich: Manning, pp.3-5.

Transdisciplinary Bachelor Course Connecting Business and Electrical Engineering

Fuhrmann, Thomas; Niemetz, Michael

Faculty of Electrical Engineering and Information Technology, OTH Regensburg,
Germany.

Abstract

The OTH Regensburg has a broad variety of study programs in technical, business, social and health sciences. Up to now, there is no integral connection in the bachelor curricula between business and technical faculties except for some small subjects. The scope of this project is to develop a new course specialization, which connects engineering and business thinking. Electrical engineering students should learn basics of business science and how managers think. Business students should vice versa learn fundamentals of engineering and how engineers solve problems. Students from both faculties work together in projects where they act like start-up companies developing a new product and bringing it into the market. It is seen a transdisciplinary effect: These projects gain innovative results between the disciplines compared to student projects of one isolated discipline. Evaluation results from the first two cohorts indicate high student satisfaction, high learning success as well as directions for further improvement.

Keywords: *Engineering Education, Business Education, Transdisciplinary Education, Project Based Learning.*

1. Introduction

The OTH Regensburg offers study courses for technical subjects in many different areas and in addition business and social work programs. The Faculty of “Electrical Engineering and Information Technology” is one of the biggest faculties in this area in Bavaria with about 1.400 students and 35 professors. It offers three bachelor programs, which were changed some years ago to allow more flexibility for the students to select specialization courses during their last two semesters. The Faculty of “Business Studies” offers also application orientated education with about 40 professors and 1.800 students in several bachelor and master programs.

2. Motivation and Study Goals

Our world is becoming more and more complex and therefore for industrial projects, labor is divided within teams, typically between people with diverse specializations and educated in different disciplines. This represents also a challenge for higher education institutions, as they are required to transform their education (Holley, 2009) to prepare students for this working environment (Holzer, Bendahan, Cardia and Gillet, 2014). Education in interdisciplinary teams has been shown to be a very effective means for achieving this goal with different approaches (Taajamaa et al., 2014; Bailleu, Kröger, Menge and Münchow-Carus, 2015). Therefore, in 2013 an interdisciplinary student project was set up developing the technical and marketing concept of a short wave amateur radio transmitter (Batz, Pauser, Wagner, Fuhrmann and Niemetz, 2013). At the beginning of the project, students from different disciplines had problems to understand each other. After this initial phase, a highly motivated team formed with excellent working results. It is also often seen in industrial projects that conflicts arise between employees from different disciplines due to misunderstandings. To address this challenge in education, both faculties started a new specialization within existing bachelor programs to obtain a closer relationship between engineering and business. Students from business studies learn to understand basic approaches of engineering while students from electrical engineering obtain an understanding of basic management concepts. The goal of this program is to educate graduates for bridging the gap between these two different disciplines for a better understanding and therefore a more effective cooperation in companies (Niemetz and Fuhrmann, 2017). To achieve this goal, students get knowledge about technology and innovation management as well as concepts of intrapreneurship and entrepreneurship.

3. Curriculum Development

3.1. Management for Electrical Engineering Students

About four years ago, the Bachelor “Electrical Engineering and Information Technology” curriculum was rearranged to gain more flexibility for the students in their higher semesters to choose preferred topics. In the sixth and seven semesters, they can choose nine modules from a catalogue of technical electives. When choosing two modules from the business studies curriculum for electrical engineers (see Table 1), students can obtain the additional specialization “Engineering and Management” on their bachelor diploma.

Table 1. Module Overview - Management for Engineering Students

Module Name	Hours/Week	Credits
Entrepreneurship and Innovation Management	4	5
Seminar in Technology, Entrepreneurship and Management	4	5
Business Simulation for Engineers	4	5

The first electrical engineering students start with this management specialization in Summer 2018. Up to now, there are no evaluations and results from this part of the study concept.

3.2. Engineering for Management Students

Business students can choose in their sixth and seventh semesters from one of nine study options to deepen their knowledge. A new option “Engineering and Management” was introduced in 2016 to teach business students engineering principles and connect them with engineering students in joint projects. The course overview of this specialization can be seen in Table 2 (OTH Regensburg, 2017). It starts with the courses “Entrepreneurship and Innovation Management” and “Seminar in Technology, Entrepreneurship and Management” in the sixth semester to lay a theoretical basis for the lab work “Technical Project” and the lecture “Fundamentals of Engineering” in the seventh semester.

Table 2. Module Overview - Engineering for Management Students

Module Name	Hours/Week	Credits
Entrepreneurship and Innovation Management	4	5
Seminar in Technology, Entrepreneurship and Management	4	5
Technical Project and Supplementary Lecture	4	5
Fundamentals of Engineering	4	5

Entrepreneurship and Innovation Management

Principles of innovation management and related topics are taught. Models of processes, functions and stakeholders in innovation management, strategic planning, controlling, decision making, evaluation and ethical aspects of innovations are explained. Creative techniques and creativity within teams are important tools for developing new products. Entrepreneurship and intrapreneurship, founding lean start-up companies, managing products and market introductions, aspects of intellectual property are also parts of this lecture. Students learn to know the importance of innovation management for companies, understand innovation processes and their controlling. They learn about corporate entrepreneurship systems and their management, basic concepts of product management and production management, introducing technology with new products or founding new companies and protecting their intellectual property. Students work in teams, present and discuss their results. They know different creativity and innovation management techniques, can analyze and optimize or reorganize business innovation systems. Students learn to know consequences of decisions in innovation systems, can solve problems and calculate risks.

Seminar in Technology, Entrepreneurship and Management

Students learn start-up methodology, entrepreneurial marketing, developing and testing business cases with risk and reward analysis, they plan prices, production capacities, investments, costs, finances and market positions. They analyze industry structures and business models. After this seminar, students know business cases and can develop business plans. They know the interaction between technical demands and product specifications on the one side and business and sales demands on the other side. Students understand the roles of company founders, innovation managers and business plan processes. They know production and capacity planning, material flow planning and human resources planning.

Technical Project and Supplementary Lecture

In this lab course the seventh semester business students work together with fourth semester engineering students in small groups. Students have to create a common vision for a product to be developed. While the engineering students are following the goal to develop a technical solution for an engineering problem, the tasks for the business students are to develop a cost calculation, marketing and distribution concept for this product. All students have also to contribute to the organization of their team, e.g. by project target specification, work package definition and time schedule planning. At the end of the course, the teams are expected to present their results, design a poster and write an entry for the faculty internal Wiki.

Some of the projects are listed below:

- Automatic garbage can, which opens when a user approaches.
- Power pack charging device, which charges a power pack during riding by bicycle.
- Automatic flower pouring with humidity sensor.
- Tea timer for automatically pulling a tea bag out of a cup.
- Bicycle alarm system with GPS tracking.

In a parallel supplementary lecture, the business students learn basics about electrical components and circuits. The main lecture contents are

- basic electric circuits,
- electric voltage, current and power,
- binary and hexadecimal numbers,
- passive electric components and basic semiconductor devices,
- basic structures of printed circuit boards,
- development of finite state machines and
- differences between parallel and serial data transmission.

Students also train to handle electronic components and solder printed circuit boards by building up an electronic kit. In addition, questions regarding project work are clarified.

Fundamentals of Engineering

This lecture tells the students about typical engineering job profiles, like development engineer, quality assurance engineer, process, production, marketing and application engineer. Typical thinking processes and main tasks of engineers are explained. Students precisely analyze a task and develop an appropriate solution, work in teams and consider technical possibilities as well as cost restrictions. After this lecture, students should know about job profiles of engineers and their main working principles, the importance of

specifications and how to solve problems and describe solutions. They understand engineering thinking and are able to work together with engineers. Students know basic approaches in developing electric and electronic devices, and have obtained an understanding for the steps necessary to transfer prototypes into production. They learned about requirement, quality, project and knowledge management. Students know methods to develop time and project plans, judge critical project situations, can communicate and cooperate within a technical working environment.

4. Evaluation Results of the Technical Project Course

For Winter Semester 2016/17, one identical feedback sheet was used for engineering and business students. To get differentiated results, this concept was changed for the second cohort into two separate evaluation sheets with identical questions.

4.1. Winter Semester 2016/17

No evaluation differentiation was made between business and engineering students. The overall evaluation results were good; students were satisfied with the laboratory equipment and group size. Project complexity was not too high, practical relevance was visible and project goals were clear. The students were highly interested and they learned a lot during this practical course. Contacts to professors were appropriate, questions were answered and the atmosphere was good and motivating. Students were also asked to answer two additional questions especially about the interdisciplinary work in the project. The first question deals with the working climate between the faculties and it can be seen in Figure 1 that the perception of working atmosphere was very inhomogeneous. While some students were very satisfied, some others were not happy about group dynamics.

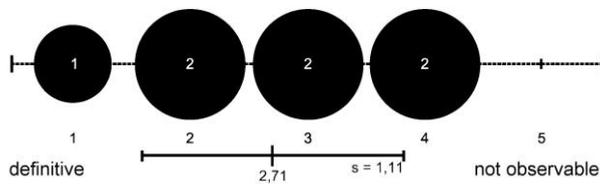


Figure 1. All students 2016/17: It is a constructive working climate between both faculties during the project.

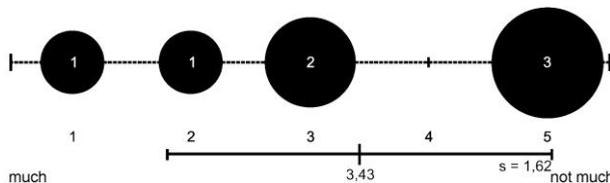


Figure 2. All students 2016/17: The amount I learned about methodologies and topics of the other faculty.

Figure 2 shows the interdisciplinary learning success with a broad spread of ratings. This feedback was not fully satisfying as a higher learning success between the disciplines was expected. In the free text evaluation, students asked for a better interdisciplinary preparation at the beginning of the project course. As a result of this feedback, a more detailed introduction was given at the beginning of the project course in Winter Semester 2017/18.

4.2. Winter Semester 2017/18

In this evaluation, the feedback sheets were separated between business and engineering students but identical questions were used. This gives the chance to see a possible heterogeneity between both student groups. The overall evaluation for the whole project course was very similar to the results from Winter Semester 2016/17. Students were satisfied with laboratory equipment, practical relevance and support by professors.

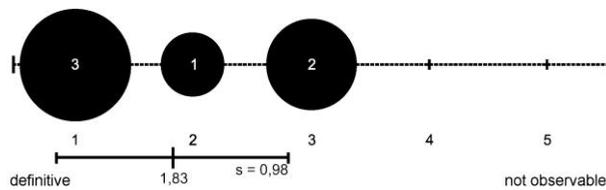


Figure 3. Business students 2017/18: It is a constructive working climate between both faculties during the project.

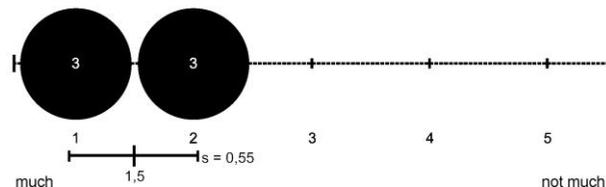


Figure 4. Business students 2017/18: The amount I learned about methodologies and topics of the other faculty.

All business students see a positive working climate between both faculties during the project work (see Figure 3) and had learned a lot from the engineering side (see Figure 4). This evaluation results indicate a high success for the concept of interdisciplinary projects. Some of the free text answers honor the high degree of freedom in their project work. Other business students wished to have more guidance by the professors during their project.

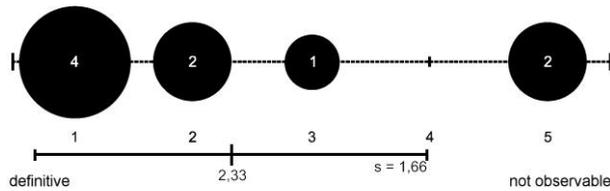


Figure 5. Engineering students 2017/18: It is a constructive working climate between both faculties during the project.

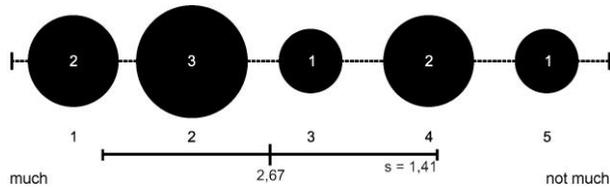


Figure 6. Engineering students 2017/18: The amount I learned about methodologies and topics of the other faculty.

Working climate (see Figure 5) and learning success from the other faculty (see Figure 6) were seen as positive by some of the students while others were obviously dissatisfied. The two dissatisfied students stated in their free text answers that they learned nothing from the business colleagues, the project management within the group was not satisfying and the business students were not very motivated in accomplishing their part of the project work. It is clear from the statements that this was caused by a teamwork problem within this specific group and is not a criticism of the interdisciplinary approach. Different expectations of the two student groups were observed: While the business students in this project had explicitly chosen this specialization and were already in their seventh semester shortly before their graduation, the engineering students were in their fourth semester in the middle of their bachelor education before choosing any specialization. Therefore, the motivations for the interdisciplinary projects were different for both disciplines.

5. Conclusion and Outlook

From the evaluation results, it can be seen that the satisfaction is very high on the business students' side but it needs some additional work to increase satisfaction for the engineering students, as they are too early in their study life to fully value the contribution of the other discipline. The interdisciplinary projects yield much more innovative and better results than projects, which are carried out by students of one faculty. It leads to the conclusion that a transdisciplinary effect is seen which creates additional project output. There were also discussions during the business faculty graduation ceremony 2017 where some graduates told about their further studies in a master program or their starting career as technology managers in industry. All of them were very satisfied with the program due to their great

success in getting an appropriate master program or an interesting and well-paid job. The first engineering students start in Summer Semester 2018 with entering lectures of business sciences. They will be also evaluated to develop this program further. The overall goal is to further develop and promote this specialization. It is seen as a great opportunity to connect both faculties closer and educate students for an interdisciplinary working life.

References

- Bailleu, A., Kröger, S., Menge, M. & Münchow-Carus, A. (2015, June 24). Elective Interdisciplinary Project Laboratories combined with Lectures on Demand as an innovative Teaching Method for Highly motivated Students. In *1st International Conference on Higher Education Advances, HEAd'15*.
- Batz, S., Pauser, L., Wagner, S., Fuhrmann, T. & Niemetz, M. (2013, March 13). Development and marketing of a short wave transmitter as an interdisciplinary student project. In *Global Engineering Education Conference (EDUCON)* (pp. 631–638).
- Holley, K. (2009, August 18). Interdisciplinary strategies as transformative change in higher education. *Innovative Higher Education*, 34, 331–344.
- Holzer, A., Bendahan, S., Cardia, I. V. & Gillet, D. (2014, September). Early awareness of global issues and development of soft skills in engineering education: an interdisciplinary approach to communication. In *2014 information technology based higher education and training (ithet)* (pp. 1–6).
- Niemetz, M. & Fuhrmann, T. (2017, September 25). Wie können wir Professorinnen und Professoren ein überfachliches Studium vermitteln? In *3. Symposium zur Hochschullehre in den MINT-Fächern*. Nürnberg.
- OTH Regensburg. (2017, March 14). Modulhandbuch Bachelor Betriebswirtschaft. Retrieved from https://www.oth-regensburg.de/fileadmin/media/fakultaeten/bw/studiengaenge/bachelor_betriebswirtschaft/info/pdf/Modulhandbuch_BBW_14.03.17.pdf
- Taajamaa, V., Westerlund, T., Guo, X., Hupli, M., Salanterä, S. & Salakoski, T. (2014, March). Interdisciplinary engineering education - Practice based case. In *Fourth interdisciplinary engineering design education conference* (pp. 31–37).

University students developing imaginative problem solving skills — the case of food engineering

Torrecilla, José S.^a; Aguado, Roberto ^b; Tijero, Antonio ^a; Ballesteros, Menta ^b;
Moral, Ana ^b; Lastra, Miguel ^a

^aDepartamento de Ingeniería Química. Universidad Complutense de Madrid, Spain,

^bDepartamento de Biología Molecular en Ingeniería Bioquímica, Universidad Pablo de
Olavide, Sevilla, Spain.

Abstract

In this summary, a teaching technique to learn relevant food engineering and chemical engineering concepts has been presented. This method has been tested experimentally for the last two years in a class which belongs to the Food Science and Technology Bachelor's Degree in the Complutense University of Madrid in Spain, and it is based on the induction of complex concepts through comprehensive everyday examples. More than 90% of students have adequately been able to extrapolate the knowledge acquired to other technical fields.

The application of this method has resulted in an increased rate of passing exams and classes, as well as a higher attendance percentage. And most importantly, the students are having fun while learning. Furthermore, this great experience has encouraged some students to collaborate in the development of this teaching approach.

Keywords: *Creative Learning; Induction Didactic Method; Engineering.*

1. Introduction

It is true and clear that all scientists need imagination. We (scientists) need it to come up with hypotheses to problematic phenomena, to devise how to get the evidence which is required, to figure out potential sources of error, to modify the initial conjecture if it is not corroborated by evidence, or to suggest a different one (Haack, 2007). Science education must convey not only facts and skill, but also virtues required by any inquirer: imagination, persistence, care, reason, honesty.

These ideas are far from being new. The role of creativity in learning has motivated countless research papers and books since the middle of the 20th century, and more than 150 thousand publications deal with creativity in the context of science education (Hadzigeorgiou *et al.*, 2012). Imaginative problem solving should be encouraged in university staff, as it enhances divergent thinking abilities among students (Alharji, 2010; Shen, 2012).

Nonetheless, even as of today, there is evidence that students fail to see science as something inherently imaginative, that “they do not view science in general as a creative endeavor” (Hadzigeorgiou *et al.*, 2012). This is undoubtedly an education failure, and it comes at no surprise if we take into account that students of science from any level are, in most cases, solely evaluated by external verification. This evaluation is usually carried out through consultation of textbooks, guidelines, standards, etc., that the pupil has been asked to study. This leads students to misunderstand science as a discipline in which recall of facts and technical/practical skill is preferred over “the ability to extend and reconfigure understanding when confronted with novel problems” (Schmidt, 2011).

Even more worrying is to realize that many teachers and practitioners of research hold the belief that there can only ever be one “scientific” way of knowing (Kind and Kind, 2007), still rooted in the thoughts of the first Positivist thinkers. This nonsense seems to indicate that most scientists pay as much attention to philosophy of science as stars and planets to astronomical papers.

2. Imagination in the theory of knowledge

Likely, the reactionary conceptualization of science as facts and methodology comes from a real necessity —the urge to demarcate reliable empirical science from *a priori* metaphysics, legends, proverbs, traditional know-how, religion, and superstition. Thus, inductivism was born to free the scientist from preconceptions. According to Bacon in 1620, everything starts with observation of nature (Bacon and Devey, 2016). A law follows, not precedes, careful experimentation. General observation comes before a modest law. Extensive observation comes before a broad law, but theory never exceeds experimentation.

Developing the motivations of inductivism in a modern world, Comte, in the middle of the 19th century, creates what he calls “positive philosophy” (Comte, 1988). As an enemy of metaphysics and theology, he compels us to focus on *the positive*: real, perceptible, useful, accurate, sensible, and constructive. Although the Positivist battle against superstition must be appreciated, these views on science education are nothing short of reactionary. Opinion is out of place in scientific research, imaginative theorizing and free inquiry are mercilessly shunned. He called irresponsible the suggestions of Rousseau, whose opinion was that a teacher should give his pupil freedom, so he can find love and motivation to do things by himself.

Important voices against the theory of induction arose in the 20th century. Einstein and Infeld (1936): “Physical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world”. As mere anecdotes, Einstein imagined himself flying at light speed and visualizing the objects that he could see, and Kekulé literally imagined the shape of benzene prior to experimentation (Ho et al., 2013; Wang et al., 2015). But these anecdotes can only illustrate the debate that took place in the field of the theory of knowledge.

The so-called “problem of induction”, i.e., the lack of justification for generalizing about the properties of a class of objects based on some number of observations, was first described by Hume, but he stated that science could only be inductive anyway. In the epistemological battle of the 20th century, Carnap (1950) dedicated appreciable efforts to justify the place of inductive logic in science, but Popper (1959) shunned them all. In *The Logic of Scientific Discovery*, he states: “[A] theory of induction is superfluous. It has no function in a logic of science. [...] This appraisal of the hypothesis relies solely upon deductive consequences (predictions) which may be drawn from the hypothesis: There is no need even to mention ‘induction’.” Science is not born from perception, science is “an adventure of the human spirit”. A scientist must be creative, imaginative, daring and, above all, critical. Theories are not confirmed or verified. They may be falsified and rejected or corroborated in the absence of falsification.

Popper’s views on education are anything but timely. In *Unended Quest*, he claims: “If I thought of a future, I dreamt of one day founding a school in which young people could learn without boredom, and would be stimulated to pose problems and discuss them; a school in which no unwanted answers to unasked questions would have to be listened to; in which one did not study for the sake of passing examinations.” (Popper, 2002). We hope to rescue the idea that pupils should not study for the sake of passing examinations. They should be ready to confront novel problems with imagination and bravery.

A new general didactic method has been tested and compared against classic ones in the “Food Engineering” context during the last two academic courses. This core class belongs

to the 3rd level of classes of the Food Science and Technology Bachelor's Degree in the Complutense University of Madrid in Spain. The comparison was done using a survey where the students shared their opinions on the matter.

3. Examples of imaginative problem solving in food engineering

Most of our students of Food Engineering have many problems in understanding the basis of the transportation of properties. To overcome it, different everyday examples were used to induce the concepts in the students. For instance, the flow of fluids can be explained by observing how sailplanes or small airplanes fly, figure 1. The difference of pressures and friction on the wings of the airplane helps us explain the concept of friction force and pressure. Another interesting example consists of describing the thermal energy interchange using domestic heaters.

Once the student comprehends the concept provided by these examples, the underlying law or theory is easier to understand. This method has been implemented while teaching 154 students, and more than 90% of them were able to understand and extrapolate the knowledge gathered to other systems. This great experience has even encouraged some students to collaborate in improving the teaching examples.

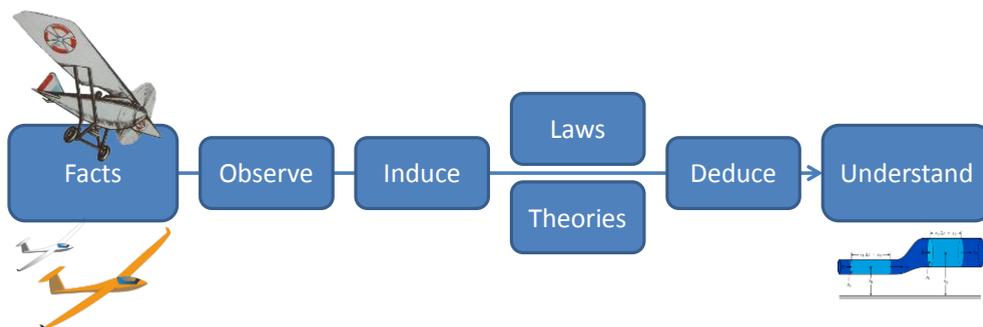


Figure 1. Induction method applied

It has been shown that students learn chemical engineering concepts better if given tools to reproduce physically the goals of the problem, such as 3D puzzles, mirrors, Lego® pieces, balloons, etc. (Raviv, 2004). In addition to this, most of the students (96%) prefer this methodology over other more common ones. As a consequence of it, the attendance is also increasing. All of these facts result in higher passing rates in these two classes, meaning that students enjoying the classes is correlated with their success in them.

As a consequence of these results, this teaching approach is being applied to other subjects in different bachelor's degree programs and different Spanish universities.

References

- Alhajri, S.A. (2010). The importance of creativity in teaching graphic design in Arab world. *Design Principles and Practices: An International Journal*, 4(1), 59-69.
- Bacon, F., & Devey, J. (2016). *Novum Organum —True suggestions for the interpretation of nature*. Altermünster: Jazzybee Verlag.
- Carnap, R. (1950). *Logical Foundations of Probability*. Chicago: The University of Chicago Press.
- Comte, A. (1988). *Introduction to positive philosophy*. Indianapolis: Hackett Publishing.
- Einstein, A., & Infeld, L. (1938). *The evolution of physics*. Cambridge: Cambridge University Press.
- Haack, S. (2007). *Defending Science —within Reason*. New York: Prometheus Books.
- Hadzigeorgiou, Y., Fokialis, P., & Kabouropoulou, M. (2012). Thinking about Creativity in Science Education. *Creative Education*, 3(5), 603-611.
- Ho, H.C., Wang, C.C., & Cheng, Y.Y. (2013). Analysis of the Scientific Imagination Process. *Thinking Skills and Creativity*, 10, 68-78.
- Kind, P.M., & Kind, V. (2007). Creativity in science education: Perspectives and challenges for developing school science. *Studies in Science Education*, 43, 1-37.
- Popper, K.R. (1959). *The Logic of Scientific Discovery*. London: Hutchinson & Co.
- Popper, K.R. (2002). *Unended Quest: An Intellectual Autobiography*. London: Routledge.
- Raviv, D. (2004). *Hands-on Activities for Innovative Problem Solving*. Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition.
- Schmidt, A.L. (2011). Creativity in science: tensions between perception and practice. *Creative Education*, 2(5), 435-445.
- Shen T.L. (2012). Inspiring the creativity and imagination of university students during creative curriculum by teaching design. *Procedia —Social and Behavioral Sciences*, 45, 615-620.
- Wang, C.C., Ho, H.C., & Cheng, Y.Y. (2015). Building a learning progression for scientific imagination: A measurement approach. *Thinking Skills and Creativity*, 17, 1-14.

Developing Healthcare Leaders, Fostering Collaboration, and Facilitating Transformation in the Kingdom of Saudi Arabia: Practice-Based Synthesis Projects in a Global Executive Graduate Program

Celaya, Leandra Y.^a; Mueller, Daniel K.^b and Hernandez, S. Robert^c

^aDepartment of Health Services Administration, University of Alabama at Birmingham, United States of America, ^bDepartment of Health Services Administration, University of Alabama at Birmingham, United States of America ^cDepartment of Health Services Administration, University of Alabama at Birmingham, United States of America.

Abstract

At the 2015 International Hospital Federation (IHF) World Congress in Chicago, Illinois, USA, the Global Consortium for Healthcare Management Professionalization presented a call to action to professionalize the field of healthcare management. Governments and organizations that seek to realize the benefits of professional healthcare managers may meet this challenge by providing educational opportunities to established executives who are positioned to lead and ultimately mentor future managers. This paper presents a case example of an executive graduate program in health administration, delivered by a university in the United States in partnership with the Ministry of Health in Saudi Arabia, with the aim of developing Saudi healthcare professionals as healthcare leaders. We share challenges, experiences and insights related to adapting a US curriculum for the Saudi working executives during a time of transformation in the Kingdom. We also provide a detailed description of the Executive Management Study, an applied synthesis activity required for all executive learners in the program. Results of an alumni survey are incorporated to demonstrate graduates' perceptions of the effectiveness of the learning experience.

Keywords: *healthcare management education; executive education; synthesis projects; team-based learning; project-based learning; global graduate education.*

1. Introduction

At the 2015 International Hospital Federation (IHF) World Congress in Chicago, Illinois, USA, the Global Consortium for Healthcare Management Professionalization presented a call to action to professionalize the field of healthcare management. The consortium, consisting primarily of professional associations and academics from around the globe, argued that “enhancing the management capacity of individual leaders and teams” has been shown to improve the quality of healthcare services and to lead to better use of resources (International Hospital Federation [IHF], 2015). Recognizing the growing need to improve the skills, depth of knowledge, and competencies for healthcare managers and leaders worldwide, they suggest that governments and health systems will need to invest in training and education if they wish to realize the benefits of professional management.

For decades in the United States, the master’s degree in health administration has served as an entry requirement for healthcare management positions. However, it is common practice in many countries for clinicians to be promoted to healthcare management positions having never received formal training or education in management or leadership (Hernandez, O’Connor, & Meese, 2018). Clinicians who are promoted to leadership positions often learn on the job, facing a complex environment where resources are often scarce and demand for high quality, efficient care is pervasive.

Governments and organizations that seek to realize the benefits of professional healthcare managers may meet this challenge by providing educational opportunities to established executives who are positioned to lead and ultimately mentor future managers. One country where such efforts were recently undertaken is the Kingdom of Saudi Arabia (KSA). A major transformation in all sectors of government (including the Ministry of Health), a lack of sufficient formal educational programs in healthcare management, compounded by a countrywide effort to invest in education as a “means of reducing Saudi Arabia’s dependence on expatriate staff” (Eckstein, et al, 2003), led to a strategic decision to collaborate with a university in the United States to develop a customized graduate program to develop Saudi leaders.

With the broad goal of ensuring the future success and sustainability of the healthcare delivery system in KSA, health system leaders and administrators from the American university designed a program for professionals who are in positions where they can immediately apply the knowledge they are gaining in the classroom to real world situations. Choosing the appropriate content and method of delivery for formal education or training can prove challenging, especially when facing a variety options for pedagogical approaches such as classroom instruction, skill-based training, challenging job assignments, team training, action learning, feedback, mentoring, and coaching (Landry & Bewley, 2009).

Rather than selecting one approach, program leaders recognized the value of integrating a variety of pedagogical approaches.

Furthermore, as Scott argues, learning in the 21st century must move beyond traditional lecture models to more engaging and applied methods. “To develop the higher-order skills they now need, individuals must engage in a meaningful enquiry-based learning that has genuine value and relevance for them personally and their communities” (Scott, 2015). In addition to action learning assignments throughout the curriculum, a structured Executive Management Study (EMS) was designed as a practice-based synthesis activity, requiring learners to develop creative solutions to real-time challenges in the Saudi health system.

The purpose of this paper is to provide a case example of cross-cultural collaboration in higher education; and, specifically, to share experiences and preliminary outcomes of the applied synthesis projects in a global graduate degree program for healthcare executives in the Kingdom of Saudi Arabia. A post-graduation survey was administered to all 64 graduates to evaluate attitudes and feelings regarding the program. Most questions were evaluated on a five-point Likert scale, with five being the most favorable response and one being the least favorable response. We highlight specific findings (from 22 respondents) in section three of this paper.

2. Program Description and Key Challenges

2.1. Adapting the Curriculum

An initial challenge facing the American university was to adapt a US-based healthcare management curriculum to be appropriate for the Saudi educational environment. The main objective was to design the curriculum based on the roles that executive graduates would assume after completing their degree. The curriculum needed to incorporate the specific knowledge, skills, and abilities that future KSA leaders would use to overcome challenges facing their healthcare system.

To tailor the curriculum to be appropriate in KSA, American faculty members engaged in detailed discussions with Saudi healthcare leaders and administrators to learn more about hospital and health system operations in Saudi Arabia. Saudi leaders offered valuable input regarding relevant topics in specific courses such as Finance, Human Resources, and Health Policy. A Saudi attorney who was familiar with both US and Sharia Law co-taught the Health Law course, and the Marketing course was adapted to focus more on managerial epidemiology than on topics important in the competitive US healthcare environment.

Furthermore, it was important for the executive education design to differ from traditional lecture-based methods in order to be valuable for professionals. Traditional approaches

emphasize rote memorization and the application of simple educational procedures, which do not enhance critical thinking skills or student-directed learning. Teaching strategies, especially for the executive learner, must include a problem-based educational model (Donnelley, 2017). In addition, the curriculum needed to be sensitive to the concerns of teaching across cultures, to prepare Saudi medical professionals to cope with the challenges facing healthcare, and to improve their readiness for implementing changes that would later be defined by the 2030 Healthcare Transformation Strategies (“Saudi Vision 2030”, 2018).

2.2. The Blended-Delivery Model

To meet the needs of executives who would maintain their full-time employment while undertaking a graduate degree program, the Executive Master of Science in Health Administration (EMSHA) combined traditional classroom instruction and online digital media. This blended-delivery approach required faculty members and learners to participate in didactic presentations, along with guided on-line media interventions and mentored group activities. American faculty members traveled to Saudi Arabia for on-site sessions once each semester, delivering approximately 20 contact hours per course in a face-to-face format. On-site sessions were complemented by online group lectures, student-led team projects, concept-based group discussions and applied course assignments.

While the American university has successfully delivered domestic programs for working executives since the 1990’s, the global nature of the EMSHA program presented several unique challenges. Time zone differences, differences in the scheduled workweek, long-distance travel requirements for faculty, and technology support were just a few of the barriers to executing the blended-delivery format of the program from the US to KSA.

2.3. The Executive Management Study Timeline and Process

A critical element of the curriculum was the EMS, which was designed to serve as a synthesis activity during the second year of the two-year program. The EMS projects employed practiced-based learning, which afforded executive learners the opportunity to identify healthcare problems plaguing service delivery in KSA and to work in multi-disciplinary, dual-gender teams to study and suggest innovative solutions (Furman and Sibthorp, 2013). The components of the EMS required learners to integrate concepts from most courses in the curriculum. Work spanned approximately nine months to allow time for concept development, coaching feedback, and schedule adaptation around the holy month of Ramadan.

Projects were based on real-world issues and were designed to address problems of relevance and importance to the executive learners and their organizations. Initially, many suggested projects were very broad in scope and scale. Faculty coaches guided learners to construct clear, concise problem statements and often intervened to assist the teams in

breaking down larger tasks into smaller, more manageable pieces. This helped the teams to better define targeted solutions and produce a more realistic time line for implementation.

The following outline lists sequential steps for implementing an EMS. Over the course of two executive cohorts in KSA, this timeline has been revised to better facilitate the learning process and to adjust for work expectations during Ramadan and other religious holidays.

Table 1. EMS Structure and Nine-Month Timeline

Timeframe	Activity	Deliverable
Early Month 1	Identify topics, select teams, and meet with faculty coach to finalize topic proposal	
End of Month 1	Meet with CEO/senior leader to present topic for approval	X
Early Month 2	Meet with Faculty Coach to discuss project plan	
End of Month 2	EMS Chapter 1: Intro, Problem Statement and Justification Due	X
Early Month 3	EMS Chapter 2: Literature Review Draft Due	X
Mid-Month 3	Faculty Coach Review Meeting	
Early Month 4	EMS Chapter 3: Methodology Due	X
End of Month 6	EMS Chapter 4: Results Due	X
Early Month 8	EMS Chapter 5: Results and Recommendations Due	X
Early Month 9	Submit written report and virtual oral presentation to faculty	X
Mid-Month 9	Incorporate feedback and revise	
Late Month 9	Final oral presentation to senior leadership team	X

3. Strategies and Outcomes

3.1. Developing Leaders

A key driver behind the establishment of the EMSHA program in KSA was the desire by the Ministry of Health to develop competent Saudi healthcare leaders and, ultimately, reduce the reliance on expatriates in administrative positions. The EMSHA program and, particularly, the EMS provided opportunities to develop leaders in a variety of ways.

Stefl (2008) described the important role that executives play in providing a clear understanding of the healthcare organizational vision and mission to engage their leadership team in programmatic development. As an experiential, problem-based learning exercise that involved application to real-world projects, the EMS gave learners an opportunity to develop programs that engaged colleagues and demonstrated their leadership

abilities. Senior leaders, such as the hospital CEO and senior executive team, provided guidance and consultation to ensure that project topics directly aligned with the organizational vision and mission and delivered direct value to the organization.

The Global Healthcare Management Competency Directory lists analyzing problems, promoting solutions, and encouraging decision-making as a leadership competency that healthcare managers should possess (IHF, 2015). Others have argued that executives need skills in critical thinking, effective communication, and innovative problem-solving (Tsisis, et. al., 2013); and Kovner & D'Aunno (2017) stressed the importance of developing healthcare leaders who can employ evidence-based management skills to improve the decision-making processes in their organizations.

The project-based learning design of the EMS required executive learners to analyze and define problems, to reason using clear arguments and communicate their ideas effectively, to use evidence in their decision-making, and to propose inventive implementation strategies. As a result, they further developed a number of important leadership abilities and behaviors. In fact, more than 86% of respondents to the alumni survey stated that the EMSHA program had an above average effect on improving both their ability to communicate their ideas to others throughout their organizations and on their ability to make evidence-based decisions.

3.2. Fostering Collaboration

The EMS fostered collaboration amongst Saudi executive learners through the multidisciplinary, team-based approach. Teams often included physicians, nurses, and administrators working across silos to accomplish the objectives of the project. Most graduates (86%) perceived a high level of value from the multidisciplinary team design of the EMS. In addition, the opportunity to collaborate and work as a team was specifically and repeatedly cited as a major benefit of the EMS experience.

The dual-gender team design also offered a unique opportunity for men and women to collaborate in an educational environment. Traditionally, education in Saudi Arabia is segregated by gender (Smith & Abouammoh, 2013). Healthcare, however, is a professional environment where men and women from a variety of cultural backgrounds work side-by-side to care for patients. At the beginning of the EMSHA program in 2012, the sponsoring institution and the American university received special permission to hold classes in an unrestricted (meaning there would be no dividers or barriers in the room) dual-gender setting and for the EMS teams to be comprised of both men and women.

The goal of the program was not to impose Western values in the Saudi educational environment. Rather, program and hospital leaders recognized how imperative it is for men and women from various disciplines to collaborate to solve problems in health care.

The EMS provided a chance for developing collaborative professional relationships that transfer from the educational environment to the workplace.

3.3. Facilitating Transformation

The vast transformation currently taking place in the health system in Saudi Arabia requires leaders who are better prepared for problem solving and for implementation of changes that have the potential to improve healthcare organizations and healthcare delivery. All survey respondents stated that the program improved their ability to apply their newly acquired knowledge of health administration to propose creative solutions to challenges. In addition, the EMS projects presented opportunities for learners to make an impact on healthcare delivery and the health system as a whole in Saudi Arabia.

EMSHA students gained support for their projects from senior leaders prior to beginning the EMS process and presented their work and findings to senior leaders at the conclusion of the program. This was an important step toward ensuring the possibility for implementation. Despite major change during this time of transformation and somewhat restricted access to funding, approximately 64% of survey respondents said it was likely that their team's EMS would be implemented.

EMS projects such as, "Reducing cardiac mortality during Hajj Season: the largest gathering on the planet" and "A proposal to establish a Saudi equivalent of the National Institute of Health" are already underway and have the potential to make a broad impact on the Kingdom. Other projects such as, "The effectiveness of recruitment strategies and the severity of barriers of staff nurses in a selected tertiary care hospital in the Kingdom of Saudi Arabia" and "Proper utilization of an out-patient department at (a specialty care hospital in Saudi Arabia)" are being implemented to make improvements in strategic areas for one particular hospital. However, these projects have the potential to be replicated in other organizations throughout the Kingdom.

4. Conclusion

In conclusion, the EMSHA program and, particularly, the EMS experience have provided several opportunities for developing leaders, fostering collaboration, and facilitating healthcare transformation in Saudi Arabia. There is more work to be done in terms of refining the program and measuring outcomes, but projects are already making an impact in the Kingdom. Now, many of the recent graduates are utilizing their acquired administrative and management skills to lead the changing healthcare environment to better serve its citizenry.

References

- Donnelly, R. (2017). Blended Problem-Based Learning in Higher Education: The Intersection of Social Learning and Technology. *Psychosociological Issues in Human Resources Management*, 5(2): 25-50.
- Eckstein, L.K., et. al. (2003). *Understanding Your International Students: An Educational, Cultural, and Linguistic Guide*. J. Flaitz (Ed). Ann Arbor, MI: The University of Michigan Press.
- Furman, N. and Sibthorp, J. (2013). Leveraging Experiential Learning Techniques for Transfer. *New Directions for Adult and Continuing Education*, (137), 17-26.
- Hernandez, S. R, O'Connor, S. J., and Messe, K. (2018). *Global Efforts to Professionalize the Healthcare Management Workforce: The Role of Competencies*. Manuscript submitted for publication.
- International Hospital Federation. (2015). *Leadership Competencies for Health Services Managers*. Bernex, Switzerland.
- Kovner, A. R., & D'Aunno, T. A. (2017). *Evidence-Based Management in Healthcare* (2nd ed.). Chicago: Health Administration Press.
- Landry, A. Y., & Bewley, L. W. (2009). Leadership Development, Succession Planning, and Mentoring. *Strategic Human Resources Management in Health Services Organizations*, 133-146.
- Saudi Vision 2030. (2018) National Transformation Program 2020. Retrieved from: <http://vision2030.gov.sa/en/ntp>
- Scott, C. L. (2015). *The Futures of Learning 3: What Kind of Pedagogies for the 21st Century?* UNESCO Education Research and Foresight, Paris. ERF Working Papers Series, No. 15.
- Smith, L. and Abouammoh, A. (2013). *Higher Education in Saudi Arabia: Achievements, Challenges, and Opportunities*. Dordrecht: Springer Netherlands.
- Stefl, M. E. (2008). Common competencies for all healthcare managers: the Healthcare Leadership Alliance model. *J Healthc Manag*, 53(6), 360-373; discussion 374.
- Tsasis, P. et al. (2013). Learning to Learn: Toward a Relational and Transformational Model of Learning for Improved Integrated Care Delivery. *Administrative Science*, 3(2); 9-13.

A longitudinal study on language learning vocabulary in L2 Spanish

Pardo-Ballester, Cristina

Department of World Languages and Cultures, Iowa State University, Ames, Iowa

Abstract

Some learners perform better on listening tests that include visual input instead of audio only (Wagner, 2008) while others have found no difference in the performance of participants in the two test formats (Batty, 2015). These mixed results make it necessary to examine the role of using audio and video in listening comprehension (LC). This study examines the effect of input modality on the learning of new vocabulary with intermediate L2 learners. The study gave four versions of the same text: a baseline in audio format, a baseline in video format, a redundancy-enhanced version in audio format and a redundancy-enhanced version in video format. Three hundred sixty two intermediate learners of Spanish participated in this study over a period of three consecutive semesters. Results about input modality indicated audio or video does not seem to matter in responding correctly to the vocabulary items. However, the redundancy-enhanced version in audio and video formats helped learners to respond correctly to vocabulary items when enrolled in face2face-blended courses compared to online-hybrid courses.

Keywords: *listening; vocabulary; video; audio; redundancy;assessment.*

1. Introduction

For years I have been observing and evaluating language classes as one of my responsibilities for directing first and second Spanish courses at a Midwest medium-size research university. Teaching a more interactive class has given prominence to the use of videos, visual support, or games, especially when the target language is spoken constantly. That is, language instructors incorporate visual support in their lesson plans (Batty, 2015) not only for teaching listening, grammar, vocabulary and culture (Pardo-Ballester, 2012), but also to prepare students before an assessment. Moreover, well-known publishers supplement their textbooks with online learning management systems to fit every learning style. Platforms such as WileyPlus, McGraw-Hill Connect, and others include online exercises and assessment using visuals and videos. However, most of the time when language instructors assess their students' LC skill, visual aids are not used. Becker and Sturm (2017) state that among scholars there is agreement in incorporating audiovisuals for L2 instructions, but researchers do not agree about using them for language testing. Furthermore, my personal experience, observing and evaluating courses as some of my service responsibilities in my position as a faculty member at the Department of World Languages and Cultures, reveals that for the listening section of the test, the instructor still reads aloud a scripted text instead of using an audio-only file or audiovisual file (i.e., still pictures and graphics, or a video with non-verbal communication such as body gestures and facial cues). The scripted text is normally written and revised either by the instructor, the supervisor, or the publisher. According to Wagner (2014), important language testing organizations do not use videos for L2 LC such as the International English Language Testing System (IELTS) or the Pearson Test of English Academic (PTE). It makes sense that if students learn the foreign language using visual support, they should also be tested in the same way (Lee & Van Patten, 2003).

A number of researchers (Batty, 2015; Coniam, 2001; Pardo-Ballester, 2016; Suvorov, 2014; Wagner, 2010) have found mixed results when assessing L2 LC with only audio input and/or visual support, resulting in a need to investigate this topic. The purpose of this particular project was to develop different types of L2 Spanish LC tasks with audio and video formats that were related to the type of L2 listening assessment students used in the classroom. That is, when students take a language test, the listening section includes a monologue with audio-only. The intention was to learn about 1) the effect of a redundancy-enhanced version in video and audio formats on LC and vocabulary recognition; and 2) the effect of different instruction formats (online-hybrid vs. face2face-blended) on learners' ability to respond correctly to items with new vocabulary.

2. Literature review

Jones and Plass's (2002) study, which investigated the effect of visual and verbal annotations on LC of students of French, revealed that a visual component can aid in the recall of information and vocabulary recognition. In their study, students exposed to both visual and verbal annotations performed better than those students exposed to only visuals. In a follow-up study, Jones (2003) "suggests that the availability and the choice of visual and verbal annotations in listening comprehension activities enhances students' abilities to comprehend the material presented and to acquire vocabulary" (p. 41).

Elaboration is when the input is modified by adding redundancy such as repetition, paraphrasing of information, or providing synonyms of low frequency lexical items (Long, 2007). L2 learners can better understand texts that have been modified with the elaboration device because learners "have more opportunities to process critical information" (Oh, 2001, p. 86). Elaboration has been an effective device for better comprehension of a written or an aural passage (Long, 2007; Oh, 2001).

Ginther (2002) specifically calls for more research to be done in the area of content and context visuals and their effect on learner performance on L2 listening. She differentiates between context and content visuals. Context visuals are visuals that provide information about a situation, for example a picture with a situation such as a couple of friends playing basketball in the park. Content visuals are visuals that are related to the oral input. For example, if students hear a low frequency word such as '*mostrador*' (counter), they will see a visual aid to illustrate that word with the purpose of facilitating the comprehension. That is, words and pictures convey identical content making the text redundant for the L2 learners which again facilitates comprehension. Her study showed that visuals can help students' performance on listening tests. Ockey (2007) compared context visuals in the form of still images to context visuals with a video. His study reveals that context visuals with a video were distracting for students, but it helps at the beginning of the listening test because it provided a situational context.

Regarding item preview, in Berne's (1995) study, one group had a chance to read the items before listening to the oral input while the other group reviewed vocabulary. Results showed that students who previewed items before the listening task performed better than their counterparts without access to the items.

3. Overview of the project

3.1 The Spanish courses

The intermediate Spanish courses presented in this study were delivered in two different formats: online-hybrid and face2face-blended. The students enrolled in the online-hybrid course met twice a week in the classroom for fifty minutes and one 25-minute synchronous

on-line course with four or five classmates and the instructor. The face2face-blended course met three days in a regular classroom and one day in a language computer lab. Each class time meeting lasted fifty minutes. Participants took the listening tests in the computer lab.

3.2 The listening assessments

The instruments used consisted of eight listening tests with monologues in a Spanish target language use domain, and a total of five items of multiple-choice format for each assessment. Students have access to question the preview before listening to the audio. Only two items were focused on vocabulary items, that is words or expressions that did not appear in their textbook such as “*chuparse los dedos*” (a delicious meal). See Figure 1 for a sample of the video format test. The vocabulary items were the ones analyzed in this study.

Each test was delivered on a web-based computer. All texts were monologues and were administrated within the video and audio tests based on a redundancy-enhanced version and a baseline version. Video and audio formats were embedded in the listening tests within the course platform. All listening tests included a play button and it could be played only twice without stopping the audio or reviewing for specific details.

The visual input for the video format includes context and content visuals. The context visual is the title of the test projected on the screen as a caption and the first visual they see from the video. According to Ginther (2002), this helps to set the scene for the spoken input. Participants see the title of the video and the visual input related to the topic of the test. The content visual includes photos and videos and tends to be equivalent to the aural content. If participants hear ‘*mostrador*’ (counter), they also see an image of that spoken word.

Escucha el audio dos veces y luego contesta las siguientes preguntas:



Play 

QUESTION 4

Según el audio ¿Qué significa *chuparse los dedos*?

- a. Comer comida con los dedos
- b. Comer comida deliciosa
- c. Comer comidas variadas

Figure 1. Sample of a video format listening test for ‘*chuparse los dedos*’

4. Research questions

The present research seeks to address the following questions:

RQ1: Do intermediate level learners of Spanish perform better in vocabulary items using video listening tests when compared to learners using audio listening tests?

RQ2: Is there a difference in performance between students enrolled in an hybrid course and students in a face2face-course when responding to the same vocabulary items?

RQ3: After 4-6 weeks of taking listening tests, did students learn the new vocabulary when compared with their first performance?

5. Method

A pseudo-crossover design was used for this study of the eight tasks. See Table 1 for a sample of how tests were distributed. Three hundred sixty two students of intermediate Spanish level participated in the study during three semesters. The data collected for this study were the test results for eight tests. This data was analyzed with a generalized linear mixed effects model in the SAS software for the probability of getting a correct answer on the vocabulary items. The model includes fixed effects for question, method (face2face-blended vs. online-hybrid vs. control group), audio versus video, and an interaction between audio versus video and method.

Data was also collected from a delayed post-test administrated 4 weeks after taking the last test. Results investigated whether or not students could recall vocabulary items that appeared in four of the listening tests. The paper and pencil post-test was administrated in the third semester to a total of 111 participants. This test included the same questions and possible answers that appeared in the listening tests. Students needed to identify the meaning of the vocabulary items and tell if they knew the eight vocabulary items before the research. For this, a Likert scale was used (1-for completely disagree, 4-for completely agree). For example, they were asked “Based on your Spanish knowledge, did you know the meaning of ‘*cargarse las pilas*’ before?” To investigate vocabulary retention, a profit regression model was used.

Table 1. Sample of pseudo-crossover design for two tests and two instructional formats

face2face-blended (Redundancy)	Online-hybrid (Redundancy)	face2face-blended (Control)	face2face-blended (Control)
AR1	VR1	VC1	AC1
VR2	AR2	AC2	VC2

AR1: Audio redundancy-enhanced version for test 1, VR2: video redundancy-enhanced version for test 2, VC1: video control with baseline version for test 1, AC2: audio control with baseline version for test 2

6. Results

R.Q.1. There was no significant difference on vocabulary items between the audio group and the video group ($p= 0.6759$) indicating that the effect of audio versus video did not seem to matter. Table 2 lists Least Squares-Means (LS-Means) for the audio effect; the predicted probability or the average of log-odds of getting a correct answer is shown with the estimate result (0.04485), meaning that participants are more likely to respond correctly to vocabulary items when using video.

Table 2. Least Squares Means Estimates for the effect of audio

Effect	Label	Estimate	S.E	DF	TValue	Pr > t
Audio	Audio vs. Video	0.04485	0.1072	359	0.42	0.6759

No a significance difference on vocabulary items for audio or video ($p= 0.6759$)

R.Q.2., Looking at specific groups based on instructional formats in Table 3, we learn that the face-2-face-blended group working with videos with redundancy performed better answering vocabulary items compared to other groups. The estimate column displays the least-squares mean estimate on the logit scale of getting the correct answer when the odds are higher than 0, and the mean column represents its mapping onto the probability scale. So, as showed in Table 3, the performance of the F2F-blended group is significantly different when they used video with redundancy, indicating that this group outperformed the others (with an estimate of 1.17, $M=0.76$, $p<.0001$). The same group is significantly different when using audio enhanced with redundancy when compared to the hybrid and control groups (with an estimate of 0.90, $M= 0.71$, $p<.0001$).

Table 3. Least Squares Means for the method

Method	Estimate	S.E	DF	T Value	Pr > t	Mean	S.E. Mean
Control video	0.5856	0.1574	359	3.72	0.0002	0.6424	0.03616
Control Audio	0.4634	0.1482	359	3.13	0.0019	0.6138	0.03514
Online-hybrid Video	0.3950	0.1955	359	2.02	0.0441	0.5975	0.04702
Online-hybrid Audio	0.6474	0.1818	359	3.56	0.0004	0.6564	0.04100
F2F-blended Video	1.1715	0.1606	359	7.29	<.0001	0.7634	0.02901
F2F-blended Audio	0.9067	0.1678	359	5.40	<.0001	0.7123	0.03438

The F2F-blended group when working with video and audio enhanced with redundancy outperformed the other groups.

Results for comparing groups show that the hybrid and control groups have similar performance ($p=0.98$). It is significantly different from the face2face-blended group when compared to control ($p=0.0009$) and compared to the hybrid ($p=0.00014$). This tells us, on average, the performance of students who were enrolled in face2face-online courses and worked with listening tests enhanced with redundancy did better than their counterparts in the control groups and the hybrid groups.

R.Q. 3. Results from the delayed post-tests indicated that none of the 111 students tested knew the vocabulary items before the study. A significance difference ($N=111$, $z = 2.62$, $p>|z|=0.009$), comparing results from the first time they took the tests to the second time taking the recognition vocabulary test, indicated that the probability of answering the items correctly is less than 1%.

6. Implications and Conclusions

Implications for future research in pedagogy and testing emerge as an outcome of the results of this study. Participants were comfortable listening to an audio in Spanish and answering questions. That is, they were not instructed about any listening strategies. Current research has proved that the role of strategy instruction on L2 LC helps learners improve their listening proficiency (Nogueroles Lopez & Blanco Canales, 2017). Further research should be conducted to examine the relationship of instructed strategies for listening tests with the use of visuals which

could help sensitize students on the process of watching and listening. For example, if students are taught about the cognitive strategy of visual elaboration, they could relate an image with the audio and therefore select the correct answer. This study proved that when listening tests are enhanced with redundancy, participants perform better when responding to vocabulary items, but only for those students not pertaining to the online-hybrid or control groups. So there appears to be some variation among L2 listeners as to the degree to which they can cope with unknown vocabulary items as they listen. Perhaps students spending more time in the classroom with their teacher is the key to account for this variation.

References

- Batty, A.O. (2015). A comparison of video-and audio-mediated listening testes with many-facet Rasch modeling and differential distractor functioning. *Language Testing*, 32 (1), 3-20.
- Beckner, S. & Sturm, J. (2017). Effects of audiovisual media on L2 listening comprehension: A preliminary study in French. *CALICO Journal*, 34 (2), 147-177.
- Berne, J.E. (1995). How does varying pre-listening activities affect second language listening comprehension? *Hispania*, 78, 316-329.
- Conian, D. (2001). The use of audio or video comprehension as an assessment instrument in the certification of English language teachers: A case study. *System*, 29(1),1-14.
- Davies, M. (2006). *A frequency dictionary of Spanish: Core vocabulary for learners*. New York: Routledge.
- Ginther,A. (2002). Context and content visuals and performance on listening comprehension stimuli. *Language Testing*, 19,133-167.
- Jones, C. & Plass, J. (2002). Supporting listening comprehension and vocabulary acquisition in French with multimedia annotations. *The Modern Language Journal*, 86 (4), 546-561.
- Jones, L.C. (2003). Supporting listening comprehension and vocabulary acquisition with multimedia annotations: The students' voice. *CALICO Journal*, 21(1), 41-65.
- Lee, J.A & Van Patten, B. (2003). *Making communicative language teaching happen*. New York: McGraw Hill.
- Long, M. (2007). *Problems in SLA (Second language acquisition research)*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Nogueroles López, M. & Blanco Canales, A. (2017). Un modelo de instrucción en estrategias: efectos sobre la competencia en comprensión auditiva. *Journal of Spanish Language Teaching*, 4 (1), 75-89.
- Ockey, G. J. (2007). Construct implications of including still image or video in computer-based listening tests. *Language Testing*, 24 (4), 517-537.

- Oh, S. Y. (2001). Two types of input modification and EFL reading comprehension: Simplification versus elaboration. *TESOL Quarterly*, 35 (1), 69-96.
- Pardo-Ballester, C. (2016). Using video in web-based listening tests. *Journal of New Approaches in Education Research (NAER)*, Vol.5 (2), 91-98.
- Pardo-Ballester, C. (2012). CALL evaluation: Students perceptions and use of LoMásTv. *Computer Assisted Language Instruction Consortium (CALICO) Journal*, Vol. 29 (3).
- Suvorov, R. (2014). The use of eye tracking in research on video-based second language (L2) listening assessment: a comparison of context videos and content videos. *Language Testing*, 1-21.
- Wagner, E (2008). Video listening tests: What are they measuring? *Language Assessment Quarterly*, 5, 218-243.
- Wagner, E. (2010b). The effect of the use of video texts on ESL listening test-taker performance. *Language Testing*, 27(4), 493-513.
- Wagner, E. (2014). Assesing Listening. *The Companion to Language Assessment*, 1-17. DOI.10.1002/9781118411360.wbcla094

Forced vital capacity & oxygen consumption screening at students

Mostoflei, Florin ^{ab}

^aBiochemistry and Training Technology Department, National Institute for Sport Research, Romania, ^bPhysical Education and Sport Department, The Bucharest University of Economic Studies, Romania

Abstract

This work was conducted with the support of 19-20 years old students during physical education classes across the 1st Semester of AY 2017/2018 at The Bucharest University of Economic Study. The study case starts with the premise that all subjects were under/medium level trained and it focuses on a cross-screening survey which includes body mass index, oxygen consumption, heart rate activity, oximetry, spirometry and caloric consumption rate. The participation of subjects was voluntary and for this they signed a written agreement which allows the results to be published. The surveillance process was made using approved devices and a previously tested methodology. The final results revealed that there is no correlation between VO₂, BMI and FVC for the subjects of the group.

Keywords: *oxygen consumption; forced vital capacity; caloric consumption rate*

1. Introduction

The study should be linked to previous research of metabolic adaptation process to the physical activity for some untrained 19-20 years old students. The research focuses among others on possible heart rate (HR) malfunctions at young people during effort. Related to the opinion of a local cardiologist (Dimulescu, 2017) *“there is no monitoring program at national level of ischemic diseases, high blood pressure and cardiovascular activity”* and this work might be a starting point for economical university area in our town.

2. Objectives

Three objectives followed are: #1: Determination of maximum caloric rate correspondence with maximum HR for each monitored subject, related to physical education (P.E.) classes typologies. #2: Identification of some possible malfunctions of student's cardiovascular system during effort surveillance. #3: Establishing of a potential correlation between body mass index (BMI), oxygen consumption (VO₂) and the forced vital pulmonary capacity (FVC).

3. Assumption

The study case starts from the premise that all subjects were under or medium level trained and from one already proved truth: “cardiorespiratory activity is linked (...) by relative level of activation of muscles, regardless of their mass” (O'Dwyer & Neilson, 2000, p.2); the assumption follows the identification of any possible correlation between BMI typology (Haff & Dumke, 2012), VO₂ and FVC to the study group.

4. The purpose

Through this issue, I will try to launch an assistance program into university area, focused on a screening process that includes a multiple morphological indexes in order to prepare the future economists for life and work activities. My believe is that a good and efficient young economist must be healthy and a pretty fit/active human being; Secondary, I would like to increase the awareness level of the subjects in a sense of self-surveillance for those with any particular HR sensibilities using medical and fitness approved devices and healthy habits.

5. Research timesheet, the study group and technical support

The study was conducted during the 1st Semester of AY 2017/2018 at The Bucharest University of Economic Study sport facilities. The class was 70 minutes long, attendance 1/week and all leading activities were managed by P.E. teacher. The subject's participation was voluntary and, consent by them by a written agreement for public reveal of the data research. [1]

From a total of 256 students, after the disposal of classes, 45 of them agreed in writing to be part of the study as volunteers. In the end, 22 students went through all 5 phases of the research: anthropometry check, oxygen saturation and fitness tests, HR surveillance and spirometry evaluation. The data was gathered in a 14 weeks period.

The technical support consisted of the following approved devices [2]: cronometer Geonaute (China), body composition analyser Healthy Living (Korea), video recorder SONY Handycam (China), Polar V 800 & sensor H10 (Finland), Polar Precision Performance System (Finland), pulsoximeter SANITAS (Germany), spirometer SPIRODOC – M.I.R. (Italy). Previous the start of data acquisition (1.10.2017) and later on week VI and VII, a technical synchronisation of the devices became necessary; this procedure was repeated each time when I wrote the observation protocol files, during primary data acquisition.

6. The methods

The following research methods were used: observation, interview inquiry and study case.

7. The methodology

7.1. Step 1

At this stage, people distribution into the sport areas and interviewing a bigger number of students was necessary. By doing this, I could identify the subjects with special particularities related with their post traumatic experiences, different surgical interventions or any other medical records. That information was useful in order to adapt subsequent activity to their needs. From a total of 256 identities, 9 were rejected, 27 were medical exempt, 21 were absented and, in the end, only 60 of them were interviewed and included into the initial study group. Related to the available sport facilities and minimum conditions for quality acquisitions, the subject's distribution and class typologies were the following: volley/football/combat sports – men & fitness/aerobics - women;

7.2 Step 2

Obtaining the subject's written agreement was the next phase of the study. By doing this, students agreed for the results to be published without any risk of confidentiality

infringement. At the same time, the anthropometry (Healthy Living) data were extracted for BMI calculation.

7.3 Step 3

Next, the pulseoximetry report (Sanitas) allowed surveillance of resting H.R. and oxygen saturation (SpO₂) values/sitting position, useful information for oxygen consumption (VO₂) calculation (Polar V 800 – Fitness test).

7.4 Step 4

Surveillance of HR dynamics during effort (Polar Precision Performance System) was next phase into the study. All previously gathered data was inserted into device, in order to achieve the maximum caloric consumption rate in accordance with maximum HR value during effort and class typology for each subject. Observation protocols were filled, each moment of activity was marked for better identification of metabolic response.

Related to lesson typologies, I have used different methodologies as following: combat classes/man – comparative analysis of HR diagrams for subjects that made similar/alternative effort; fitness classes/woman – comparative analysis of data extracted on standardized effort (1x2 min running effort at V8 speed & 1x2 min at V11 speed on trade mill model Vision Fitness T 9800); aerobic classes/women - comparative analysis of HR diagrams for subjects that made similar effort; football classes/man – analysis of data individually for each subject related with game phases.

7.5 Step 5

The final step of my research included data extraction of FVC (Spirodoc – M.I.R.). Each subject has 2/3 tries to complete the spirometry test and best value was instantly predicted (%) and interpreted on NHANES III data base (Miller & al, 2005). The protocol presumed one slow deep inspiration as much air as possible, followed by one complete expiration as fast as possible and the test was finished with additional forcefully inspiration.

8. Processing & data interpretation

8.1. First objective

With Polar Precision Performance System support I could determine the maximum caloric consumption rate for each tested subject (Table 1). The data was gathered in accordance with their particularities (age, sex, height, weight, resting HR, VO₂ and self-appreciation of physical activity) and the results emphasized their individual adaptability response to stress/effort. 33 subjects were involved into survey process, in the end was gathered 28 hours and 39 minutes with a sample of 5 second/data.

Table 1: Sample of maximum caloric consumption rate at different class typology

Subject	Sex	Class typology	Maximum consumption rate	Individual details	Moment in effort
I.C.	f	fitness	896 kcal/60 min/189 bpm	19 y.o.rest HR 84; VO2:38	trademill running
N.A.	f	aerobics	561 kcal/60 min/194 bpm	20 y.o. rest HR 84; VO2: 36	standing activity
B.C.M.	m	football	1339 kcal/60 min/207 bpm	19 y.o. rest HR 84; VO2: 52	offensive play
I.A.A.	m	combat	1550 kcal/60 min/194bpm	20 y.o. rest HR 84; VO2: 40	striking at rubber (boxing)

8.2 *Second objective*

HR surveying process relieved that 2 individuals from the study group might have some heart particularities, presenting the following dynamics: Subject # 2 with HR media of 144 bpm (S.D. 16,9 bpm) compared with Subject #11 who presented a HR media of 91 bpm (S.D. 18,6 bpm) during the same controlled effort (gap 53 bpm). (Figure 1) Second case: Subject # 17 who developed an increase gap in HR diagram from 158 to 198 bpm (+ 40 bpm) during 60 seconds easy pace run on trade mill (V8/Vision Fitness T 9800) and aborted the test.

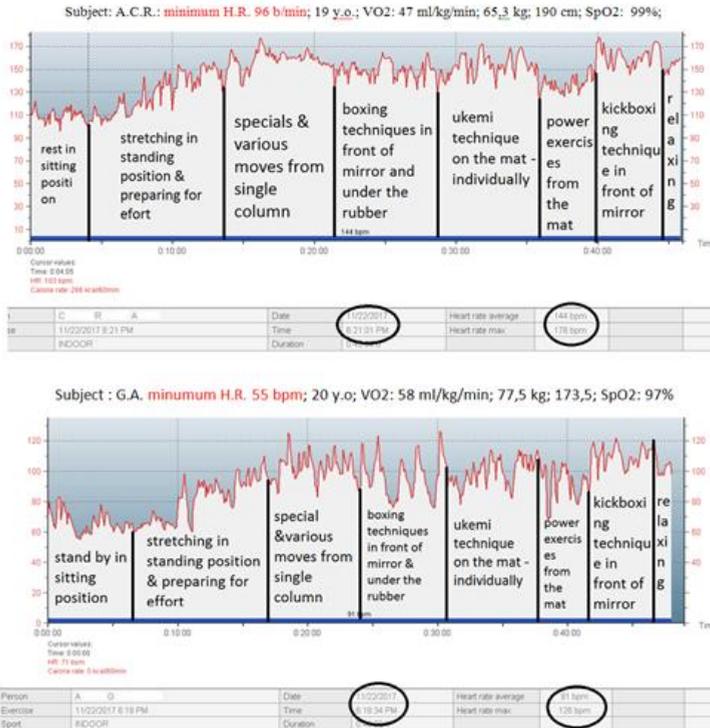


Figure 1. Sample of different H.R. activity during the same conducted effort.

8.3 Third objective

I have focused on those subjects who already presented overweight trends at 19/20 years old. Like others (Ricardi, G. & Dendale, P., 2017), I consider that a young person needs a weight loss program when overweight (BMI > 25 kg/m²) signs appears. Centralized data, linked to spirometry test results, present Subject # 2 & 7 & 9 developing an easy obstruction diagnosis. More than that, Subject # 7 with excellent VO2 values (68 ml/kg/min) and predicted FVC index (117%) received from Medical International Research (M.I.R.) device a contradictory diagnosis of easy obstruction for upper respiratory tract. This aspect might be confirmed by additional radiology tests which are out of my competences and could be an argument for the amplitude of this type of research.

	SEX	B.M.I.	FVC(l)	predicted %	VO2	resting HR	estimate			
Subject1	M	26.59	6,01.	97.	49	69	N.S.	LEGEND	symbol	measurement units
Subject2	M	18.01.	7.16	115	47	96	E.O.	body mass index	B.M.I.	kg/m2
Subject3	M	23.12.	5,01.	97	64	80	N.S.	forced vital capacity	FVC	liters
Subject4	M	21.05.	5.32	101	62	61	N.S.	predicted FVC value	%	percent
Subject5	M	23.45	5.17	100	51	78	N.S.	oxygen consumption	VO2	ml/kg/min
Subject6	M	26.22	6.69	122	52	84	N.S.	normal spirometry	N.S.	
Subject7	M	21.78	6.54	117	68	74	E.O.	easy obstruction	E.O.	
Subject8	M	21.15	5.07	90	58	71	N.S.	medium obstruction	M.O.	
Subject9	M	27.38	6.64	134	47	76	E.O.	positive values		
Subject10	M	25.21	5.61	111	45	81	N.S.	overweight		
Subject11	M	25.43	4.9	91	58	70	N.S.	obesity		
Subject12	M	38.99	6.27	104	40	84	N.S.	sample of easy obstruction & normal spirometry report		
Subject13	M	26.75	5.73	111	47	77	N.S.			
Subject14	M	21.55	5.3	103	46	86	N.S.			
Subject15	F	18.93	4.37	103	39	61	N.S.			
Subject16	F	20.17	3.48	96	41	90	N.S.			
Subject17	F	20.43	3.01	85	39	117	M.O.			
Subject18	F	20.07.	4.57.	110	45	81	N.S.			
Subject19	F	18.29	3.45.	92	36	94	N.S.			
Subject20	F	23.61	3.41	101	34	88	N.S.			
Subject21	F	17.91	3.38	90	34	70	N.S.			
Subject22	F	18.90	4.38	118	36	93	N.S.			

Figure 2. BMI, VO2 & predicted FVC values (NHANES III) from 22 subjects.

9. Conclusion

The fifth step of the research (spirometry/FVC test) emphasise the following aspect: it is possible for one subject with superior predicted value (>100%) to associate one diagnosis of easy obstruction for upper respiratory tract. There are also similar examples (62,5%) who presented normal spirometry reports as well. (Figure 2)

From the beginning of data collection, I have started the research from the premise that all subjects will be under/medium fitness trained, but following acquisitions with Polar Precision Performance System and Polar V 800 devices revealed a large spectrum of fitness levels, from fair to excellent/highly trained (men) or fair to good (women).

Analysing the group as a whole, I did not find any aspects that describe all subjects in their entirety (man & women); Between trained and untrained, underweight and Class 2 obesity, healthy and possible heart malfunction subjects, I have discovered only one connection which is different from initial hypothesis: from a total of 22 subjects (14 male & 8 female aged 19 to 20 years old) that went through all 5 research phases, 4 of them were diagnosed with easy/medium upper respiratory obstruction; among them, 2 cases (subject #2 &17) may have some HR particularities that needs subsequent surveillance. Nevertheless, the research hypothesis it is not confirmed for the whole study group (no correlation between BMI, VO2 and FVC).

Acknowledgements

[1] The list with subject's written agreement was attached to this paperwork.

[2] Excepting Sanitas pulseoxymeter, all the devices belongs to the National Institute for Sport Research – Romania; technical support for Step 3 (device V 800) was possible with Polar local distributor help – LivingWell s.r.l.

References

- Dimulescu, M. (2017, June) – The assesment (at the time) of aortic valve malfunctions, (Chair), *National Cardiology Conference in General Medicine*, Bucharest.
- Haff, G.G. & Dumke, C. (2012) – Body composition asesments, *Laboratory manual for exercise physiology*, 385-389, Human Kinetics, ISBN-10: 0-736-8413-4
- Miller, R.M. & al. (2005, April) – Standardization of spirometry, *ATS/ERS task force: standardization of lung function testing*, Brusasco, V., Crapo, R. & Viegi, G., (Edit), (2), *Eur Respir J* 2005; 26: 319–338 DOI: 10.1183/09031936.05.00034805
- O'Dwyer, N.J.,& Neilson, P.D. (2000) - Metabolic Energy Expenditure and Accuracy in Movement: Relation to Levels of Muscle and Cardiorespiratory Activation and the Sense of Effort. in Sparrow, W.A. (Editor) *Energetics of Human Activity* 1-36, Human Kinetics, ISBN:0-88011-787-7
- Ricardi, G., & Dendale, P., (2017) - Weight reducing regimens, *European Society of Cardiology*, retrieved at <https://www.escardio.org/Education/ESC-Prevention-of-CVD-Programme/Treatment-goals/Risk-factor-control/weight-reducing-regimens> accessed January 27.2017 at 12:44 hours
- Shvarts, E., & Reibold, R.C., (1990) - Aerobic fitness norms for males and females aged 6 to 75 years: a review., *Aviat Space Environ Med* 61, 3-11, quoted by https://support.polar.com/en/support/how_fit_am_i_compared_to_the_population, accessed January 25.2017 at 8:35
- Spirodoc user manual, pag 27, retrieved at <https://www.spirometry.com/ENG/download/3manuals.asp?device=spirodoc> accessed January, 28.2017 at 12:37 hours

Impacting Networked Technologies on Teaching Practices

Cutajar, Maria^a and Montebello, Matthew^b

^aFaculty of Education/Junior College (Computing & IT), University of Malta, Malta,

^bFaculty of Information and Communication Technology, University of Malta, Malta.

Abstract

Networked technologies are found permeating all work and life activities even in the education realm. Today's networked technologies are changing the way we interact within the online environment and amongst themselves. Networked technologies have unleashed a plethora of possibilities for educators to take advantage of by employing them as part of their teaching practices. In this paper are presented findings related to how academics are experiencing networked technologies for teaching and their relation to learning. A phenomenographic approach and subsequently a quantitative stance was employed to shed light on the nature and the current dynamic of such practices. This paper recounts the phenomenographic outcome, but it particularly attends to subsequent quantitative findings obtained from consideration of learning experiences against the phenomenographic map of variation in teaching experiences whereby an unexpected clustering trend was exposed. The outcomes of this exploratory research provide crucial and essential insights for higher education administrators and policy makers on how to regulate themselves with regards to the adoption of networked technologies within their institution.

Keywords: *Networked Technologies; Phenomenography; Teaching; Higher Education; Web 2.0.*

1. Introduction

Networked technologies are found permeating all work and life activities even in the education realm. Policy-makers at international, national and institutional levels are encouraging educators to rise to the challenges of the networked era, embrace networked technologies in professional practice and in so doing exploit the potential of contemporary digital technologies for improving teaching and learning. Teachers are increasingly pressured to adapt their teaching practices to include networked technologies for teaching. In this paper the focus is particularly set on the role of networked technologies in the teaching methodologies of academics within higher education (HE) institutions, rather than teaching in general. The reason behind this delineation is in recognition that educators at the highest level of schooling need to take advantage and fruitfully employ these new technologies, to ensure that graduates are equipped with the required core transferrable skills as part of their generic competencies (Goodyear, 2002), today popularly referred to as ‘twenty-first century skills’. These include “An extensive set of ... literacies (literacy, numeracy, citizenship, digital, and media); competencies (critical thinking, creativity, collaboration); and character qualities (curiosity, initiative, persistence, resilience, adaptability, leadership) that are believed to be critically important to success in the modern world” (HEA, 2018). If teaching academics aspire to instil such skills, they themselves require new skills to adapt to the dynamic nature of networked technologies and pedagogies that offer novel and potentially more effective teaching and learning experiences. This was amplified by the emergence of Web 2.0 (O’Reilly, 2005) technologies as current available networked technologies for learning that changed the way web pages and Internet applications generally are designed and used. According to Davies and Merchant (2009), Web 2.0 is a generation upgrade on the previous static World-Wide Web (WWW). It is comprised of dynamic technologies which endorse and propagate learner generated material, and moreover provide mechanisms that encourage and support interaction between Internet users more than ever before. To such extent, the authors claim that Web 2.0 technologies have the potential to enrich and transform the entire education process; as they point out four distinct ways of how learners, through Web 2.0 and today’s networked technologies generally, experience learning (Cutajar, 2017a). Learners are also able to modify content itself as well as generate new material that can be appended to the content, and at the same time participate in the social activities that such technologies enable. These communal practices empower the learner (Bousaaid, et al., 2015) to actively produce, freely share, communicate and collaborate with other learners. Networked technologies as an integral part of the teaching and learning environment support the fostering of a learning eco-system that learners and tutors create and generate through blended and online activities. In view of these technological and social developments and their potential for teaching and learning, an exploratory investigation was taken up with a number of academics to analyse and document their experiences in engaging with networked

technologies for teaching. The authors argue that such research is crucial to the continuous professional development of academics as well as to the development of HE teaching and learning which until recently was generally overlooked. This paper follows another research article (Cutajar, 2018) specifically reporting on the phenomenographic research outcome describing HE academics' experiencing of using networked technologies for teaching. This paper recounts this phenomenographic outcome, but it particularly attends to subsequent quantitative findings and the results obtained from consideration of participants' learning experiences against the phenomenographic map of variation in teaching experience obtained earlier whereby an unexpected clustering trend was exposed.

2. Related Literature

Web 2.0 technologies and evolving Internet applications have enabled a novel networked medium which educators and learners alike can benefit from. These technologies have “blurred the line between producers and consumers of content and shifted attention from access to information toward access to other people” (Brown & Adler, 2008, p. 18). In this way networked technologies empower educators and learners to communicate and interact in new and natural ways that were not previously possible thereby creating a new educational medium that educators, even at a higher level, have to rethink and eventually require re-training and development (Montebello & Camilleri, 2017). From a students' perspective, Cutajar (2017b) reports on variation in thinking about teachers and other students in a networked learning setting as in a pairwise tie expanding from the teacher as director of all learning and other students as separately persevering with their own studies, to the teacher as organiser and other students as direct learning contributors through their visible activity and interactivity, to the teacher as convener coming close to being a co-actor and other students as co-creators for learning. An active networked learning approach is proposed requiring learners to engage with each other, tutor and resources for learning. Networked learning is characterised by co-operation and collaboration within a learning group (McConnell, 2000). Goodyear et al. (2010) remark that “there is no point to networked learning if you do not value learning through co-operation, collaboration, dialog, and/or participation in a community” (p.2). The authors strongly believe that the use of networked technologies for teaching and learning offer innovative pedagogic prospects to educators in HE. This research was purposely aimed at exposing the different ways of discerning the use of such technologies for teaching. A fundamental premise giving direction to this research is that different ways of experiencing networked technologies for teaching are not right or wrong, but more, or less, elaborate ways of integrating contemporary digital technologies within professional practices (Cutajar, 2018). This premise links up to the notion that what academics see as most appropriate in their professional teaching substantially influences what they do in practice (Kirkwood & Price,

2014). Similar studies by Roberts (2003), Lamerias, et al. (2012), and Shah (2014), investigated the employment of technologies within higher education, but focused on generic practices of how the web, learning technologies, and virtual learning environments are being productively used for teaching within the HE environment. In this research the focus is on the meaning-making and the related operationalisation of networked technologies in an effort to explore the academics' teaching experiences and the attainment of a current dynamic of variation in experiencing and how this relates to their learning.

3. Research Methodology

The empirical study was based on a purposive sample of 27 teaching academics within a HE institution. The sample of participants is demographically balanced in terms of academic entity of affiliation, discipline area of specialisation, tenure, status and gender. Data generation was carried out in the first quarter of 2016 using one-to-one semi-structured interviews with consenting participants. Interviewees were invited to describe concrete examples of how they integrated networked technologies in their teaching, and to reflect on their motivations, intentions, student learning engagement and student learning benefit. Phenomenographic data analysis led to a map of variation in academics' experiencing of networked technologies for teaching. The phenomenographic map was subsequently used as a basis for charting a quantitative representation of academics' experiencing of networked technologies for teaching.

Phenomenography was employed because of its effective and compelling potential to set out different ways of experiencing a phenomenon of concern. Phenomenography originated from within the HE context (Richardson, 1999) to investigate students' learning engagement in reading activity. Limberg (2000) argues that this research approach is best performed through the compilation of interview data, bringing together as a single collective interviewees' descriptions of experience and conceptual thought. The combined accounts of the participants, rather than the individual interview transcripts are the unit object of phenomenographic data analysis for mapping out differences and similarities in ways of experiencing the concerned phenomenon; therefore the constitution of a structurally related set of distinct categories describing the person-phenomenon relationship. In doing phenomenographic analysis, one needs to focus on what is being said vis-a-vis the study phenomenon; for the case of this study, the meaning making and intertwined engagement to using networked technologies for teaching. The constituted categories expose a distinct way of perceiving, conceptualising and experiencing the study phenomenon (Marton & Booth, 1997). Internally, each 'category of description' may incorporate further non-critical variation in describing a distinct way of relating to the phenomenon. The distinct categories are logically related forming a hierarchical inclusive

structure technically referred to as the 'outcome space'. The outcome space is configured from the interview transcripts using an iterative process. The phenomenographic data analysis process for this study was comprised of 7 iterations each leading to the next set of categories of description. The first 4 iterations of the analysis were carried out with respect to the whole transcript data. Later iterations when the categories of description started to stabilise were done with reference to the relevant transcript excerpts highlighted in the previous rounds of data analysis. Qualitative data analysis (QDA) software conveniently served to organise, annotate and manage transcript data, and later facilitated retrieval of quotations. Åkerlind (2005) recommends an ongoing effort to support all claims by evidence from the collective of transcripts, and so an attempt to confirm or discredit each category until a final global agreement is achieved. Furthermore, Åkerlind (2005) points out that the category identification process requires counter-checking to ensure that the categories are communicatively valid, and that they jointly form the outcome space. A typical check requires another researcher, or researchers, to perform the identical process independently; and compare results hence engaging in a consultative dialogue to argue, defend and mutually scrutinise the conclusive decisions of each other. For the case of this research the phenomenographic analysis done by the first author was later validated by another independent phenomenographer. An electronic spreadsheet was subsequently employed to automate and complete the quantitative data analysis required for the later part of the research enterprise.

4. Results and Discussion

The resultant phenomenographic outcome space portrayed a distinctive variation made out of five (5) hierarchically inclusive categories of description. The resultant categories, from the least to the most elaborate ways of experiencing networked technologies for teaching are: Accumulating subject content; Motivating students to engage in learning; Building the teacher-student rapport; Modelling behaviour to inspire students; and Fostering a learning community. Cutajar (2018) provides a detailed account of these categories including elaborate descriptions of the distinct ways of experiencing using networked technologies for teaching at a higher education level. It is not the scope of this paper to develop a detailed discussion of this phenomenographic component of the research study, but notably this phenomenographic outcome advances the viewpoint that transmissive and participative teaching approaches are imperative teaching practices that are different and related. Furthermore, while the results confirm prior similar studies (such as those of Lamerias, et al.(2012) and Shah(2014)), this description of variation distinctively exposes the use of networked technologies for projecting a caring attitude towards the learners. However, it also revealed the absent manifestation of the use of networked technologies for collaboration among academics as emerged from other similar studies.

The representation of variation obtained from the earlier part of the study was used as a basis for relating academics' teaching experience to learning experience using networked technologies. A preliminary task was to explore the distribution of participants across the five (5) distinct ways of experiencing networked technologies for teaching as configured by the phenomenographic effort. This task was considered important in its capacity exposing the pattern of spread of the research sample.

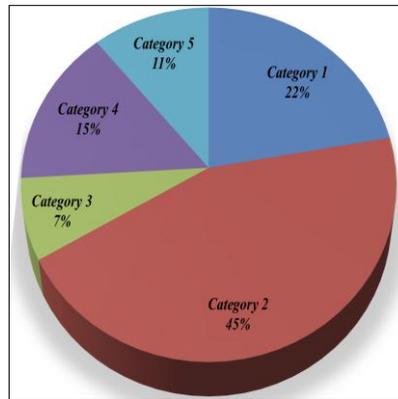


Figure 1 - Distribution of Transcripts

A representation of the obtained distribution is given by Figure 1. The different category percentages give an indication of how the transcript distributions were recorded. Approximately one fourth of the research participants (25.92%) aligned to the more complex categories (Category 4 and Category 5) of using networked technologies for teaching focused on encouraging student participation and contribution to learning as well as fostering co-learning attitudes (beyond any transmission effort). The majority of the participants aligned mostly to the less elaborate categories with 22.22% in Category 1 focusing on passing on (factual) disciplinary knowledge, 44.44% in Category 2 focusing on getting across to students the understanding of disciplinary knowledge, while 7.41% in Category 3 focusing on conveying a caring attitude using networked technologies. At large, 74.07% of the participants aligned to a category representing a transmissive teaching attitude using networked technologies (Categories 1, 2 and 3) as compared to the 25.93% of the participants aligning to categories over and above advancing participative attitudes (Categories 4 and 5).

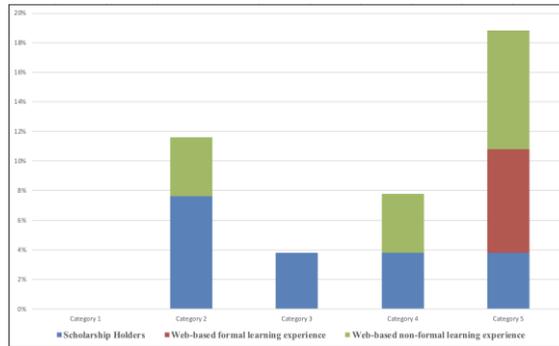


Figure 2 - Relation between Teaching & Learning

In relation to online learning, 19% of the participants were scholarship holders of an online teaching certification course that encouraged the adoption of networked technologies. Another 7% of the participants referred to their web-based formal learning experiences during the individual interviews. Furthermore, 15% of the participants (one of whom was also a scholarship holder) talked about non-formal learning experiences (such as synchronous meetings with supervisors when reading post-graduate studies; reading a massive open online course (MOOC); and so on). A good number of participants also described informal web-based learning activities such as watching recordings shared on video-sharing websites such as YouTube, and listening in on webinars which they came across. Figure 2 presents the spread of participants' online learning experience in relation to the phenomenographic spectrum of expanding awareness generated from the first part of this explorative study. Noteworthy is the finding that the participants who experienced web-based online learning emerged as aligning to the more elaborate ways of seeing online teaching – the red coloured section of the rightmost column. This finding is remarkable in realisation that these participants are not scholarship holders (reading the distance learning course on online teaching) but claimed positive web-based collaborative learning experiences.

5. Concluding Remarks

In this paper there were shared some of the results of a research study investigating teaching academics' experiences of using networked technologies within a HE institution. The core significance of the qualitative part of the research is that the variation in academics' experiences using networked technologies for teaching is not to be considered in terms of transmissive and participative binaries, but more constructively as significant aspects of the same teaching approach. The quantitative research findings presented by this paper underscore the pressing need to support academics at the academy to develop as 21st

century educators and their development of teaching using networked technologies. They signal the need for further research to explore the conditions whereby the experience of learning using networked technologies can be truly claimed to incite the development of teaching using networked technologies. But in the meantime, constructive efforts responding to the challenges implicated by the results of this study would build and expand on current practices and encourage self-initiated effort so as to positively develop teaching at HE levels in what we are experiencing as the networked era.

References

- Åkerlind, G. S. (2005). Variation and commonality in phenomenographic research methods. *Higher Education Research and Development*, 321-334.
- Brown, J. S., & Adler, R. P. (2008). Minds on fire: Open Education, the Long Tail, and Learning 2.0. *Educase Review*, 43(1), 17-32.
- Cutajar, M. (2017a). The student experience of learning using networked technologies: an emergent progression of expanding awareness. *Technology, Pedagogy and Education*, 26(4), 485-499. doi:10.1080/1475939x.2017.1327451
- Cutajar, M. (2017b). Students' perceptions of others in a networked learning environment. In *Networked Learning: Looking Back - Moving Forward*. London: Springer.
- Cutajar, M. (2018). *Teachers' experiences using networked technologies for teaching*. Paper presented at the Eleventh International Conference on Networked Learning, Zagreb, Croatia.
- Davies, J., & Merchant, G. (2009). *Web 2.0 for Schools - Learning and Social Participation*. New York: Peter Lang.
- Goodyear, P. (2002). Psychological Foundations of Networked Learning. In *Networked Learning: Perspectives and Issues*. London: Springer.
- Goodyear, P., Banks, S., Hodgson, V., & McConnell, D. (2010). *Advances in research on Networked Learning*. Dordrecht: Kluwer Academic Publishers.
- HEA (Producer). (2018, Jan 25). 21st Century Skills. *Higher Education Academy*. Retrieved from <https://www.heacademy.ac.uk/knowledge-hub/21st-century-skills>
- Kirkwood, A., & Price, L. (2014). Technology-enhanced learning and teaching in higher education: what is 'enhanced' and how do we know? A critical literature review. *Learning, Media and Technology*, 39(1), 6-36.
- Lameras, P., Levy, P., Paraskakis, I., & Webber, S. (2012). Blended university teaching using virtual learning environments: conceptions and approaches. *Instructional Science*, 40(1), 141-157.
- Li, L., Steckelberg, A. L., & Srinivasan, S. (2008). Utilizing peer interactions to promote learning through a computer-assisted peer assessment system. *Canadian Journal of Learning and Technology*, 34(2).
- Limberg, L. (2000). Phenomenography: a relationship approach to research on information needs, seeking and use. *The New Review of Information Behavior Research*, 51-67.

- Marton, F., & Booth, S. (1997). *Learning and awareness*. Mahwah, NJ: Lawrence Erlbaum Assoc.
- McConnell, D. (2000). *Implementing Computer Supported Cooperative Learning (2nd ed.)*. London, UK: Kogan Page.
- Montebello, M. & Camilleri, V. (2017) Social Media in Higher Education. In: Proceedings of the *3rd International Conference on Learning and Teaching, ICLT2017*. Jeju Island, South Korea.
- Richardson, J. (1999). The concepts and methods of phenomenographic research. *Review of Educational Research*, 53-82.
- Roberts, G. (2003). Teaching using the web: conceptions and approaches from a phenomenographic perspective. *Instructional Science*, 31(1/2), 127-150.
- Safran, S. (2010). *Social Media in Education*. Graz, Austria: Graz University of Technology.
- Shah, U. (2014). Teacher's Use of Learning Technology in a South Asian Context. In *The Design, Experience and Practice of Networked Learning*. Switzerland: Springer International Publishing.

Resource potential of the community of faculty members in the modernization of the russian higher education

Narkhov, Dmitry Yu.^a; Narkhova, Elena N.^a; Vishnevsky, Yury R.^b

^a Department of Organizing Youth Work, Institute of Physical Culture, Sports and Youth Policy, ^b department of sociology and technologies of the public and municipal administration, Ural Federal University named after B.N. Yeltsin, Ekaterinburg, Russia

Abstract

In work the theoretical bases and dynamics of processes of modernization of the Russian higher education are studied, conditions and specifics of its last cycle reveal (the end of XX – the beginning of the 21st centuries). The attention to global character, interaction with the international educational space is paid. The professional community of teachers (scientific and pedagogical workers) of the higher education (HE) acts as an object. Research objective – identification of a state, opportunities and conditions of realization of resource potential of teachers of higher education institutions for ensuring modernization of higher education. Studying of problems of resource ensuring modernization was carried out from positions of system, constructivist, resource, activity and structurally functional approaches. The empirical base was made by materials of the all-Russian sociological researches: questionnaire, expert interviews. The new scientific idea that the speed of modernization changes of system of the higher education depends on a state and conditions of updating of resource potential of community of teachers of higher education institutions is developed; their resource potential develops unevenly and depends on inclusiveness degree in an educational vertical and the status of higher education institution. Concepts of resources and resource potential of modernization of education are entered, their substantial characteristics are opened. Recommendations about optimization of this process are submitted.

Keywords: higher education, modernization, resource potential, community of faculty members, social changes, knowledge society.

1. Introduction

The change of the social development model of the late XX-early XXI, related to the formation of the knowledge society, the society of the global communication and innovations, has had a significant influence on the educational systems during the last twenty years. The concepts of the social modernization are still relevant for the modern researchers. Studying the role of the educational system in the modernization of national societies is important, because these are the educational systems that, in our point of view, define the characteristics of the global social structure. At the same time, the knowledge and information society, converting knowledge into the main capital and the principal resource, imposes new requirements towards professional education, and, thereby, determines the changes in the latter.

In this context, for the Russian society it is very important to monitor and adjust the changes in the system of higher professional education, as it predetermines future development of the country, the condition of the society and its professional resources. Finally, higher education serves as one of the main indicators of personal success. It is a basic premise for entering upper social layers, one of the forms of capital, guaranteeing a person's well-being through socially beneficial activities.

The relevance of the problem of modernization of higher professional education and the role of the basic community – the professional community of faculty members in this process - is contingent on a number of contradictions related to both the process of development of the institution of higher education by itself, and the processes linked with its reformation. The central contradiction is the desynchronization of the increased social demand for quality education and the possibility to guarantee in full the increase in the quality of educational services offered by universities on the part of the state due to the scarcity and the irrational use of the existing resources. One of such resources is the professional community of faculty members, studied by us. It is necessary to point out the inconsistent character of the processes taking place in the system of higher education, different start conditions, significant territorial and resource differences that lead to the educational inequality.

Implementation of the unified requirements towards modernization, set legislatively [*On Education, 2012 etc.*], in the given context led to ambivalent results both in terms of the quality of training, and the development of educational communities.

At the first stages, our studies were carried out under the supervision of Professor G. Korableva and were aimed at defining the condition, possibilities and requirements to the implementation of the resource potential of the university faculty members in order to ensure the modernization of higher professional education, and the search of mechanisms

for the optimization of its negative consequences and the development of the basic professional community – the university faculty members.

2. Methodology

The theoretical background of this work is formed by a significant number of works by the leading Russian and foreign sociologists (all in all we have analyzed more than 300 articles and monographs, collections of materials of the congresses and conferences including [Huntington S. (2004), Wissema J.G. (2009), Yadov V.A. (2009), He Chuanqi (2011), Sheregi F.E. & Savinkov V.I. (2011), Zborovsky G.E. [etc.] (2016), OECD (2017), HEAd'17 ect.)), that formulate the concepts of the modernization of society, the knowledge society, the development of the institution of education, the transformation of capitals, the resources provision of the social processes, the social changes and the social and professional communities. The problems of the resources provision of the modernization of higher professional education and the resource potential of the communities of faculty members were studied from the perspective of the systemic, constructionist, resource, pragmatist and structural-functional approaches.

The empirical basis of the study includes the materials of qualitative and quantitative sociological studies carried out by the author: “University faculty member in the context of the modernization of higher professional education” (2012-2013, questionnaire survey, N=1115, faculty members of 51 universities in 32 Russian cities, quota sample by reference to the status of the university); “Professional community of faculty members in the modernization of higher professional education” (2010, 2014, 2017, 12 expert interviews). The list of experts included the representatives of regional public authorities, management of universities, deans, heads of departments and faculty members from Moscow, Ekaterinburg, Perm, Irkutsk, Arkhangelsk and Saint Petersburg. Regional complex sociological survey of the students of the Sverdlovsk region (2016), two-stage quota and cluster representatives sampling, the basis for quota allocation - the number of students and the location of the university; area of study.

3. Results of the study

The study is based on the understanding of the Russian version of the modernization of higher professional education as a multiple-vector and a continuous process of progressive transformational changes of the educational system in close unity and interaction of structural, institutional and conceptual directions, aimed at increasing the quality and competitiveness of its sub-systems. One of such sub-systems is the professional community

of faculty members, which plays a special role in the process of modernization, as it stands in as a resource potential.

It consists in the maintenance of the unity of its structural (by means of simultaneous pursuit of educational activities in various elements of the changing system of higher education), institutional (through the formation and dissemination of the system of values, regulations and rules allowing to ensure the optimum interaction of subjects and communities within the sphere of education and with other social institutions) and conceptual (by means of creation and dissemination of knowledge) directions, and thus – in the preservation and harmonious development of the common educational space.

The study process only employs this potential, and it is not directly aimed at developing it. Such development would rather present a "side effect" of the professional activity. Modernization, on the contrary, is aimed at increasing the potential of the community to the level, allowing to ensure competitiveness in the knowledge society both on the level of the system of education, and on the level of the society as a whole. That is why to comprehend the successfulness of the modernization processes we studied the changes taking place in the capital and in the resources of the faculty members community.

The model of resource potential of modernization of higher education is based on the theories of Bourdieu, related to the forms of capital [Bourdieu P. (2012)], J. Coleman, related to the social capital, A. Giddens, related to the properties of social systems and others. In the Russian sociology, they gained traction in the works of T.I. Zaslavskaya (2004), G.E. Zborovsky (2009), N.E. Tikhonova (2006) and others. In the model we make a distinction between the notion of capital, understood, following Bourdieu, as relations towards resources included in the social relations of different spheres of the social life, and the notion of resource. We consider the resource for the modernization as a measure of the possibility of actualization of various forms of capital of the professional community of faculty members, that can be used by the subjects of modernization (the state, governing bodies in the sector of higher education, faculty members and students) in the course of this process. Resources can be classified under two groups a) actual (active) – those used directly in the process of modernization that can be capitalized b) potential (passive) - those that can be attracted, but have not yet been employed. As a result of the actualization of the capitals, being at disposal of the social group, the resources can be spent (reduced), like it happens to material resources in economics or social resources – in case of exceeding the scope of the set rules and regulations, stay level, or increase, forming new resources and developing a base for the respective forms of capital. Basic resources of the faculty members' community, securing the success of the modernization of higher education, are the political, economic, cultural and social resources.

The theoretical methodological and empirical analysis of the modernization processes and the changes taking place in the resource potential of the faculty members' community held by us allowed formulating a number of theoretical conclusions.

Modernization of the Russian society and its sub-systems, including higher education, has been traditionally related to the deep and fundamental cycles, significant in terms of time and space.

The main contradiction of its present-day stage is related to the orientation at the application part of this process, the aim to obtain quick results due to the technification under the conditions of "accelerating the time", the lack of availability of the resource of time, and the remarkable social persistence of education as a system and an institution. The character of the changes that take place speaks for their fundamental nature, though there are no grounds for predicting equally significant results and the completion of the process in the short-term perspective. It might be possible in 25-30 years after the start of the cycle, providing that it receives a sustainable resources' provision. Today we observe some positive changes determined by this process, yet taking place against the background of a substantial reduction of the number of universities and faculty members in the country (from 381.1 thousand in 2007 to 260.4 thousand in 2016). Staff members of private universities became mostly affected by this trend (from 37.7 thousand to 17.7 thousand during the same period). The wave of general universitization and massification of higher education was followed by the strategy for enhancing the quality of higher education by means of shutting down inefficient universities.

The principal result of the modernization should be the increased capacity of the cumulative human potential of academic communities – in the first turn, the community of faculty members. Empirical studies have shown that the dynamics of the development of its resource potential during the period under study changed the trajectory from a negative to a positive one; the appearance of new professional groups and the gradual youthification of the community serve as evidence of this fact. Russian faculty members are actively involved in the process of transition to the knowledge society through generating and transferring the scientific and academic knowledge, which has had a positive impact on the development of their resources.

In relation to the political resource, it appears in the form of new opportunities for the participation in the state administration using the elements of the civil society, electronic democracy and independent network communities.

In relation to the actual economic resource, the main evidence of the positive dynamics is not so much the general increase in the income of faculty members, as the significant extension of the range of professional activities bringing this income. Development of the

strategic component of this type of resource manifested itself in the quality of training and increased graduate employability in a number of sectors.

Information society has influenced cultural resources, forming the basis of the professional expertise of the community; it resulted in the increase in the level of importance of applied knowledge, the increased proficiency in information and communication in education and science, including the language proficiency. There appeared new forms of recognition of scientific results, the process of faculty members' involvement in international research activities became more active.

Social resources of the community, that can be deemed as the most damaged because of the social transformations of the end of the last century, are characterized by the poorest positive dynamics of all. The evidence of their development are the slow strengthening of the status of the profession, the extension of the social roles of faculty members both within the university and beyond it, the increase in the number of faculty members involved in professional communities. Thus, we can see the phenomenon of status disparity in the resource potential of the community.

The studies conducted by us have identified a number of new problems that need to be studied further in relation to the resources' provision of the modernization of higher professional education and its basic community. Among them we can name: the problems of developing corporate culture of the higher education in general; the civil culture of faculty members; the factors influencing the social well-being of the community and the behavioral strategy of faculty members; the problems related to studying other communities in the frames of the educational environment – prospective students, administrative staff, employers – and their relations with the community of faculty members; the problems of particular institutions of higher education, e.g. postgraduate and doctoral schools and some others.

Drawing on the results obtained, we have to regard the condition of the community's resources as insufficient for the completion of the current stage of the modernization of the higher education system, and the society as a whole. This fact can be proved by the inconsistent development of the community in terms of the aspects of time, location and sector - in accordance with the existing "vertical of education" and the implemented projects for the modernization of economics. Different paces of development of resources create conditions for one more educational inequality that is based on the resource potential - the inequality between different groups existing within the community of faculty members.

The policy for increasing the quality of higher education by means of the mechanical reduction of the number of inefficient universities, branches and representations, and, as a result, the number of faculty members, has contributed to the development of the

community's resources. Still, in the short run, if this policy extends, it may lead to a perverse effect; the regional social structure will degrade due to the increased migration of young people to the major academic centers. Therefore, further modernization of higher professional education should be carried out "horizontally", by means of strengthening its influence in the regions and maintaining the optimum numbers of faculty members. The leading role in this process should be played by the state, and the principal method should involve the increase of the share of expenditures on education in the budget of the country, so that it reaches the level characterizing the leading countries.

The problems of increasing the occupational prestige in the society and increasing the public confidence in the education authorities are still in the spotlight. They are based on the low level of development of economic resources in the community; it aggravates controversy between the communities and groups involved in the process of education, and presents the faculty members with a choice between their profession and the acceptable level of material prosperity. The lack of availability of economic resources retards the development of other types thereof.

Thus, the successful completion of the current cycle of modernization requires that the exerted efforts should be focused more on the community of faculty members, than on the administrative and management community as it used to be. It means the necessity to develop further the measures aimed at stimulating teaching activities, releasing more time for faculty members, reducing the intensification of labor, bringing them in compliance with European standards, creating conditions for self-development and personal fulfilment.

Computerization and technification of research and teaching activities are of crucial importance for the success of modernization. The community of faculty members should have access to the most up-to-date instruments, devices and communication facilities for their professional activities and professional development. The strategy of the state support for the leading universities implemented in this regard produces tangible results, and seems reasonable. As far as such academic centers develop, it is necessary to amend the list of the leading universities in accordance with the demands of the regions. At the same time, the development of the private-public partnership in the sphere of higher education will allow avoiding the dilution of the resource potential of the faculty members' community.

Significant efforts should be focused on the development of international collaboration in the fields of professional education and science. It is necessary to expand all forms of academic mobility, including those based on electronic communication means, making them available for the maximum number of faculty members.

Finally, it is necessary to expand the capacity of the faculty members' community to influence the social processes. This includes the development of the corporate culture of faculty members, the active employment of the expert potential of faculty members in the

generation of the strategy of the development of the country and particular sectors, strengthening the self-government through professional organizations, associations and unions, the development of network collaboration between faculty members.

It appears that solving the above-stated problems is a necessary condition for ensuring growth and mainstreaming the resource potential of the community of university faculty members. Thus, it will be possible to create conditions for the successful completion of the current stage of modernization of higher professional education and the transition to the information and knowledge model of development of the Russian society.

Further correction of the main directions of modernization of the Russian higher education is connected with understanding of heterogeneity of her educational space. Concepts of multivector modernization, nonlinear model of transformation of the higher education, assessment by the main educational communities of the preferred orientation of the universities – theoretical and applied in the scientific plan, with prevalence of master programs or programs of bachelors in the curriculum can be the basis.

References

- 3th International Conference on Higher Education Advances (HEAD'17), June 21-23, 2017, Valencia, Span. <http://dx.doi.org/10.4995/HEAD17.2017.6713> (access: 12.11.17)
- Bourdieu P. (2012) *Forms of capital* [Electronic resource]. In: the sociological space of P. Bourdieu. Access: <http://bourdieu.name/bourdieu-forms-of-capital> (access: 12.11.17). (In Russ.).
- He Chuanqi (2011). *Summary report on the modernization in the world and in China (2001-2010)* Translated from English. Under the editorship of N.I. Lapin. Moscow: Publishing house “Ves Mir”. (In Russ.).
- Huntington S. (2004) *Political Order in Changing Societies*. Moscow: Progress-Traditsiya publishing house (In Russ.)
- Korableva G.B. (1999) *Profession and education: sociological aspect of the interrelation*. Ekaterinburg: RSVPU (In Russ.).
- OECD (2017), *Education at a Glance 2017: OECD Indicators*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/eag-2017-en> (access: 12.11.17).
“*On Education in the Russian Federation*”. Federal law of the Russian Federation of December 29, 2012 No 273-Ф3 // Rossiiskaya gazeta. December 30, 2012. (In Russ.)
- Sheregi F.E. & Savinkov V.I. (2011). *Education as a factor for the formation of the intellectual potential of Russia*. Moscow: CSFaM publishing house (In Russ.).
- Tikhonova N.E. (2006) Resource approach as a new theoretical paradigm in stratification studies. *Sociological studies*, 9, 28-40. (In Russ.).
- Wissema J.G. (2009) *Towards the Third Generation University (Managing the University in Transition)*, Edward Elag, Cheltenham, UK; Northampton, MA, USA

- Yadov V.A. (2009) *Modern theoretical sociology as a conceptual basis for the studies of the Russian transformation*. St. Petersburg: Intersotsis publishing house. (In Russ.).
- Zaslavskaya T.I. (2004) *Modern Russian society: social mechanism of transformation*. Moscow: Delo publishing house. (In Russ.).
- Zborovsky G.E. [etc.] (2016) *Nonlinear model of the Russian higher education in the macroregion: theoretical concept and practical opportunities*. Ekaterinburg: Humanities university. (In Russ.).
- Zborovsky G.E. (2009) *Theory of social community*. Ekaterinburg: Humanities university. (In Russ.).

When the Massive Open Online Courses, MOOC, become Hybrid at the Open University of Mauritius

Narrainen, Gundeea

Department of Communication Studies, Social Sciences, University Of Mauritius,
Mauritius.

Abstract

With more and more courses being offered online, trainers are constantly being asked to change their teaching style. Online courses have taken another twist with innovation such as the MOOC. MOOC being non-fee paying courses by nature, are delivered mostly by established universities, course structure and management were bound to change.

With less than 10% successful completion rate for MOOC courses and keeping in mind the Mauritian context, the Open University of Mauritius, OUM, decided to offer a hybrid MOOC. By hybrid, Daniel Peraya (2006) suggests blended courses that is online training and face to face sessions. It is more about tutoring and guiding learners rather than mere teaching.

The main objective of this paper is to show the effectiveness of a hybrid MOOC in terms of organisation and course structure. The methodology adopted in this paper is a survey questionnaire and data from a MOODLE platform. The fact that this course has been organised in a blended mode has assured a higher completion rate. Face to face sessions helped learners to interact. The use of MOODLE as an additional platform accessed by a restricted number of participants proved to be helpful to get acquainted to online learning.

Keywords: MOOC; MOODLE; customization; course management; innovation;

1. Introduction

Distance learning as a self-instruction mode of learning is not enough. Thus trainers as well as institutions decided to opt for blended learning, a mix of online courses and on campus sessions. Blended is also referred to as hybrid. Distance learning and MOOC are similar in the sense that both are offered fully online, except that MOOC which emerged in 2008, target mass learners. With relatively a poor percentage of users successfully completing the different MOOC courses, some institutions decided to offer rather blended MOOC as opposed to standard ones.

MOOC may be considered as a trend but it is being more and more considered as an innovation in distance teaching and learning. When distance learning was launched there was a specific type of organisation about the way distance learning is conducted. Distance learning systems comprises of 'planning, organizing, leading, and controlling... institutional framework and the funding system... three major subsystems, the material subsystem involving production of materials, the service subsystem of support for learners, and the administrative subsystem for management of tutors', Rumble, 1992.

MOOC are an extension of distance learning with changing parameters. The planning phases are the same for both distance learning and MOOC. Concerning MOOC production of material is different as it is mainly focused on video lectures, support for learners is done mainly by tutors or peers and administration takes place only if the participant needs a certification.

A hybrid course is comprised of participants who are no more mere listeners and passive participants but are actors in the learning process. Greater interactions take place in such teaching context in terms of learners and tutors, peer to peer, learner and course content, learners and external resources, and integrated evaluation mechanism.

Our main objective is to demonstrate the effectiveness of a hybrid MOOC in terms of organisation and course structure, to point out the importance of face to face sessions and ultimately to shed light on the fact that an additional platform, ¹MOODLE, can be used for a smaller group of learners. In order to collect data, survey questionnaire and available data from a MOODLE platform were used.

2. Tech Support: Hybrid MOOC

The Coursera MOOC E-Learning and Digital Cultures (EDCMOOC) was launched in 2013, and was offered for a period of five weeks. This course is described as 'an xMOOC

¹ Modular Object Oriented Dynamic Learning Environment

platform, with trainer-defined structure, content, and assignments, EDCMOOC had a social, non-hierarchical approach to the process of the MOOC itself.' Waite, Mackness, Robets and Lovegrove (2013), have described the EDCMOOC as a "hybrid" MOOC.

The eFAN MOOC 'Enseigner et Former Avec le Numérique' hosted by Cahan and Lyon Universities paved the way for the eFAN-Maths MOOC, which ran between April and June 2014. The number of enrolled learners for this course was 10,000 approximately. Participants were active in as they participated in the proposals for education projects which was the sole assessment of this course. This MOOC comprised of a MOODLE platform as support for participants to upload their projects.

The Stanford MOOC is a ten week course launched in 2012. The trainer 'wrapped' his/her course around an existing MOOC and a new version of the 'flipped classroom' emerged. Campus sessions were focused on 'interactive discussions' and 'more challenging material' Derek, Douglas, Kathryn, and Blaine (2013). The learners reacted enthusiastically to this proposed combination of MOOC and on campus course. Learners found the well designed and that the MOOC was appropriate as a self- paced learning option. Interaction was done insitu rather than through the online community. A number of concerns were flagged by users namely that of incorporating online and oncampus course mechanisms.

In 2013 the undergraduate course of Web Programming, at the University of Politehnica Timisoara, Romania, adopted a tailor-made course scenario. The blended course included face to face sessions, online multimedia course materials on Cirip group (similar to MOODLE platform), and group work. Learners 'appreciated the multimedia materials, high interactivity, collaborative activities, mobile access, openness to Social Media platforms,³OERs and MOOC; most proposals were for increasing the number of tutorials in video format', Holotescu, Grosseck, Crețu and Naaji (2014).

3. The Context

The OUM in 2013 offered the Emerging Trends & Technologies in the Virtual K-12 Classroom in collaboration with the University of California Irvine, the Education USA office and the U.S embassy of Mauritius. The target audience was primary and secondary school teachers.

² ... any blended learning strategy that requires students to prepare learning before they meet and engage with peers in purposeful activities.' <http://www.uq.edu.au/teach/flipped-classroom/what-is-fc.html>

³ 'Open educational resources (OER) are free and openly licensed educational materials that can be used for teaching, learning, research, and other purposes.' https://wiki.creativecommons.org/wiki/What_is_OER%3F

This course is part of the ‘Virtual Teaching Program’ offered to trainers in the United States. In an effort to democratise education in the developing world, the United States had the mission to build up learning hubs by promoting education through MOOC.

Emerging Trends & Technologies in the Virtual K-12 Classroom on Coursera platform: What is it?

This Coursera course was targeted for trainers working with children between 5 to 18 years old. The course objective was to show to trainers how they could make use of technologies in order to enhance their teaching. This was a five week course. It comprised of: video lectures, lecturers slides and notes, weekly announcements, discussion forums, an assignment graded by peers, peer assessment of 3 classmates, 4 weekly quizzes comprising of 5 multiple choice questions, a final quiz comprising of 35 multiple choice questions, weekly readings, completing pre-course and post-course surveys. Coursera evaluation can be found in figure 6.

Customisation

The OUM launched an open registration, then sorted out eligible participants and organised 6 face to face sessions. A total of 115 participants had been chosen out of the. The OUM could only accommodate 60 participants per face to face session and ran two sessions per day. Face to face sessions consisted of: content expert live presentation on the week’s topic, peer presentations and answering participants’ queries. A MOODLE platform was accessible to local learners. The MOODLE platform consisted of the following: video and audio format of guest speaker presentations, peer presentations, discussion forums, polls, interesting links, YouTube videos and announcements.

Activities	Timing	Activities	Timing
Welcome	5 min	Course Requirements	20 min
Feedback	15 min	Food for Thought	10 min
Think-Pair-Share	10 min	Question Forum	5 min
Issues	20 min	Guest Lecture	30 min
Wrap up	5 min	Total no of minutes	120 min

Figure 1. Attendance details sample of a face to face session. Data generated by the Author.



Figure 2. Sample of a week content on MOODLE platform. Data generated by the Author.

The OUM evaluation

The evaluation consisted of: the portfolio, the attendance (face to face), participation on MOODLE platform and completing Coursera requirements as follows:

Portfolio (75%)	MOODLE	CAMPUS	COURSERA
Reflection: learning experience throughout the course. (15%),	Participation in discussion forums(15%), in	attendance face to face (10%),	completion of Coursera requirements (10%)
Research Findings (10%)			
Application (40%)			
Formal Aspects (10%)			

Figure 3. breakdown of evaluation. Data generated by the Author.

The portfolio was optional. Two best candidates were rewarded a scholarship to follow any tertiary level course of their choice at the OUM. Learners, once they had completed the MOOC requirements had to go back to their classrooms, from their learner experience of the MOOC state what they have learned and what were the difficulties encountered. They had to look for interesting articles and websites focusing on teaching and ICT. They had to state application made of the MOOC and provide learners feedback. MOOC course ended December 2013 and learners had to submit the portfolio in March 2014.

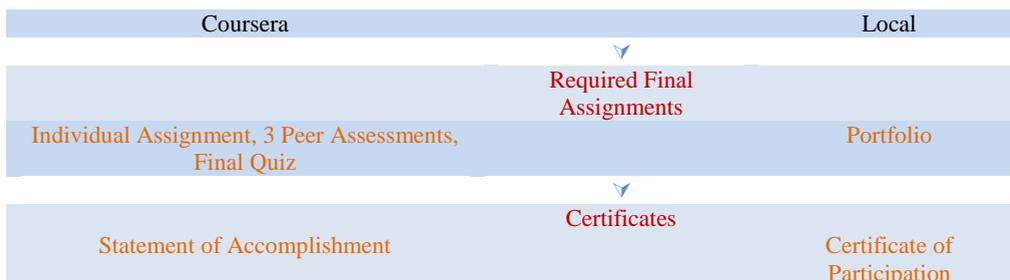


Figure 4. Weekly Course Requirement. Data generated by the Author

Statement of Accomplishment	Certificate of Participation
Weekly Course Requirements	Weekly Course Requirements
Individual Assignment	Portfolio
3 Peer Assessments	
Final Quiz	
Surveys (Optional)	Log book diary to describe learner's learning journey (Optional)

Figure 5. Complete Course Requirements. Data generated by the Author.

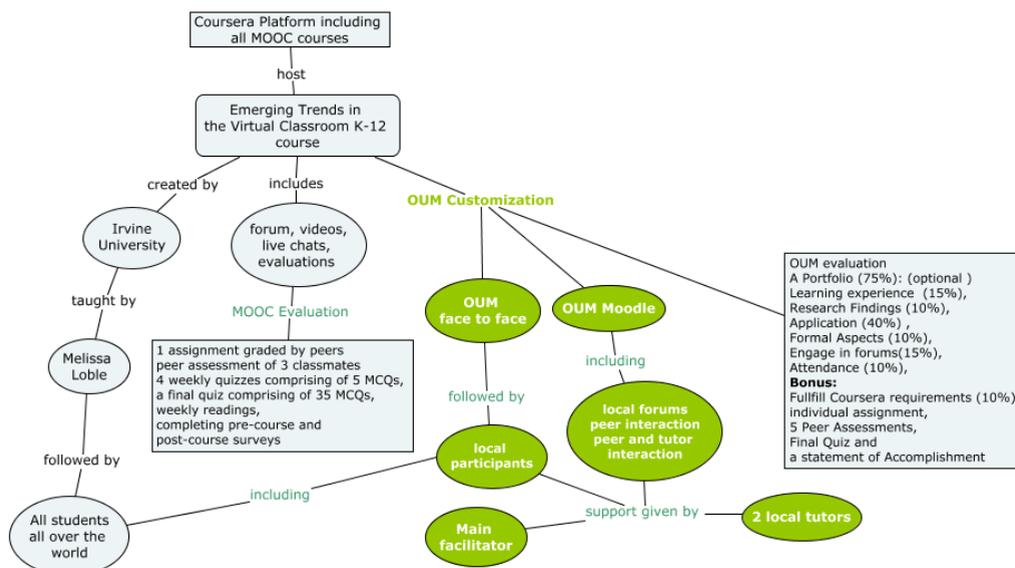


Figure 6. Overall presentation of components of the customized MOOC. Concept Map generated by the Author.

4. Methodology

The method used was a combination of a questionnaire and observation of learners interaction on MOODLE platform.

5. Results and analysis

MOODLE acted as an interface for those who were not used to technology driven platform similar to the Coursera platform. In fact, users preferred MOODLE in the first place as it was a user friendly platform. This is identified by 90 students who started getting acquainted with MOODLE platform before moving to Coursera. The participation in the MOODLE forums proved to be popular and thus learners could voice out their opinions.

This is acknowledged by 90 students. The local discussion forums proved to be the ideal place for interaction as all learners agreed that this was the space where facilitators responded to their requests. Concerning the use of the two platforms that is MOODLE and MOOC simultaneously, learners found that this was time consuming. This was pointed out by 42 learners. Furthermore these learners stated that this mode of delivery was a constraint to manage their time as they had to be active on both platforms and be present on campus for face to face sessions.

The campus sessions was an opportunity for learners to interact live. Learners were satisfied with the content experts and peers live presentations. Learners were asked to give their feedback on the campus sessions. As weeks went by learners seldom gave their feedback to improve the on campus sessions. We thus assume that the campus sessions answered the needs of learners. Most participants found that on campus sessions were very useful and enriching.

The portfolio, the tailor-made mode of assessment, was attempted by one third of the enrolled learners. Out of 115 learners, 40 decided to submit portfolios. The quality of the portfolio varied as some learners were teachers of primary schools and had only diplomas. The level of submission was different for those who possessed a Bachelor or a Masters degree, and these were more secondary school teachers. Out of the 40 portfolios which had been submitted, 15 proved to be highly professional.

More than half of the learners found that the contents were equivalent on both platforms and this was stated by 70 learners. We note the learner engagement and willingness with the number of peer assessments corrected by each of them as follows:

No of Learners	No of corrected assessments	No of Learners	No of corrected assessments
10	<5	21	6
30	5	6	8
5	9		

Figure 6. No of peer assessments corrected by each learner. Data generated by the Author.

6. Conclusion

This research aimed at understanding the organization of a redesigned MOOC. This proposed course structure shed light on the fact that learners tend, to succeed when MOOC courses are coupled with face to face sessions which are compulsory. Learners experience a smaller platform like MOODLE before indulging in the hive which are MOOC. We point out the success rate of this MOOC with 66% of participants having successfully completed

the course and been granted a certificate of participation. Learners have scored between 70% and 99% for the Coursera evaluation which can be considered as an encouraging trend for successful MOOC. In this precise context the MOOC was a success as it was institutionalised and well monitored. Not all MOOC have a high completion rate.

References

- Aldon G., (2013). MOOC, Formations à distance, Formations hybrides.
- Bruff D. O., Fisher D. H., McEwen K. E., Smith B. E., (2013). Wrapping a MOOC: Learner perception of an experiment in blended learning.
- Cisel, M. et Bruillard, É. (2012). Chronique des MOOC.
- Demaizière F., Grosbois M., (2014). Numérique et enseignement-apprentissage des langues en Lansad – Quand, comment, pourquoi? 29. Et les MOOC / Cloms?
- Dépelteau, F. (2000). La démarche d'une recherche en sciences humaine, *presse de l'Université de laval, Bruxelles, De Boeck Université.*
- Depover, C., (2014) Quels modèles économiques et pédagogiques pour les MOOC ?
- Epelboin Y., (2013) , MOOC in Europe.
- Henri F., (1993). Formation à distance, matériel pédagogique et théorie de l'éducation: la cohérence du changement.
- Holotescu, C., Grosseck, G., Crețu, V. & Naaji, A. (2014). Integrating MOOCs in Blended Courses.
- Jordan K., (2014). Initial Trends in Enrolment and Completion of Massive Open Online Courses.
- Minichiello F., (2013). Le phénomène des MOOC (Massive Open Online Courses).
- Peraya D., (2006). Distance learning: a device of mediatized formation and communication. An approach to the processes of mediatization and mediation.
- Quintin J.J. , Depover C., Degache C., (2005). Le rôle du scénario pédagogique dans l'analyse d'une formation à distance Analyse d'un scénario pédagogique a partir d'éléments de caractérisation dénis. Le cas de la formation Galanet.
- Roland, N. (2014). Baladodiffusion et apprentissage mobile : approche compréhensive des usages étudiants de l'Université libre de Bruxelles.
- Rosselle M., Caron P. A., Heutte J., (2014). A typology and dimensions of a description framework for MOOC.
- Rumble G., (1992). The Management of Distance Learning Systems. Fundamentals of Educational Planning 43
- Sandeen C., (2013). Assessment's Place in the New MOOC World.
- Valdes D., (1995). Enseignement à distance et dispositifs intégrés de formation, Vers de nouvelles formes de formations :Les formations hybrides.
- Waite M., Mackness J., Roberts G., Lovegrove E., (2013). Liminal Participants and Skilled Orienteers: Learner Participation in a MOOC for New Lecturers.

Teaching and learning experience in soil consolidation aided by computer software

García-Ros, Gonzalo¹; Sánchez Pérez, Juan Francisco²; García-Fernández, Martina³ and Del Cerro Velázquez, Francisco³.

¹Civil Engineering Department, Technical University of Cartagena, Spain. ²Applied Physics Department, Technical University of Cartagena, Spain. ³Electromagnetism and Electronics Department, University of Murcia, Spain.

Abstract

The present article shows how the learning and personal motivation of the students in Geotechnics are improved through the realization of computer practices and thanks to the use of a software adapted to their needs. By means of a simple interface of data entry and output of results, students will master abstract concepts such as the excess pore pressure and the average degree of consolidation, while reinforcing their personal motivation, both to face the content of the subject and those of other disciplines of the Civil Engineering Degree.

Keywords: *theoretical and personal objectives; geotechnics; soil consolidation; practical exercise; software.*

1. Introduction

After the good reception, on the part of the “Civil Engineering Master” students of the Technical University of Cartagena, of the computer practices sessions for the study of the consolidation of soils with vertical drains aided by computer software [SICOMED_3D (2017), García-Ros et al. (2017)], it was decided to imitate the experience for the students of the “Civil Engineering Degree” (certification that allows, later, to accede to the Civil Engineering Master) for the academic year 2017-2018.

For these students, in the second year of the Civil Engineering Degree, the subject "Geotechnics" is presented as a completely new discipline, of which they lack any previous experience, discovering for the first time a series of concepts (earth pressures, thrusts, deformations...) that require a high level of abstraction and that, in a large number of cases, pose an added difficulty when it comes to overcoming the subject and understanding the important basic concepts for their training that are treated along the course.

In this way, and thanks to the vast experience of the “Network Simulation” research group of the Technical University of Cartagena in the development of software for educational purposes (and also professional), it was decided to create EDUCONSOL (2018), an agile program with a very simple graphical interface with which one-dimensional soil consolidation problems can be solved.

2. Objectives of the teaching and learning experience

The learning experience through computer practices carried out has as its main mission to complement the training of the student acquired in the theory classes, where the basic concepts that govern the consolidation problem are exposed [Berry and Reid (1987), Braja (2008), Wood (2009)]: excess pore pressure dissipation (of the water contained in the soil) and settlement evolution. These concepts are also practiced in the theory classes by solving exercises of varying difficulty.

Within the purely technical objectives, this computer practices aim to help the student in understanding the basic concepts that govern and characterize the consolidation problem: excess pore pressure, average degree of consolidation and settlements produced. But, in addition, the experience also aims to encourage the motivation of the student for the subject, contribute to overcoming the subject (in a more comfortable and rewarding way), encourage cooperation between students and teamwork and increase, in general, the motivation of the student for the degree they are studying. Table 1 summarizes the objectives that are to be achieved with the teaching and learning experience proposed.

Table 1. Objectives of the teaching and learning experience with EDUCONSOL

Technical knowledge	Student experience
Excess pore pressure	Motivation for the subject
Average degree of consolidation	Contribution to pass the subject
Settlements produced	Cooperation between students and teamwork
	Motivation of the student for the degree

3. Practical exercise development

The practical experience consists of a 2-hour session in which students are proposed a soil consolidation exercise similar to those that have already been solved in class. At the beginning of the session, students are explained the objectives that are pursued with the practice, the problem is stated and the EDUCONSOL software is presented, helping them to start the program and explaining its operation: introduction of data to the program and obtaining results, Figures 1 and 2.

Figure 1. EDUCONSOL data entry screen.

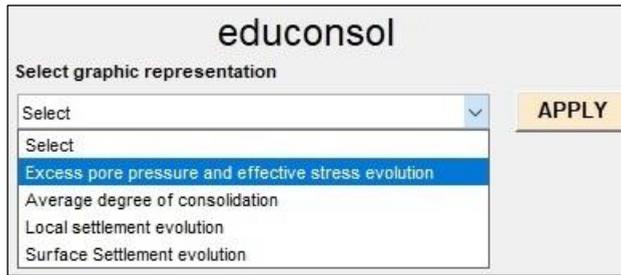


Figure 2. *EDUCONSOL* selection of representations screen.

After this exposition, students are invited to face the resolution of the problem without the help of the teacher, encouraging them to discuss among themselves, if necessary, the main questions that may arise. During this stage, the teacher will closely supervise the work of the students and will solve the doubts and the problems of use of the software when it is considered appropriate, so that, after approximately one hour since the beginning of the session, all the students have been able to solve the problem satisfactorily. Once this is achieved, and thanks to the simple program output interface, students will be able to discuss and interpret all the results obtained, Figures 3-6.

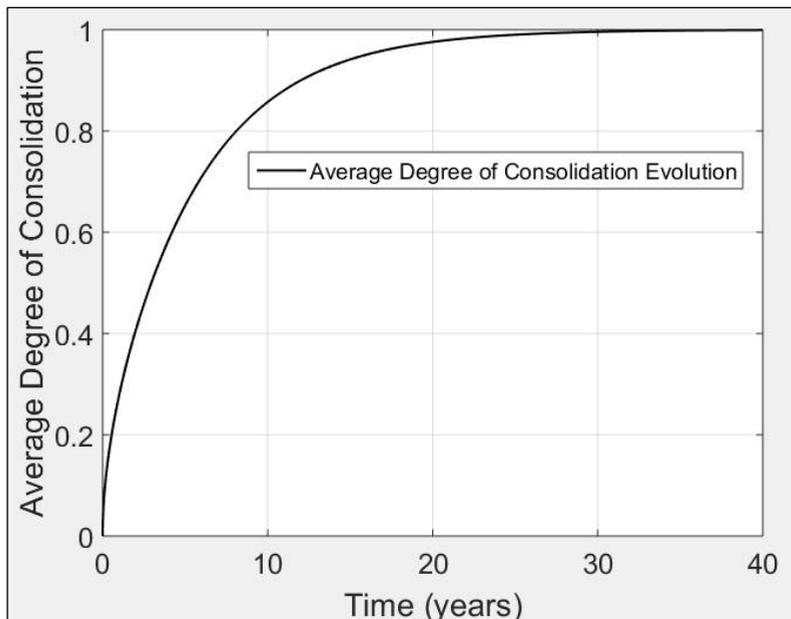


Figure 3. *Average degree of consolidation evolution.*

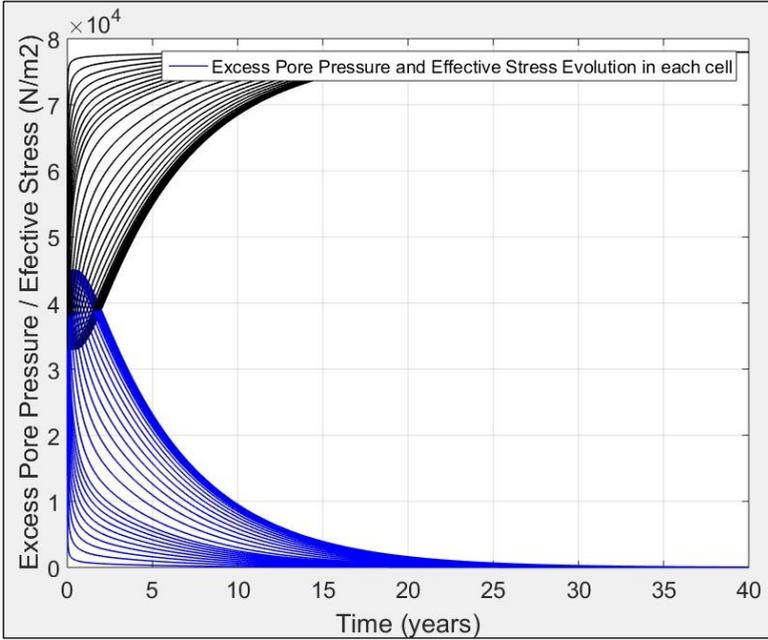


Figure 4. Excess pore pressure evolution and effective stress.

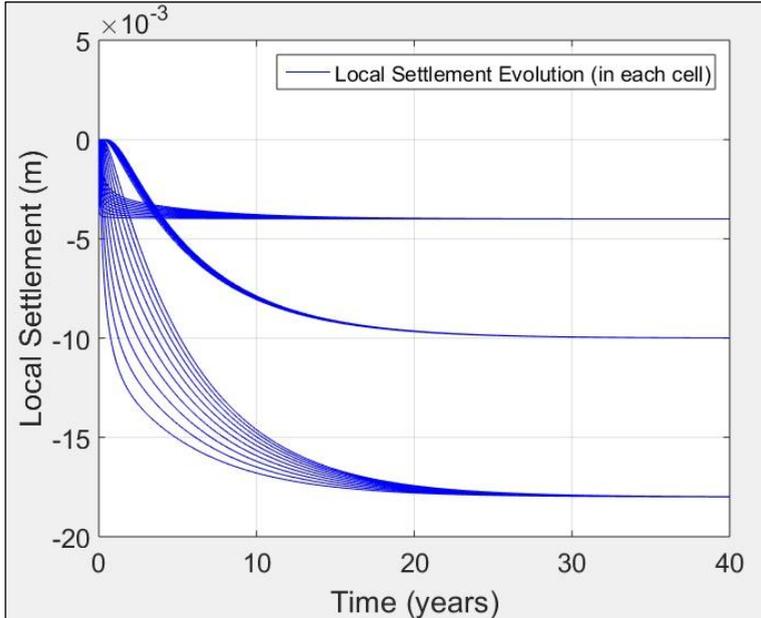


Figure 5. Local settlements evolution.

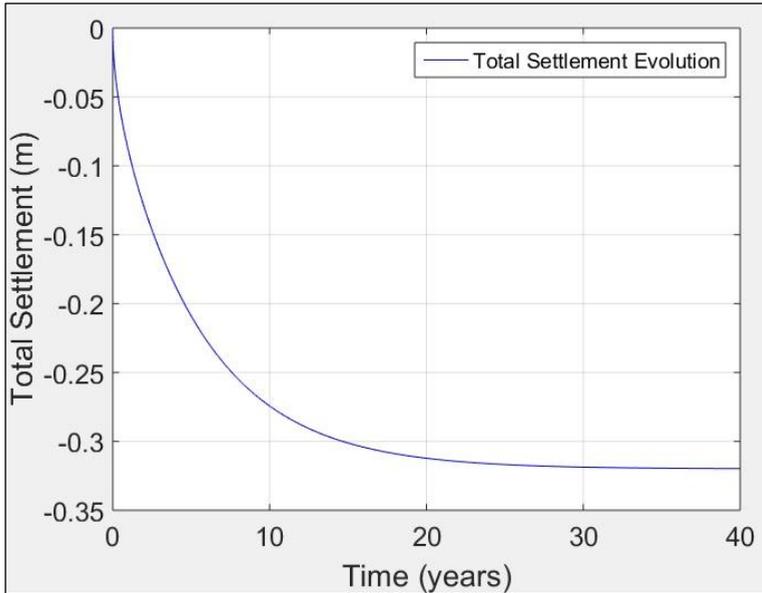


Figure 6. Surface settlement evolution.

4. Results and achievements of the experience

Once the discussion of results was concluded (emphasizing the theoretical-technical concepts used), a survey was performed to the students in order to obtain an evaluation on the fulfillment of the technical and motivational objectives. The survey was conducted on a sample of 28 students; 23 of them were freshmen, while 5 were repeating. In order not to condition the answers of the students, the surveys were done anonymously. The results are summarized in Tables 2 and 3.

Table 2. Assessment of the students on the influence of the practical experience in the acquisition of technical knowledge.

Improvement in the acquisition of technical concepts	Positive evaluation of the student
Excess pore pressure	92.9 %
Average degree of consolidation	71.4 %
Settlements produced	85.7 %

It is very interesting to check that, in terms of the technical concepts addressed (Table 2), the students state that practical experience with EDUCONSOL has allowed them to make significant progress in understanding the concept of excess pore pressure, which they had not fully understood (most of them) after the theoretical classes. Indeed, thanks to graphical representations like the one shown in Figure 3, students can observe how the pore pressure drops during the consolidation process. For the concepts of average degree of consolidation and settlements, the students said they had also experienced an important improvement.

Table 3. Assessment of the students on the influence of the practical experience on their personal motivation.

Improvement in personal motivation	Positive evaluation of the student
Motivation for the subject	82.1 %
Cooperation between students and teamwork	60.7 %
Contribution to pass the subject	89.3 %

Regarding the influence of the experience in the personal motivation of the students, Table 3, it is worth noting the important positive influence that its realization has on the perception of the students about the subject: on the one hand, the understanding of the complex theoretical concepts increase the motivation of the students for the subject, while they affirm that the practical realization of the exercise will have a positive impact on their options to pass the subject. As a pending objective for the upcoming courses, it is necessary to reconsider the proposed exercise in a way that encourages, even more, teamwork and cooperation among the students. In this regard, a possible alternative to encourage debate and cooperation is to include a section in the practical session in which they must modify the statement of the problem so that it resembles a real case that they know (or that has been previously exposed in the theoretical classes).

Due to the satisfactory results obtained, the teaching and learning methodology presented in this paper is going to be applied in future practical sessions. Thus, in the next academic year the students of "Geotechnics" will also carry out computer practices sessions of seepage under dams, a matter also unknown and complicated for them, which they must face for the first time. The software is currently in the last phase of development and will be ready for the next course. Later, practical sessions will be included for the calculation of elastic settlements by means of a software whose development has just begun and will be ready in 1 or 2 years.

At the same time, the methodology will be implemented in the subject "Geotechnics and Foundations" of the "Civil Engineering Master", where problems of consolidation with preloads, stability of slopes and thrusts on retaining walls will be analyzed. During the process of implementation, both in the master and the continuation in the "Civil Engineering Degree", an exhaustive monitoring will be carried out focused on improving the methodology and adjusting it to the students needs. The comparison of results will allow to identify differences (associated, for example, with the level of studies, degree or master), in order to adjust the contents so that the degree computer practices serve as a basis for future master practices (and vice versa, that the master practices serve as a complement and reinforcement of what was learned in the degree).

References

- Berry, P.L. and Reid, D. (1987). *An Introduction to Soil Mechanics*. McGraw-Hill, London.
- Braja, D. (2008). *Advanced soil mechanics*. Taylor and Francis, New York and London.
- EDUCONSOL [software] (2018). ('Educational Consolidation'). García-Ros, G. and Alhama, I. Intellectual Property Registration, Murcia, Spain.
- García-Ros, G., Alhama, I., Cánovas, M. and Pérez, J. F. (2017). An educational software for teaching soil consolidation. *3rd International Conference on Higher Education Advances, HEAd'17*, 865-872
- SICOMED_3D [software] (2017). ('Simulación de consolidación con mechas drenantes'). © Universidad Politécnica de Cartagena, García-Ros, G., Alhama, I. and Sánchez Pérez, J.F.
- Wood, D. M. (2009). *Soil mechanics: a one-dimensional introduction*. Cambridge University Press, New Delhi.

Factors Driving University Choice: A Principal Component Analysis on Italian Institutions

Azzone, Giovanni; Soncin, Mara

Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Italy.

Abstract

When investigating students' motivations to enroll in university, a wide range of elements related to the overall student experience concerning both the institution and the surrounding context should be taken into account. The current study moves from this point to analyse students' choice factors from a survey completed by 27,705 students across 23 Italian institutions by means of a logistic Principal Component Analysis. Results confirm the presence of multiple factors jointly influencing students' choice, with geographical proximity, job opportunities in the region, university reputation and ease of access opposing one another. Aggregating results at institutional level, students' distribution prove to be highly heterogeneous across universities. From this, a managerial tool is provided to position student population and derive strategic implications. Finally, policy considerations are reported.

Keywords: *Higher education; choice factors; principal component analysis.*

1. Introduction and background

Higher Education (HE) institutions' capacity to create public value is intrinsically embedded in their interaction with students, who are not only the final recipients of service delivery, but also play an active role in value production by means of an iterative interplay that place them at the center of the service *experience* (Osborne *et al.*, 2015). Under the assumption that value increases when users are involved in its creation, a clear understanding of their expectations facilitate the process and maximise potential results, enhancing the role of public HE institutions as *public value co-creators* (Osborne *et al.*, 2016). To enforce the co-creation process, a clear understanding of students' motivations is a necessary condition. First year students represent a case in point in this respect, given the tense expectations they have when they enter tertiary education (Trotter & Roberts, 2006). These are not only expectations in terms of teaching and learning quality and support (Jamelske, 2009), but recall a *total student experience* approach (Petruzzellis & Romanazzi, 2010). Indeed, the current study focuses on the student as unit of analysis, trying to identify the dimensions of the university experience that are mostly taken into account when choosing the HE institution. Overall, a better understanding of the drivers of choice in a total student experience approach makes a step towards the co-creation of public value, aligning students and HE institutions' perspectives. According to the literature on the topic, factors influencing students' university choice have been evolving over time. A report by the British Council (2017) affirms that in the UK students now consider availability of scholarships as the most important factor, while university ranking has dropped to the last position. In their study, Simões & Soares (2010) find that geographical proximity is the factor mainly considered by students in a Portuguese institution, followed by the university reputation. Briggs and Wilson (2007) examine the effect of costs and information in six Scottish universities, finding that course content information play a prominent role in students' choice. However, most of the cited studies do not completely exploit the complexity of students' decision that may jointly consider multiple factors related to different aspects of their university experience. In additional to that, the variability in the distribution of students' choice across institutions has high potential implications that are currently under-investigated. This study moves from these aspects analysing the case of Italy, where the HE system is characterised by a particularly challenging context in terms of number of young people (25-34 years old) earning a degree, which is 24% compared to an OECD average of 41%, or in terms of bachelor's students dropping out (13.9%) or switching to a different major or university (15.4%) by the end of the first year (ANVUR, 2016). Understanding the process that brings students to the university choice has major implications at managerial and policy level. For HE institutions' managers, understanding their students' motivations may bring to a greater strategical awareness of their attractiveness in order to better shape their orienteering activities towards either the current

or a more “desirable” population of students. At policy level, it may help to reduce the proportion of students dropping out or switching from the university where they originally enrolled by means of evidence based policy addressed to different student populations. Hence, the research questions can be stated as:

- *Which are the main multidimensional factors that drive students’ university choice in the Italian context?*
- *Is there a different distribution of these factors across HE institutions?*

For this purpose, a logistic Principal Component Analysis (PCA) has been applied to data on students’ choice collected by surveying 27,705 students across 23 public HE Italian institutions. The originality of the research lies in the creation of a unique dataset of institutions representative at national level, which allows to make considerations about students, but also to aggregate students’ choice at university level. As a remainder of the paper, section 2 reports data and methodology, while sections 3 and 4 respectively present and discuss the results.

2. Data and methods

2.1. Data

Data used in the analysis are collected within a larger project self-financed by Italian public universities called *Good Practice project*. In the edition 2016/17, 38 HE institutions took part in the project that aims at benchmarking the performances of institutions in terms of efficiency (cost per unit of output) and perceived effectiveness (surveys filled out by the main stakeholders). In the wave here considered, 23 HE institutions agreed to join the student survey. The first-year students survey is enriched by a set of additional questions concerning the factors driving the choice of the university to attend. These are related to a cross definition of university performance, which combines the characteristics of the HE institutions with those of the surrounding social and economic fabric. In details, options are related to:

- *economic factors* such as tuition fees, scholarships and financial aid provided by the university;
- *reputational factors*, related to the university prestige both in terms of “word-of-mouth” and official rankings;
- *ease of access*, linked to the presence and difficulty level of the entrance test and to the prerequisites needed to successfully attend the programme;
- *quality of student services* such as availability of information, quality of the facilities and orienteering activities;
- *proximity* to the home town;

- *quality of life* in terms of public services, amenities and metropolitan area;
- *job opportunities* in the region where the university is located, in terms of average wage, employment level and proximity to industrial areas;
- *cost of life* in the area where the university is located.

The survey was anonymous and administered over a period of nearly one month at the end of the first year of students' attendance. It is not mandatory for students to fill the questionnaire out, so the number of respondents varies across institutions. It is worth to notice that the analysis has been run at student level and later on re-aggregated at institutional level to investigate how students types are distributed across universities, so that the principal components definition is not influenced by the representativeness at institutional level. As a descriptive, Table 1 reports the number of respondents by institution and the response rates (calculated as the number of respondents over the total number of first-year students).

Table 1. List and response rate of participant universities.

University	N	Response rate	University	N	Response rate
A	2,482	13%	M	349	9%
B	1,533	54%	N	1,028	21%
C	2,448	55%	O	1,395	8%
D	336	4%	P	191	5%
E	1,814	64%	Q	157	5%
F	245	33%	R	417	15%
G	1,435	19%	S	1,183	9%
H	1,191	11%	T	3,287	86%
I	980	16%	U	407	11%
J	340	7%	W	694	16%
K	655	19%	X	5,492	70%
L	20	14%	Total	27,705	

In the survey, the student is not forced to choose only one driver of choice, but can select from one to three options, under the assumption that student's choice is multidimensional in nature and, hence, a typology of students' choice can be analysed. Table 2 reports summary statistics about the variables considered. Proximity to home is the factor selected by the highest percentage of students, showing the high costs (monetary and non-monetary) of mobility even within the country. University reputation is the second most selected factor, highlighting the importance of university prestige. Hence, the descriptive analysis confirms the results from the literature, as reported by Simões & Soares (2010).

2.1. Methodology

The methodology applied for data analysis is *logistic Principal Component Analysis (PCA)*. Logistic PCA is a method for dimensionality reduction of binary data, which moves from the original formulation of PCA by Pearson (1901) to take into consideration the possible dichotomous nature of data (Landgraf & Lee, 2015). The model is based on the definition of the best projection of parameters from a saturated model (namely a model where the

number of parameters matches the number of data points), in order to minimise the deviance (that is to minimise the distance from the overfitting saturated model). As in traditional PCA, the selection of the number of principal components is based on different parameters, namely the cumulative variance explained by the components, the existence of an elbow in the scree plot representing the variance explained by the components (for example, the presence of an elbow between $k-1$ and k components may lead to consider $k-1$ principal components) and the distribution of the scores across components, again looking for a change in the distribution when increasing the number of components. Once that the best number of dimensions has been set, *component loadings* allow for their interpretation, providing a measure of the correlation between the original variables and the new components. In order to facilitate their interpretation, a *varimax rotation* has been applied to component loadings, orthogonally rotating the reference system to minimise the number of factor loadings significantly contributing.

Table 2. Descriptive statistics of the factors driving university choice.

Variable	N	Percentage of students selecting the variable
Economic factors	4,289	15%
Reputation	9,551	34%
Ease of access	5,388	19%
Quality of student services	3,260	12%
Proximity to home	12,268	44%
Quality of life	2,888	10%
Job opportunities in the area	6,275	23%
Cost of life	1,293	5%

Note: Sum of percentages is greater than 100% given the possibility to select more than one variables per respondent.

Using the methodology here described, we are able not only to reduce the variables concerning university selection to a smaller number of dimensions better explaining the phenomenon observed, but also to demonstrate the interrelation existing between the different dimensions of choice, making latent patterns emerge from data. The existence of more than one component is able to demonstrate that students do consider a varied and interrelated spectrum of factors when they choose the university to attend.

3. Results

The number of components from the application of logistic PCA to the 27,705 student observations has been selected considering multiple indicators. The box plot representing the distribution of the scores along components reports an elbow between the third and the fourth component, suggesting that three is most suitable number of factors to be considered. With respect to the saturated model, the first component counts for the 36.9% of the total

variance. The second and third components respectively represents the 16.4% and 13.6% of the variance for a total amount of 66.9% of variability explained, which suggest a satisfying fit of the component solution. The loadings for the three principal components are represented in Figure 1. The *varimax* rotation reduces to zero some of the factor loadings to facilitate the interpretation of those that contribute the most to the component interpretation. The first component, which is explaining more than one third of the total variance, is actually a combination of the different variables. In this sense, this confirms that students do have a multifaceted approach to university choice. The fact that, among variables, the cost of life in the area report the highest absolute value highlights the important role played by the surrounding conditions when choosing university. The second component is instead represented by the contraposition of two variables, which have the highest loading value: proximity to home (PR) on one side and job opportunities in the area (JO) on the other. Hence, students are more inclined to move to a different region if they consider that attractive in terms of job opportunities. This a very *long-term perspective*, which highlights the wide vision students may adopt when choosing university. On the other hand, students that choose an institution for its proximity to the home town are not particularly interested in the implications in terms of employability in the long run. This a more *now and here* vision, which may be related to a number of physical, financial and social constraints. Finally, the third principal component is mainly explained by two variables, again pointing to opposite directions: reputation of the institution (RE) and ease of access (EA). From this point of view, students who choose an institution because of its national and international prestige do not care about how difficult it is to be enrolled. Their motivation is much more *emotional* and related to the social dimension of being part of a prestigious organisation. By contrary, part of students consider the low entrance barriers as an important driver of choice. They may consider this as a way to *minimise failure possibilities* and hence to increase their ability to succeed in studies later on. Aggregating the component scores at institutional level, it is possible to represent the university population according to the main drivers of choice. In terms of managerial implications, this may be used by institutions to have a deeper understanding of their students' population in order to reinforce their attractiveness in this direction or to modify the target population. In both cases, awareness of students' perception is a fundamental point. As examples of possible maps to be created at institutional level, Figure 2 reports students distribution along components that have a remarkable contrast between dimensions: the second (x axis) and the third components (y axis). Examples for three institutions are here represented to stress differences across universities that are located in the same region, with similar contextual characteristics. This provides evidence about the fact that even within the same context, factors of choice may differ.

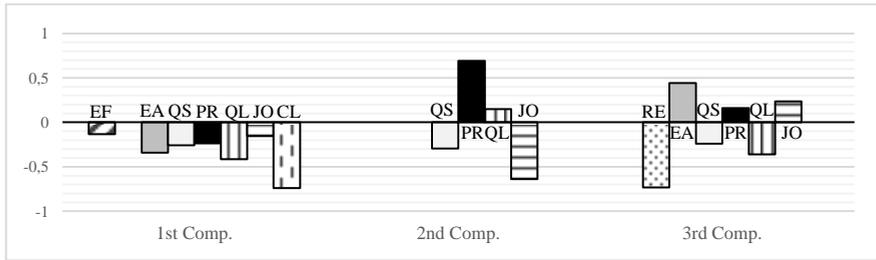


Figure 1. Factor loadings along the three principal components.

Note: EF=Economic Factors; RE=Reputation; EA=Ease of Access; QS=Quality of Students services; PR=Proximity; QL=Quality of Life; JO=Job Opportunities; CL=Cost of Life.

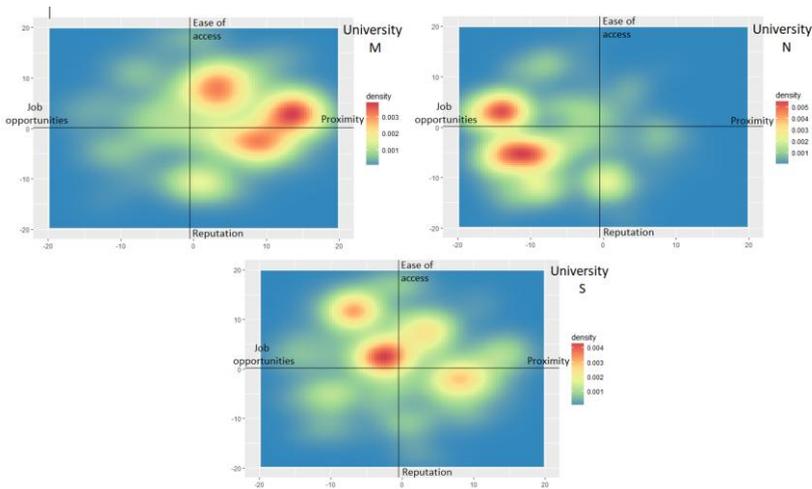


Figure 2. Students distribution along component two (Job opportunities vs. Proximity) and component three (Reputation vs. Ease of access).

Note: A higher density (red colour) represents a higher number of students with similar scores on that component.

4. Discussion

The current study moves from the idea that students may consider a composite range of factors that are widely related to the student experience when choosing university, and that a clear understanding of these dimensions align students and HE institutions' perspective facilitating the co-creation of public value. Applying a logistic PCA to a dataset of 27,705 students reporting the factors driving their university choice in 23 Italian HE institutions, composite elements emerge. Moving from the first component where the different factors are jointly considered in student's choice, four main dimensions are opposed: proximity to the home town *versus* job opportunities in the region on the one hand; university reputation *versus* ease of access on the other hand. Looking at the graphical maps (Figure 2) a great

variation in students' distribution across HE institutions emerge. For instance, a high concentration of students selects University M because of its proximity to home and ease of access (red areas, with a higher density). However, some students also consider its reputational impact as the main driver (yellow area in the bottom). Hence, a first consideration relates to the possibility for the HE institutions to implement strategic actions to leverage on the current drivers to know better their student population, attracting students aligned with their strategic vision or moving towards different and more "desirable" factors of choice. As a second point, it is worth to notice that students' distribution is quite sparse along the four dimensions. Hence, the population of students is not only differentiated among but also within institutions. This may bring a higher "internal" personalisation of services offered to students with different attitudes and motivations. At policy level, this kind of information may be used to cluster similar institutions across the country, moving towards a higher personalisation of university policies where the institution and the students are at the center of value creation. In this respect, a limitation and a future development of the study is related to the current impossibility to follow students over time and analyse the relationship between university choice and subsequent academic path or drop out probability. Moreover, students' personal information (such as previous career or socio-economic status) is not collected to guarantee complete anonymity, with limitations on the possibility to better characterise student population and to understand the possible link between motivations and social factors.

References

- ANVUR. (2016). Rapporto sullo stato del sistema universitario e della ricerca 2016.
- Briggs, S. & Wilson, A. (2007) Which university? A study of the influence of cost and information factors on Scottish undergraduate choice, *Journal of Higher Education Policy and Management*, 29:1, 57-72.
- British Council. (2017). Ten trends - Transformative changes in higher education.
- Landgraf, A. J. and Y. Lee (2015). Dimensionality reduction for binary data through the projection of natural parameters. Technical Report 890, Department of Statistics, The Ohio State University.
- Osborne, S. P., Radnor, Z., Kinder, T., & Vidal, I. (2015). The SERVICE Framework: A Public service dominant Approach to Sustainable Public Services. *British Journal of Management*, 26(3), 424-438.
- Osborne, S. P., Radnor, Z., & Strokosch, K. (2016). Co-Production and the Co-Creation of Value in Public Services: A suitable case for treatment?. *Public Management Review*, 18(5), 639-653.

- Pearson, K. (1901). On lines and planes of closest fit to systems of points in space. *Philosophical Magazine*, 2, 559-572.
- Petruzzellis, L., & Romanazzi, S. (2010). Educational value: how students choose university: Evidence from an Italian university. *International Journal of Educational Management*, 24(2), 139-158.
- Simões, C. & Soares, A. M. (2010) Applying to higher education: information sources and choice factors, *Studies in Higher Education*, 35:4, 371-389.
- Trotter, E., & Roberts, C. A. (2006). Enhancing the early student experience. *Higher Education Research & Development*, 25(4), 371-386.

Developing Design Skills in Teaching 3D Modeling at the Pre-University Level

Lokalov, Vladimir Anatolievich; Klimov, Igor Viktorovich and Makhlai, Dmitrii Olegovich

Department of Graphic Technologies, ITMO University, Russian Federation.

Abstract

The article highlights the importance of introducing students to design skills while teaching them 3D modeling at the pre-university level. Theoretical justification of the approach is offered; the approach uses a step-by-step differentiation of the orienting basis structure of the students' training-related activities as the principal psychological model of the process of developing the design skills. Three stages of developing the professional skills are distinguished and described: elementary, basic and professional. Types of assignments for each stage are analyzed. A case study of using the approach in question for courses in 3D modeling at Schoolchildren's Computer Center (SCC) of ITMO University (St. Petersburg) is detailed, its efficiency is assessed.

Keywords: *Pre-university training, design skills, 3D modeling.*

1. Introduction

Pre-university training is the educational component that later helps the students to cope successfully with the college curriculum; due to the diversity of approaches and methods, it can ensure the continuity of education (Medvedeva, 2012). Computer courses in 3D modeling for the school-level students are a helpful step both for those college-students-to-be who plan to work in this professional domain and for those who would receive training in engineering, since these courses encourage the development of spatial ability (Šafhalter, Glodež, Aberšek, & Bakračević Vukman, 2014) and lay the groundwork for a wide range of professional skills (Lokalov, Makhlai, Klimov, & Sopronenko, 2015). Design skills hold a place of prominence within this range.

Currently, special emphasis is placed on introducing the technical design skills both at the secondary - (Strimel, 2012) and high-school level (Mourtos, 2012). However, the introduction of design skills in teaching 3D modeling presents its own challenges. Unlike designing the models of material objects or technical devices, the designing of virtual 3D models doesn't stimulate the student to lay special emphasis on the design stage, since a virtual object is much easier to make or correct than a material one. Resorting to the computational power of the computer, the students tend to replace the stage of planning and of searching for the solution for a computer modeling problem by manipulations with the tool infrastructure, and opt for the trial and error approach in looking for the solution. This tack can turn into an automatic habit and, at the stage of modeling more complex objects, lead to faults and errors in the final product, including the fatal ones. Badly designed 3D models require more rendering time, and their use in real time (a game or a virtual environment) can be hampered. An attempt should be made to resolve this issue at the pre-university level of training.

2. Methods

2.1. Theoretical Framework

To avoid early habitualization of the students' faulty approaches to handling the 3D modeling tasks, it seems worthwhile to control the formation of the design skills beginning with the stage of introducing the students to the 3D modeling tool infrastructures (*elementary* stage) and up to the stage where the students are qualified enough to handle professionally-oriented projects (*professional* stage). To define the methods that ensure an efficient transition from the elementary stage to the professional one, let's compare the patterns the students use at both stages. We believe that the most appropriate approach is to use Galperin's theory of systematic formation of mental actions (1989, 1992) that reconciles Vygotsky's concept of the zone of proximal development with teaching practices (Haenen,

2001). Galperin suggests that a special stage, the so-called orienting basis of action (OBA), should be distinguished within the pattern of an action directed at solving the problem. Both the quality and the successful outcome of the action fully depend on this stage. The process of OBA includes:

- assessing the image of the situation and pinpointing the components crucial for solving the problem; comparing the components with the previous experience;
- searching for the solution (with the pinpointed components taken into the account), planning (determining the operational structure of the action and the tools);
- adjusting the action throughout the process.

It's obvious that OBA represents the psychological pattern that is responsible for the development of the design skills. In consistence with the well-known notion of psychological development as a process of differentiation (Witkin, 1962), it can be surmised that in moving from the elementary stage of studying the 3D modeling to the professional stage in OBA, the abovementioned components of OBA should be transformed into more complex structures, i. e.:

- task setting and analyzing;
- creative search for a solution, elaboration of the project;
- implementation and fine-tuning of the project.

The moment when *all* the listed components are introduced to the action pattern, signifies the beginning of the *basic* stage of developing the design skills. From that point on, throughout the transition to the *professional* stage of development, the structural complexity of OBA will keep increasing. Consequently, the three abovementioned stages can be distinguished within the process of developing the design skills for 3D modeling. At each of the stages, specific goals should be set that would encourage the students to develop the design skills (OBA structures), and to improve the intellectual abilities related to those skills.

2.2. Skill Development: Stages

The *elementary* stage should not be limited to the formal introduction to the design process (the necessary prerequisites for full-scale designing haven't been shaped yet); it should rather empower the students through diversifying the elements of their experience. This would allow them later to recognize these elements as the significant components of the OBA structure at the design stage. That's why the tasks assigned to the students should be both fairly simple (several instrumental operations) and diversified. In the beginning, the students should be introduced to a wide range of interfaces of the 3D modeling programs

and to various types of shaping used therein. As a rule, it's fairly easy to introduce these types, linking them to the students' previous experience, using such metaphors as molding, sketching, modular construction. The students should be made to understand the special features of working with such virtual "matter" as polygonal mesh. Through solving simple and maximally diversified problems, the students would definitely improve their creativity that is essential for designing 3D objects.

At the *basic* stage it's essential to make a quick move to the tasks that would encourage the students to incorporate the design process into the overall process of model building. This can be achieved either if the assignment includes additional requirements for the structure, functions or technology of the design model (e. g. to make a model from the given primitive elements with the minimal-size polygonal mesh) or if the assignment implies designing a model of a complex shape. Both approaches encourage the students to look for various solutions and to document their versions through making sketches. To be able to select the preferable version, they would first have to come up with the assessment criteria (e. g. the minimal number of operations) and then to use these criteria to analyze their results – the above leads to improving the convergent thinking abilities. As the result, the design stage would be introduced to the OBA structure, including the search for the optimal polygonal structure of the 3D model, that would be perceived by the students as a significant component of their project.

As for the practical assignments at the *professional* stage, they should be very similar to the professionally-oriented tasks. In order to cope with them, the students should master the existing technologies of designing the 3D models, as well as the requirements for these models determined by the functional properties of the final product (animation, game, virtual space, a 3D-printing model). This leads to the further differentiation of the students' OBA structure that has been shaped at the previous stage; new significant components are introduced therein. For instance, restricted polygonal mesh parameters might serve as a significant component in designing a computer game character, since the ability to control the character in real time depends on it. In the absence of the abovementioned OBA differentiation, there's a high probability that the resulting model would require a considerable amount of fine-tuning, or, possibly, would prove completely dysfunctional. Unlike the previous stages, the tasks set at the professional stage should encourage the students to look for a compromise under the contradictory conditions, e. g. in a situation when the box technological solutions speed up the process, but impair the quality of the final product. That means that, at the professional stage, yet another intellectual ability that is crucial for design skills, the ability to make evaluative judgments, is being developed.

2.3. Implementation

As a case study for the implementation of the suggested approach we would like to detail the system of developing the design skills at a pre-university educational establishment Schoolchildren’s Computer Center (SCC) of ITMO University (St. Petersburg). The students begin their studies of 3D graphics at the age of 11-12, at the *elementary* course Introduction to Computer Graphics (BV Course). At this stage, the students are introduced both to the 3D graphics and to the various 2D-graphics applications (designer and animation software). This helps them with basic orientation in computer graphics as a whole, as well as with making informed decisions as to their subsequent studies within the SCC computer course system. Besides, while studying the 2D designer programs, the students can design their own textures, backgrounds and sketches for 3D models. BV is a 96 hour course, with 18 hours dedicated to studying 3D graphics. Using various shaping devices, the students learn to make simple 3D models in Sculpttris (3D) and Google SketchUp. The reason for choosing the abovementioned programs is that they offer a wide range of shaping technologies. The assignments feature various favorite children’s characters and their respective environments.

The *basic* stage of developing design skills within the SCC curriculum begins with the Basic 3D Modeling course (M Course). The main goal of M Course (96 hours), intended for the students 11-12 years old, is to train them to design 3D objects and scenes – their shapes can be acquired with the help of a set of tools offered by 3DS Max program. Designing is an essential component of creating 3D scenes and complex objects. The Figure1 shows a student’s project, with detailed shaping operations, as well as the resulting model.

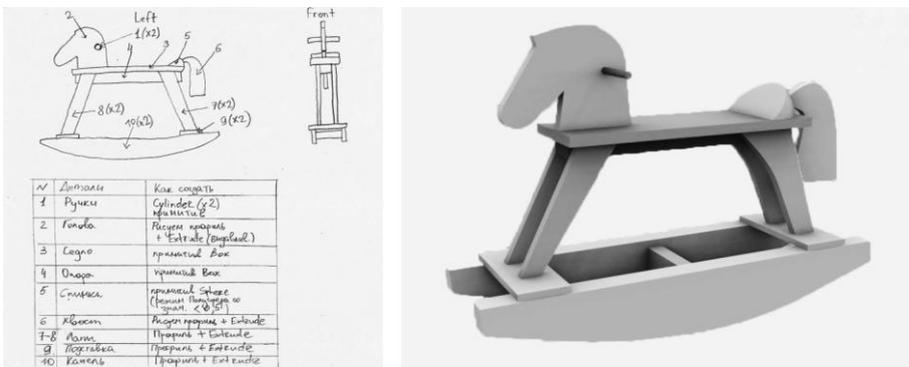


Figure 1. Rocking Horse, a sample of a project and a model (M Course).

Once the basic M Course of the SCC system is completed, the students are offered a choice of specialized *professionally-oriented* courses in 3D graphics: Game Design (GM Course),

Animation Studio (SA Course) and Virtual Reality Design (VR Course). The quality of design at this stage is determined not only by the students' skills in creating optimal models, but also by their ability to take the functional properties of the model into account. Thus, in VR Course the project solutions are related both to the implementation sphere of the virtual reality application for which the model is designed (education, tourism, architecture etc.) and to the types of the virtual reality gear used therein. For instance, the use of the mobile devices gear with low productivity, sets considerable restrictions on the complexity of the model.

3. Results and Discussion

Since specific goals are set at each step of developing design skills, the criteria for assessing the results of the intermediary stages are different too. At the first stage, it's essential to assess the creativity (e. g. the originality of the product and the technological solution). At the second stage, the creativity criterion should be supplemented by the criterion of the project's optimality (optimality of geometry and technology). And, finally, on the third stage, the criterion of the functionality of the resulting model should be added to the two abovementioned ones.

To facilitate the expert assessment, we matched each criterion with a nominative scale, expressed both through the verbal indication of the presence of a certain quality, and through ranking them on the scale of 1 to 10. The assessment of the method's efficiency was conducted through the comparison of the works and projects of two groups of students, A and B. The students of A Group went through all the stages of design skills development in SCC. Group B included the other students, those who went directly to the M Course or to one of the higher-level courses, since they already possessed the required 3D modeling skills they had obtained outside SCC. The number of such students is fairly high (ca. 40 percent). Table 1 shows the students' average results achieved in the academic year 2015-16, assessed by three parameters. The total number of assessed students is 97.

Table 1. Mean Value of the Assessment Criteria of Design Skills Development.

Groups	Parameters	Stages		
		Elementary	Basic	Professional
A	creativity	6,33	7,52	7,92
	optimality	-	8,03	9,19
	functionality	-	-	9,57
B	creativity	-	7,60	7,75
	optimality	-	5,71	7,10
	functionality	-	-	7,22

The maximal standard deviation didn't exceed 0,91. Table 1 shows significant differences between the A and B Groups as far as optimality and functionality criteria go; the above

seems to testify to the efficiency of the suggested approach to the development of design skills.

4. Conclusions

The article suggests that the approach to the development of design skills can be based on the process of gradual differentiation of the students' OBA structure in dealing with the practical tasks.

We believe that this approach is highly workable, even though it can benefit from more detailed research, in order to better adapt it to the needs of a specific educational process. For instance, it's essential to find the most efficient, student-friendly way to describe the project of a 3D model, since the traditional graphical engineering approaches are not only way too challenging for secondary school students, but also unusable for describing the stages of shaping. Related research is currently being conducted.

We plan to use the suggested approach to the development of design skills in the other computer technologies courses for the pre-university students.

References

- Galperin, P.I. (1989) Organization of mental activity and effectiveness of learning. *Soviet Psychology*, 27 (3), 65–82.
- Galperin, P.I. (1992). Stage-by-stage formation as a method of psychological investigation. *Journal of Russian & East European Psychology*, 30(4), 60–80.
- Haenen J. (2001) Outlining the teaching–learning process: Piotr Gal'perin's contribution. *Learning and Instruction* 11, 157–170.
- Lokalov V.A., Makhlai D.O., Klimov I.V., & Sopronenko L.P. (2015). Students' Vocational Skills Developing Through 3D-Modeling of Classic Still Lives. Proceedings from EVA 2015: *Electronic Imaging & the Visual Arts*. St Petersburg, Russia, 188-191.
- Medvedeva, D.O. (2012). Pre-university training in the system of lifelong education to provide continuity of transition from secondary school to University. *Lifelong learning: continuous education for sustainable development*, 1, 312. Retrieved from <http://cyberleninka.ru/article/n/pre-university-training-in-the-system-of-lifelong-education-to-provide-continuity-of-transition-from-secondary-school-to-university>.
- Mourtos, N. J. (2012). Defining, Teaching, and Assessing Engineering Design Skills. *International Journal of Quality Assurance in Engineering and Technology Education*, 2(1), 14-30.
- Šafhalter A., Glodež, S., Aberšek, B., & Bakračević Vukman, K. (2014). Developing spatial ability using 3D modeling in lower secondary school. *Philosophy of Mind and Cognitive Modelling in Education*, 61, 113–120.

- Strimel, G. (2012). *Engineering by Design™: Preparing Students For the 21st Century*. Proceedings from PATT 26: Conference; *Technology Education in the 21st Century*. Stockholm, Sweden.
- Witkin, H. A. (1962). *Psychological differentiation: studies of development*. New York: Wiley.

Holistic Architecture for Music Education: A proposal for empirical research in educational situations

Angel-Alvarado, Rolando^{a1}; Wilhelmi, Miguel R.^a and Belletich, Olga^a

^aDepartment of Psychology and Pedagogy, Public University of Navarra, Spain²

Abstract

Holistic Architecture for Music Education (HAME) arises as a Design-Based Research, that is, it is an interdisciplinary research approach based on mixed research methods, which attempts understanding empirical phenomena from music education complexity. The HAME' structural design poses a preliminary study of phenomena, the formulation of a research hypothesis, fieldwork in real-world situations and, finally, an analysis of data collected during the fieldwork with the intention of contrasting the hypothesis. This study aims to explore the technical suitability of the HAME in music education's empirical research. Results demonstrate consistency between four phases of the structural design, in addition to prove the empirical complexity of organisational structures in music classrooms. In conclusion, the HAME is understood as an interdisciplinary educational research approach, which is holistically described as it connects theoretical currents of the social sciences and humanities with actual educational situations of music education. As a consequence, the HAME provides theoretical and practical knowledge about music education.

Keywords: *Empirical research; music education; organisational structure; educational interaction process; classroom environment; teacher behaviour.*

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1. Introduction

The Holistic Architecture for Music Education (hereafter HAME) is an interdisciplinary research approach that tries conducting empirical studies in the frame of music education. It is useful both researchers and educators due to it provides theoretical and practical knowledge within teaching and learning situations since educational activities are theoretically grounded, empirically contrasted, and they could be repeatable. In this regard, HAME sticks to the idea that “the research and theoretical bases for music education must simultaneously be refined and radically broadened both in terms of their theoretical interest and practical relevance” (Mayday Group, 2009, p. xxxv).

The Holistic’s concept possesses multiple meanings. The holistic research approach implies mixed research methods, so the same phenomenon is analysed from different viewpoints (Lichtman, 2013; Creswell, 2014). For instance, the quantitative design allows collecting macrosocial data while qualitative procedures delve into specific issues. In addition to this, the holistic research approach also understands results as photography of a specific moment within a continuum construction process (Ofir, Schwandt, Duggan, & McLean, 2016), that is, outcomes depict a here-and-now of educational situations (Westerlund, 2003).

The Architecture’s concept is considered a holistic term as it is linked to arts, humanism, social sciences and engineering (Wallen, 1986; Rabbat, 2002). The Music’s concept also is understood from a holistic perspective since it is understood as an “art, craftsmanship and everyday culture” (Georgii-Hemming & Lilliedahl, 2014, p. 140). Lastly, the Education’s concept has a holistic understanding due to teaching and learning activities are analysed since educational sciences, participating different agents in educational situations, such as teachers, students, and so on. Therefore, the Design-Based Research is the HAME’s foundation because, since the Didactical Engineering (Artigue, 2015), it fulfils the holistic research approach for music education. In light of this, the HAME’s name makes reference to the holistic sight of real-world music education, so it is intimately linked to complex thinking.

In this study, we will explore the technical suitability of the HAME for conducting empirical research in the field of music education. In order to comply this aim, one research is conducted for establishing whether HAME is an interdisciplinary research approach or not, which implies focusing simultaneously on different educational situation’s agents using mixed research methods.

2. A study focused on organisational structure in music education's classroom

HAME establishes a four-phases structural design. The first phase implies a preliminary study of epistemological, institutional and didactic situations of the phenomenon. The second phase corresponds to prospective analysis, which is the moment for establishing both research questions, aims, hypothesis, mixed research methods, and so on. In HAME, the research hypothesis is essential for the structural design's validity by reasons linked to the musical *Bildung*'s hermeneutic circle (Nielsen, 2007; Georgii-Hemming & Lilliedahl, 2014). The third phase is the fieldwork as it involves data collecting in an actual education system. Lastly, the fourth phase is the retrospective analysis, which analyses data collected in the fieldwork. The obtained findings during the retrospective analysis are contrasted with the research hypothesis, so structural design possesses an internal validity that is holistically described. Considering the HAME' structural design, the announced study is conducted next.

2.1. Preliminary study and prospective analysis

Different organisational structures are observed in the classroom. On the one hand, institutions focused on one-to-one lessons, such as conservatories, are mainly promoting a didactic triangle where iteratively interacts the learning content, student, and teacher (Lilliedahl, 2015; Carey, Harrison, & Dwyer, 2017). On the other, collaborative learning would be, apparently, encouraged by formal schools (Welch, 2009) since it is based on social constructivism (Westerlund, 2003). In light of this, HAME postulates a network of didactical interactions where iteratively interacts the student, teacher, and school community. These agents are forced to interact with the learning content because it is understood as a connecting link between curriculum theory and teaching-learning procedures (Lilliedahl, 2015; Cheon, Reeve, Lee & Lee, 2018). Considering these epistemological and institutional factors, the didactic situation emphasises that teacher play a determinant role in the classroom, to the point that educator could influence in student's behaviours (Madariaga & Arriaga, 2011; Hallam, Creech, & McQueen, 2017).

HAME claims nevertheless that both organisational structures in the classroom are not enough for understanding the complexity of didactical interactions since they lose sight of external factors of teaching-learning situations. Therefore, the network of didactical interactions also includes next four anthropological elements inherent to music education: facilities and educational resources (Angel-Alvarado & Lira-Cerda, 2017), curriculum (Belletich, Wilhelmi, & Angel-Alvarado, 2016), meta-economy (London School of Economics and Political Science, 2012), and globalisation culture (Partii & Karlsen, 2010).

In this study, the prospective analysis proposes delving into organisational structures in the Spanish Primary Education's music classrooms, mainly focusing on teacher agent. The aim

is to determine kind of organisational structure in the classroom that teachers establish with their students, so this study becomes relevant for HAME because it could open new lines of research in the frame of teaching and learning situations. Teachers and students from three schools integrated the participant sample. Mixed research methods have been considered through psychological scales, questionnaires, interviews and observation procedures. Lastly, the hypothesis poses that both didactic triangle and network of didactical interactions are observed in the music education system.

2.2. Fieldwork

Two educators were interested in music theory in the frame of their instructional activities, to the point that both have mainly established one-to-one assessments. The students recognised that music theory is important in educational situations, so the individualistic perspective has been ratified. As a result, the didactic triangle is observed since the teaching content, student, and teacher iteratively interacted. In the other case, the educator was interested that learners conducted their activities within a school community, promoting that each student provided constructive feedback to their classmates during formative and summative assessments. Learners ratified the collaborative learning. As a consequence, the network of didactical interactions is observed due to the student, teacher, and school community iteratively interacted, taking the learning content as a connecting link. In all educational cases, anthropological elements inherent to music education has influenced on educational situations. Lastly, it is necessary to indicate that didactic triangle alludes to teaching content because educators are focused on what they want to teach, whereas network of didactical interactions has expressed learning content since educators are centred on what students need or want to learn.

2.3. Retrospective analysis

Four basic didactics positions (Nielsen, 2007; Georgii-Hemming & Lilliedahl, 2014) play a determinant role in HAME' data analysis. The first position is the *basic subject didactics* that comprises music education since curriculum. Secondly, *ethno-didactics* implies daily musical experiences. *Challenge didactics* is the third basic didactics position, promoting critical and civic thinking. Finally, *philosophical anthropological didactics* articulates the emotion and logic in each person.

In this study, the basic subject didactics showed that two educators focused their teaching on academicist approach (Manrique, Revilla, Lamas, 2014) while the other teacher considered musical knowledge as a mean for encouraging social skills. The ethno-didactics demonstrated that teacher agent could determine the educational environment in the classroom by means of organisational structure established by her/him. The challenge didactics displayed that collaborative learning encourages critical and civic thinking of

students through their active participation in the frame of assessments. Finally, the philosophical anthropological didactics would indicate that students prefer lessons based on social constructivism since they could autonomously manage their musical resources.

The retrospective analysis has confirmed then the research hypothesis as both didactic triangle and network of didactical interactions are observed in the music education system. This study has demonstrated therefore that teachers establish different kinds of organisational structures in the classroom, which would have an impact on their students. In light of this, the HAME' structural design possesses an internal validity that is holistically described.

From a theoretical perspective, this study proposes to discuss organisational structures in music education systems as it provides relevant empirical data referred to the didactic triangle and network of didactical interactions. Considering the limited sample' size, research results are particularly revealing for music education research since a greater sample would show likely more organisational structures in the classroom. This study could be opening then new lines of research in the frame of teaching and learning situations due to educators and students think in organisational structures in music classrooms from different viewpoints. In light of this, organisational structure's observation and analysis have become essential activities in the third phase of HAME, fieldwork.

From a practical perspective, research outcomes are useful for the participant teacher sample at least, as results would promote pedagogical reflection centred on teacher's impact on the student, both in their identity, motivation, self-regulation, and so forth. In addition to this, research results also are useful for education management as analysed schools could consider organisational structures in the classroom for designing and executing improvement plans.

3. Conclusions

HAME' structural design is described as an interdisciplinary research approach because it discloses how different educational agents are interrelated, trying to establish the relevance that each agent holds in the classroom's organisational structure. Specifically, the preliminary study understands phenomena from epistemological, institutional and didactic dimensions. The prospective analysis enables the formulation of research questions, aims, hypothesis, and so on. The third phase is the fieldwork, which considers the organisational structures' observation in the classroom during data collecting. Finally, the retrospective analysis considers four basic didactics positions for analysing collected data. The HAME's validity is demonstrated through a contrast between the retrospective analysis and research hypothesis, describing holistically such contrast's process since findings are understood as

the photography of a specific moment of the educational situation, using mixed research methods. In conclusion, the consistency between four phases of the HAME' structural design has been empirically proven, therefore, it is confirmed the technical suitability.

So far, HAME is successfully applied in studies that are being carried out in different countries. Both the classroom's organisational structure and four-phases structural design are adjustable to any educational environment, so it is feasible that HAME could be applied in a wide variety of formal, non-formal or higher education systems.

References

- Angel-Alvarado, R., & Lira-Cerda, J. P. (2017). Educational facilities for Music Education according to the social representation of Chilean students. *Electronic Journal of Music in Education*, (40), 19-31. doi: 10.7203/LEEME.40.10412
- Artigue, M. (2015). Perspectives on Design Research: The case of Didactical Engineering. In A. Bikner-Ahsbabs, C. Knipping, & N. Presmeg (Eds.), *Approaches to qualitative research in mathematics education* (pp. 467-496). Dordrecht: Springer.
- Belletich, O., Wilhelmi, M. R., & Angel-Alvarado, R. (2016). La educación musical en la formación básica en España: El problema de la dispersión curricular. *Perspectiva educacional*, 55(2), 158-170. doi: 10.4151/07189729-Vol.55-Iss.2-Art.454
- Carey, G., Harrison, S., & Dwyer, R. (2017). Encouraging reflective practice in conservatoire students: A pathway to autonomous learning? *Music Education Research*, 19(1), 99-110. doi: 10.1080/14613808.2016.1238060
- Cheon, S. H., Reeve, J., Lee, Y., & Lee, J. (2018). Why autonomy-supportive interventions work: Explaining the professional development of teachers' motivating style. *Teaching and Teacher Education*, 69, 43-51. doi: 10.1016/j.tate.2017.09.022
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches*. Los Angeles, CA: SAGE
- Georgii-Hemming, E., & Lilliedahl, J. (2014). Why "what" on the content dimensions of music didactics. *Philosophy of Music Education Review*, 22(2), 132-155.
- Hallam, S., Creech, A., & McQueen, H. (2017). What impact does teaching music informally in the classroom have on teachers, and their pedagogy? *Music Education Research*, 19(1), 42-59. doi: 10.1080/14613808.2015.1122749
- Lichtman, M. (2013). *Qualitative research in education: A user's guide*. Thousand Oaks: SAGE.
- Lilliedahl, J. (2015). The recontextualisation of knowledge: towards a social realist approach to curriculum and didactics. *Nordic Journal of Studies in Educational Policy*, 1(1), 40-47. doi: 10.3402/nstep.v1.27008
- London School of Economics and Political Science. (2012). *The impact of three London conservatoires on the UK and London economies*. London: LSE.
- Madariaga, J.-M., & Arriaga, C. (2011). Analysis of the educational practice of music teachers and their relationship with student motivation. *Cultura y Educación*, 23(3), 463-476. doi: 10.1174/113564011797330234

- Manrique, L., Revilla, D., & Lamas, P. (2014). Theoretical approaches underlying primary education curricula in Peru. In W. Pinar (Ed.), *International handbook of curriculum research* (pp. 376-390). New York: Routledge.
- Mayday Group (2009). Action for change in music education. In A. Regelski & T. Gates (Eds.), *Music education for changing times: Guiding visions for practice* (pp. xxxi-xxxvii). Dordrecht: Springer.
- Nielsen, F. V. (2007) Music (and Arts) Education from the point of view of didaktik and bildung. In L. Bresler (Eds.), *International handbook of research in arts education* (pp. 265-285). New York: Springer.
- Ofir, Z., Schwandt, T., Duggan, C., & McLean, R. (2016). *Research quality plus [RQ+]: A holistic approach to evaluating research*. Ottawa: IDRC/CRDI.
- Partii, H., & Karlsen, S. (2010). Reconceptualising musical learning: New media, identity and community in music education. *Music Education Research*, 12(4): 369-382. doi: 10.1080/14613808.2010.519381
- Rabbat, N. (2002). The boundaries of architectural education today. In A. M. A. Salama, W. O'Reilly, & K. Noschis (Eds.), *Architectural education today: Cross-cultural perspective* (pp. 149-154). Lausanne: Comportements.
- Wallen, G. (1986). The scientification of architecture. In G. Böhme & N. Stehr (Eds.), *The knowledge society: The growing impact of scientific knowledge on social relations* (pp. 161-182). Dordrecht: D. Reidel Publishing Company.
- Welch, G. F. (2009) Ecological validity and impact: Key challenges for music education research. In A. Regelski & T. Gates (Eds.), *Music education for changing times: Guiding visions for practice* (pp. 149-159). Dordrecht: Springer.
- Westerlund, H. (2003). Reconsidering aesthetic experience in praxial music education. *Philosophy of Music Education Review*, 11(1): 45-62.

Introducing Voice Recognition into Higher Education

Dittrich, Toby^a and Star, Sequoia^b

^aDepartment of Physical Science, Portland Community College, USA

^bSequoia Star Consulting, USA

Abstract

Voice Recognition (VR) software has now evolved to be fast and accurate enough to be useful in many educational settings. This paper describes two new uses for VR technology, both protected by patents, which can effectively address the lack of universal oral training in education today. The first use is Instant Note Capture (INC) which can be employed in live computer presentations and in an online software add-on tool called Incredible Classroom (IC) to place and store voice to text records in educational activities. The second is a new assessment tool called Virtual Oral Recitation Examination System (VORE) which enables oral discourse to be automatically and instantaneously identifies the necessity for and demonstrates the uses of voice recognition systems in education.

Keywords: *Voice recognition; speech recognition; educational technology.*

1. Introduction

Computer advances in memory and speed coupled with continuous efforts by many research teams have advanced voice recognition technology (VRT) sufficiently that it has made its way to the consumer market. The 1990s saw the first introduction of commercially successful VRT. In the early 2000s, speech recognition was still dominated by traditional approaches such as Hidden Markov Model (HMM) (Baum & Petrie, 1966) combined with feed forward artificial neural networks. Today, however, many aspects of speech recognition have been taken over by a deep learning method called long short-term memory (LSTM) (Hochreiter & Schmidhuber, 1997), a recurrent neural network. VRT has reached maturity based on these deep learning techniques and is delivered by Google, Microsoft, IBM, Apple, Amazon, and Nuance. Even before the turn of the century, the vocabulary of the average commercial speech recognition system was larger than the average human vocabulary (Huang, Baker, et al., 2015). Currently, VRT is in common use in many applications and disciplines; however it has not yet appeared in the field of education.

The *Instant Note Capture* (INC) technology listed herein will provide the first live, dynamic, interactive classroom experience in online education. Additionally, the component introduces oratory elements into online classrooms, which has never before been available.

The *Virtual Oral Recitation Examination System* (VORE) initially sprung from the teaching of a conceptual physics course. The professor, after having read a similar written paragraph from dozens of students, thought there must be a better way. His concept was using a computer to assess the verbal answer to questions by using key words from a rubric used to assess points to the written answer. With this concept, the idea of automated assessment of oral discourses was born. The door is now open to implement technologies that allow all students to answer content questions orally. These discoveries are of great importance to the field of educational as it has been shown, repeatedly, that the introduction of oral components to learning processes improves students' academic, personal, and professional success (Beers & Nagy, 2008; Berninger & Abbott, 2010; Semel, Wiig, et al., 2003; Berninger, Abbot, et al., 2010; Nelson, 2011).

Toward the end of introducing VRT to education, efforts are underway by Northwest Educational Software Inc. of Vancouver, Washington USA, to pioneer the herein delineated VR technologies into educational tools and applications. This effort is strengthened by the company's intellectual property (IP) portfolio, which includes three US Patents (Dittrich, 2009a, 2009b, 2009c) and two similar Canadian patents.

2. Applications for the technology

Another recent and applicable educational development is called Active Learning. Active learning is an approach to instruction in which students engage the material they study through reading, writing, talking, listening, and reflecting (Carr, Palmer, et al., 2015). Active learning stands in contrast to other standard models of instruction in which teachers do most of the talking and students remain passive. Perhaps the easiest and most effective way to engage students in active learning is by getting them to talk with others and explain, reason, and debate curriculum. This invaluable process of engaging students in talking while learning is at the heart of both the technologies introduced above and described below. When students transition into the workforce, depending upon the employment position, 75% to 85% of a typical work day is spent in oral exchange (Blalock, 2006). In management level positions the percentage is as high as 90%. These workplace communication requirements stand in stark contrast to oral skill capacity garnered by students (Peter D. Hart Research Associates, 2005). The INC and VORE technologies are aimed directly at this deficiency.

2.1. *The Incredible Class Room and Instant Note Capture*

The primary educational tool under development, using the INC software, is the Incredible Classroom (IC). This tool is designed to maximize verbal exercise and face-to-face communication in the on-line educational setting. Current learning management systems (Blackboard, Desire2Learn, Canvas) have negligible or nonexistent built-in conferencing systems, or they contain imbedded links to an external conferencing program, which are neither tied to, nor associated with, the student's online learning platform. Instant Note Capture, within the IC platform, textually stores all verbal discourses in class sessions, office hours, tutoring, and student-to-student conferencing. This enables the teacher to assess students, to review lecture content, tutoring sessions, and student conferences. The text can easily be converted into thirty languages (currently available through Google). Additionally, and of invaluable importance, disabled students, those unable to type, can join the conversation by voice.

More specifically, the INC offers a synchronously interactive component to online learning not previously available. The software's unique features will address several discreet concerns that current Learning Management System (LMS) platforms exhibit. One major LMS issue resolved by IC is the use of the current *raise your hand* feature used by students when asking questions during online class time. Currently, entering a question is done by typing into a provided text box. This process is cumbersome, and often leads to awkward delays in the flow of an online class, as others must wait while one student types. With IC's INC technology, the voice audio signal and the output of voice recognition software will

both record and instantly display the spoken question and the instructor's answer on the wall of the online classroom. Additionally, questions, answers, and lectures are stored both in writing and recorded format for future review or replay, a feature useful to student and instructor alike. Microsoft Powerpoint™ is currently testing a system for introduction in the Office™ suite next year called Presentation Translator, which is essentially the application of INC.

2.1.2 VORE Oral Discourse Automated Assessment Technology

VORE is a patented software programming code for learning and assessment which enables a teacher to assign oral work questions and give oral examinations. VORE tasks are performed by the student with the aid of a computer and software. The graded results of these oral tasks are available immediately, both to the teacher and the student. The essence of the VORE technology is the use of computer code to connect voice recognition software output in text document format with essay or written document evaluation software code. This combination enables the computer to evaluate, correct, and assess or grade verbal answers and presentations. Potential applications for this technology include but are not limited to: synchronous remote online class time, office hours, and study and tutoring sessions. To further example the implementation of the intervention, an application scenario has been created and a figure of the technology provided:

First, a teacher or a textbook publisher creates an oral question to be answered by the student user. In creating the question and answer key, certain phrases, concepts, and linked concepts, which will be used for grading, are selected using indicia on the keyboard. When the instructor creates the answer for the answer key, it is spoken into a microphone for conversion to text with VR software. Due to the differences in the syntax for written text and the spoken word, the answer would be created verbally and input with a microphone (hence preventing comparing the teacher's written answer to students' oral answers). The question is then stored in a VORE answer key file of the VORE Program Test application of the administrator's computer.

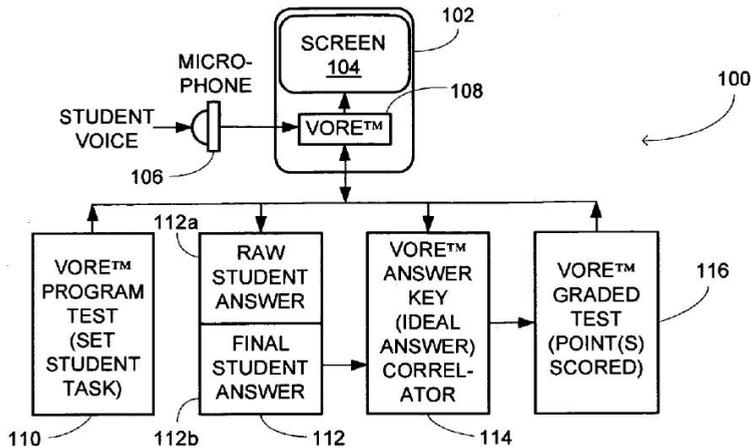


Figure 1. Vore Technology. Dittrich (2009a)

The student subsequently initiates the VORE task and a question appears on the screen of the user's computer. The student orally responds to the question using their computer's microphone, (students can also be videotaped and digitally recorded). Their verbal answer is digitized into text by VR software. Editing software can be used to correct punctuation, grammar, word usage, and sentence structure. The number of editing corrections is noted. The final student answer is assessed by automated assessment software and the grade is displayed on the screen. If the user is not accurate in their response, after further research and the formulation of a new answer, they would be allowed to delete the session and start a new VORE task. The number of times the student attempts an answer is recorded for the teacher. When the user is satisfied with their final score they deliver the score, and the text document (and audio and video recording, if one is made), to the teacher's computer (grade book file). The above delineated process possesses an additional very desirable advantage, security in the process of course administration.

The above description opens the door to a wide variety of educational applications that exist for the implementation of VORE technology. These include:

- Providing an opportunity to utilize oral examinations for students with poor writing skills or disabled students not capable of writing or typing;
- A tool for underperforming students, with test scores that are lower than average. VORE can be implemented to allow for additional study and retakes of exams orally;

- Enabling teachers to provide a method to create closure to a daily class lesson, in a quick and easy manner, with immediate feedback identifying low performers in the class;
- Providing positive identity verification for testing in online courses, since the task could be completed while being videotaped (Voiceprint identification software can also be used for positive identification of the test-taker as well);
- Provide a method of automated assessment of the oral expression CCSS standards in schools and districts nationwide; and
- Increase the capacity of student's oral skills.

Several specific educational tools have been designed and are available for development. They include the following.

VORE in Reading Comprehension: Students were given a reading assignment and after reading a portion of the assignment, the computer would present them with a content related question. The reader would be required to answer the question verbally and their answer would be graded instantly with VORE. If the assessment was successful, the reader would be presented with the next portion of the assignment. If not, the reader would be directed to reexamine the original portion and answer another related question. This process continues until the reader successfully answers the question and can proceed. At the end of the assignment a series of VORE tasks are presented for completion of the reading assignment. This creates a research opportunity to compare groups of students who have used VORE and those who have not with regard to their overall reading comprehension abilities.

VORE in Mathematics: The ORAL Equation Solver: The following is an example of a VORE Mathematic task titled Oral Equation Solver (OES). When the student boots up the OES software they would be able to choose from mathematical tasks such as: 1) Add and subtract fractions; 2) Multiplying polynomials; 3) Find linear equation from (x_1, y_1) and (x_2, y_2) ; 4) Solve two linear equations in x and y for (x, y) ; 5) Factor polynomials of second degree; 6) Determine zeros or roots of polynomials; 7) Determine the derivative of a function at a point given its algebraic form; 8) Determine the derivative of a function at a point given its graph; 9) Describe the end behavior of functions (rational, linear, polynomial); and 10) Find the determinant of a 2×2 matrix.

To demonstrate VORE's basic working architecture, adding fractions has been chosen. Upon selection of this math task, the student would see the following:

$$\frac{2}{3} + \frac{1}{5} = \frac{\boxed{}}{\boxed{}}$$

Figure 2. Sample Mathematics Problem

Initially the student would be asked to make a general statement about this task, e.g., "Fractions may be multiplied and divided easily but cannot be added or subtracted without a common denominator" (Note: the task's key words are underlined). Then an instructor's voice or text on the screen would instruct the student to go through the individual steps of the mathematical task, in this case, to add this fraction. Each step would contain interactive boxes and specific computer generated voice instructions, for example: "Please enter the proper common denominator and explain the process by which you arrived at your answer." After entering 15 into the denominator box, the student's response would be something to the effect, "The common denominator is fifteen because it is the product of three and five." If the VORE assessment was passed by the student statement, the software would then accept the 15 in the common denominator box and go to the next mathematical operation with a voice prompt. This process would repeat until the final answer was stated, in this case 13/15. Finally, a voice prompt would ask for, a final closing statement, such as: "Explain why this task is complete?" The student would respond, "Because the fraction or answer - thirteen fifteenths - cannot be simplified or further reduced to a simpler fraction." The VORE assessment score would then be stored and presented to the student.

VORE Interactive Biology- Skeleton/Human Body: Software would be developed utilizing the patented VORE technology to construct an interactive skeleton for the purpose of training Anatomy/Physiology and General Biology students on the constituent parts of anatomy. This software could be used both for training and for assessment. The fact that this tool is much like an educational game enables it to increase content knowledge while simultaneously providing students with oral training.

When the program is booted up in the training mode, a colored skeleton showing bones is seen. The cursor arrow randomly points to a bone or joint and the student is then required to name that component and provide a short statement as to its function. The VORE technology would then score the answer and if the answer score is above the passing level, the arrow would move to another bone. This process would be repeated a certain number of times and a cumulative score would be presented. As an example, this repetitive process could occur twenty times at five points each time, for a total possible score of 100 points. Each repetition would need a minimum score of three points to proceed. If the score was

less than three points, a tutoring session would automatically start on that component, but the user could not immediately redo that repetition.

Upon completion of this session the student would see their overall score and if not satisfied they could start a new session and attempt a higher score. Potentially, these sessions could be engaged by two or more students, each student getting consecutive tries with a running score competition. The number of repetitions per session could be increased as desired, and the grading rubric for each component could be adjusted for the grade level of the course. When the student has mastered the bones, they could then click on muscles, or nerves, or circulatory system and proceed to learn all of the components of the human body. This example demonstrates how the VORE technology is similar in function to the combination of a video game, flash card training, and the memory recall game Concentration.

VORE Science Technology Engineering Math (STEM) Oral Story Problem Solver and Content Knowledge Assessment: Often in STEM, students learn to solve story problems without much regard for concepts and theoretical considerations. Students frequently pick an equation and simply substitute the variables numerically and calculate. This is termed the “plug and chug” technique. This shortcoming in STEM learning is often accentuated even more in more advanced courses, where mathematics often overshadows concept knowledge. Instead students should think, evaluate, consider alternatives, plug, and calculate. To enhance the story problem solution experience VORE can, in much the same way as the OES require verbal explanations for each step in the STEM story problem. This would require the student to understand each step and not just manipulate symbols. Many automated solutions systems, can grade the symbolic manipulation, but fail to assess the content knowledge associated with the symbolism.

3. Conclusion

In conclusion, VR is an effective software technology and can be used to accomplish multiple tasks. The troubling fact is that this technology's use in education is lagging and in fact is essentially nonexistent. Described herein are two technologies that could change this regrettable fact. Both INC and VORE are effective strategies to promote students talking and using oral communication, which is at the core of one of active learning's key components. Implementing these technologies would tackle a most glaring deficiency in education, the lack of universal oral training at every level. These platforms would expand the potential for many interesting educational activities beyond the applications described above. Once VRT is introduced into education, an avalanche of applications for it will most certainly appear.

References

- Baum, L. E., Petrie, T. (1966). Statistical inference for probabilistic functions of finite state Markov chains, *The Annals of Mathematical Statistics*, 37(6), 1554–1563. doi:10.1214/1177699147
- Beers, S. F., & Nagy, W. (2008). The development of syntactic complexity in oral language texts: Effects of grade and genre. Proceedings from: *The International Conference on Writing Research Across Borders*. Santa Barbara, CA.
- Berninger, V. W., Abbot, R.D. (2010). Listening comprehension, oral expression, reading comprehension, and written expression: Related yet unique language systems in grades 1, 3, 5, and 7. *Educational Psychology*, 102 (3), 635-651. doi: 10.1037/a0019319
- Blalock, M. (2006). Why good communication is good business. Retrieved from <http://www.writingforbusinessandindustry.com/uploads/2/8/7/2/2872349/goodcommunication.pdf>
- Carr, R., Palmer, S., & Hagel, P. (2015). Active learning: the importance of developing a comprehensive measure. *Active Learning in Higher Education* 16, 173-186. doi: 10.1177/1469787415589529
- Dittrich, W. A. (2009a). United States Patent No. 7,296,218 B2. New York, New York: U.S. Patent and Trademark Office.
- Dittrich, W. A. (2009b). United States Patent No. 7,562,288 B2. New York, New York: U.S. Patent and Trademark Office.
- Dittrich, W. A. (2009c). United States Patent No. 7,657,221. New York, New York: U.S. Patent and Trademark Office.
- Peter D. Hart Research Associates. (2005). *Rising to the challenge: Are high school graduates prepared for college and work?* Washington, DC: Hart, P.
- Hochreiter, S., Schmidhuber, J. (1997). Long short-term memory. *Neural Computation*, 9(8), 1735-1780.
- Huang, X., Baker, J., & Reddy, R. (2014). A historical perspective of speech recognition, *Communications of the ACM*, 57(1), 94-103. doi: 10.1145/2500887
- Nelson, M. (2011). Oral assessments: Improving retention, grades, and understanding. *PRIMUS*, 21(1), 47-61. doi: 10.1080/10511970902869176
- Rabiner, L. (1984). The acoustics, speech, and signal processing: A historical perspective, *IEEE ASSP Magazine*, 1(1), 4-10. doi: 10.1109/MASSP.1984.1162225
- Semel, E., Wiig, E. H., & Secord, W. A. (2003). *Clinical evaluations of language fundamentals: Examiner's manual* (4th ed.). San Antonio, TX: Harcourt Assessment/

How we have motivated students in sciences

Uukkivi, Anne^a and Labanova, Oksana^b

^{a,b}Centre for Sciences, TTK University of Applied Sciences, Estonia

Abstract

For improving academic performance teachers must search for possibilities to increase students' motivation. Teachers must understand that what motivates teachers may not motivate students (Wiesman 2012). The aim of the article is to present what has helped to motivate students in learning sciences. The article is based on the results of qualitative feedback questionnaires.

Although the studies took place mostly in face-to-face classes, students liked to have all the materials in e-learning environments. The most preferred were tutorial videos made with software applications that have the ability to turn a digital device into a virtual board using screen zoom and annotation tools in parallel. These encouraged learners to solve their tasks independently. Online calculators helped to solve more difficult exercises as they offer step-by-step solutions. The choice of bonus tests which were made using interactive videos also received a very positive feedback. Full-time students considered game-based learning platforms to be the most effective revision technique. Using some learners as tutors in teaching was also highly appreciated.

Most of the above-mentioned methods support self-studying, therefore, learners need effective learning tools and materials, particularly for independent learning.

Keywords: *Students' motivation; teaching experience; educational technology; teaching sciences; blended learning; higher education.*

1. Introduction

In a competitive environment, the number of graduates is for the universities a very important factor (Breen & Lindsay 1999; Winn 2002; Lukkarinen & Koivukangas 2017). Achieving a higher number of graduates poses a challenge for the teachers. Students are unmotivated and without an interest to learn (Hidi & Harackiewicz 2000), they have different subject knowledge and learning skills (Winn 2002), distance students and also many daytime students need to work to cope (Uukkivi & Labanova 2017). These are just some challenges the teachers face.

However, students vary in beliefs, values and attitudes toward learning (Breen & Lindsay 1999). There are different factors that affect their willingness to learn. According to Ryan & Deci's (2000) self-determination theory, if external events promote the feeling of support and security, intrinsic motivation will increase. For improving students' academic performance teachers must search for possibilities to increase students' motivation. At the same time teachers must realize that students and lecturers may not be motivated

in the same way (Wiesman 2012). The aim of the article is to present what has helped us in motivating students in learning sciences.

2. Methods

This paper presents the results from TTK University of Applied Sciences in the subjects "Mathematics I" and "Data and text processing" in year 2017.

"Data and text processing" represents 3 ECTS-credit points. The objective of the course is to create conditions to successfully use MS Office in studies and workplaces. This is a blended learning course in Moodle environment. The subject is based on project learning. The course consists mainly of practical work in classroom and teamwork and independent learning outside the classroom. Independently the students need to get acquainted with study materials, complete half-finished exercises and do repetitive exercises as teamwork.

"Mathematics I" represents 3 ECTS credits. The programme of this course contains the main subjects of the gymnasium mathematics programme. This course provides sound knowledge of mathematics and explains how to use mathematics as a tool in engineering. In this course students also develop their logical and mathematical thinking ability. Students who have completed this course are well prepared for more in-depth studies in the subsequent mathematical courses (Mathematics II and III). Learning and teaching are supported by a Moodle course with different types of materials, tests and videos. The methods used are lectures, seminars, demonstrations, classroom discussions, flipped classroom.

The article is presenting the results that emerged from the qualitative analysis of open-ended questions collected through the feedback questionnaire of both subjects. The feedback questionnaire of the subject “Data and text processing” consisted of 10 questions and “Mathematics I” from 9 questions. Among the different questions the students of both subjects had to answer to three common question: express their opinion on the teaching format, engagement with study materials, and explain what they liked most in the learning process and assessment. Feedback was requested in the end of the semester in Moodle environment. The feedback was not anonymous. Overall 149 responses were received from all the 311 students. The respondents were both daytime and distance students who study different specialties: Transport and Logistics, Automotive Engineering, Electrical Engineering, Production and Production Management, Building Construction, Road Construction, Facilities Management and Construction Geodesy.

We coded and categorised the answers thematically according to Flick (2011). First we familiarised ourselves with the data, then started to create initial codes, sorted the different codes into potential themes, refined those themes and wrote a detailed analysis for each theme. The five most commonly coded themes have emerged. Themes are as follows: 1. The importance of the course in virtual learning environment (VLE) 2. Learning materials 3. Bonus tests 4. Revision with game-based platforms 5. Students as tutors.

3. Findings

3.1. The importance of course in VLE

A half of the students emphasised the importance and availability of our supportive teaching and learning e-course and its structure.

Student 1: There was clear guidance on the e-course to explain what we need to do and how. If I had any problems, I had a chance to post my question into online forum and answers came quite quickly.

Student 2: In spite of our fast pace in classroom, distance learners have a very good teaching system. Online materials are meaningful and helpful. This is a very supportive e-course.

In case of face-to-face learning, the location limits attendance to a group of learners who have the ability to participate in the area, and as concerns case the time, it limits the crowd to those who can attend at a specific time. So, we are convinced that absolutely all the materials, learning tasks and guidance should be available in VLE. We used Moodle environment. The feedback shows that such an approach is highly appreciated by our students, especially by distance learners. This understanding of flexibility and the ability to

remotely access a classroom in the student's own time facilitates and motivates students to learn independently and to achieve learning outcomes.

3.2. Learning materials

Students appreciated all types of learning materials (.pdf files, formula sheets, tutorial and instructional videos, text-based guidance with pictures) that were presented in the Moodle courses. A half of the students rated our tutorial videos the highest.

Student 3: Mathematics I' course was the best of TTK UAS in this semester thanks to videos.

Student 4: I particularly liked the tutorial videos which were fundamental in helping to understand the topics.

Tutorial videos are a key component in our Moodle courses and it became an undivided part of our learning process. While there is a lot of existing content on the Internet, there are only few of them in mathematics in the Estonian language. All our videos are in the Estonian language and we can convey the material through auditory and visual channels, creating a multisensory learning environment. Our tutorials do not attempt to achieve too much in a short period of time because they would then become muddled, bloated and difficult to follow. To avoid this, we write plans for our tutorials that will not result in more than 4-9 minutes worth of video.

We use videos mainly in two ways: to support or enhance the understanding of the course content, or as the primary mode of content acquisition. So there are different types of tutorial videos in our courses: mini-lectures, tutorial (problem solving walkthrough), how-to or step-by-step videos, interactive videos, individual videos. For creating videos we use such tools as Lensoo Create, Screencast-O-Matic, Zoom, Power Point, H5P and ZoomIt.

Lensoo Create is a virtual whiteboard with voice recording and instructors draw and write freehand digitally on a digital tablet. Lensoo Create provides an opportunity to answer promptly students' individual questions (finding mistakes, giving further instructions, etc.) and it is extremely useful when we want to illustrate problems in sciences. With the help of Lensoo Create we also create mini-lectures videos to implement the flipped classroom model.

Screencasts are another option that we use to make videos. We found it very comfortable for making "how-to" tutorials. In those "how-to" short videos we give instructions to students on how to use special software (MS Excel, MS Word). Also we need screencasts to help our students to understand how some free online calculators such as Symbolab, Desmos, and Wolframalpha work. For example Symbolab provides automated step by step

solutions to algebraic, trigonometric and calculus topics. Our students find that this corresponds to the 21st century working life requirements and also stimulates them to solve problems independently, knowing that they can check their answers and often also the solution steps online in a minute.

Today's internet viewers have very high expectations to their web content, so we diversify videos with annotations, arrows, circles, and other graphics and texts, it is probably the best way to demonstrate during recordings what we are trying to teach. In this context ZoomIt helps us a lot. ZoomIt is a zoom and annotation tool for presentations, it resizes the capture window dynamically during the recording without pausing or external editing later. Such "keep moving" on the screen definitely helps to focus on the main aspects.

Our students also pointed out interactive videos. An interactive video is a type of interactive content that creates engagement by layering other types of interactions (multiple choice- and fill-in-the-blank questions, pop-up text and other) on top of an existing video. For this purpose we use a free content collaboration framework called H5P and EdPuzzle. Students can skip to specified sections of the video on demand. Such interactive videos motivate students to watch them, as they will receive instant feedback, it is like turning a monologue into a dialogue, moving from a passive to an active viewing experience.

By using tutorial videos we create the opportunity for students to master tough concepts by watching "movements" at their own pace.

3.3. Bonus tests

"Mathematics I" course consists of several tests: classroom tests, online grade tests, self-tests, bonus tests. The students liked bonus tests the most. Nearly half of the students reported that the bonus tests system motivated them to complete those tests.

Student 5: Bonus tests are a good motivator for raising your grade points!

Student 6: Certainly, great help were bonus tests which helped to improve the ratings and thanks to these tests the knowledge improved.

The bonus test system was as follows. For each learning outcome, a short bonus test was possible. The motivation for completing those tests was that extra points could be obtained. On the other hand, it provided a good overview to both the student and the teacher about the extent the learning outcomes were achieved. A large majority of students tried to pass all the tests. Under each topic several self-tests were also available on the Moodle course. Students reported that because of the flexibility of materials they were engaged and motivated to work independently, it allowed them to schedule their work in a better way and it also helped to self-manage their studies.

3.4. Revision with game-based platforms

Over a half of the daytime students reported on their willingness to answer to online tests made by game-based platforms like Kahoot. When using Kahoot one can add videos, images and diagrams in addition to text questions. Players need to answer the questions on their own devices like smart phones, laptops or tablets, while games are displayed on a shared screen.

Student 7: At the beginning of every lesson there should be a Kahoot quiz to remind us of what we learned last week.

Student 8: More Kahoots!

During the teaching process we use game-based platforms for getting feedback about students' knowledge, understanding and remembering. Such platforms help us to get to know the students' previous knowledge and understanding about new issues. We use game-based platforms when dealing with the most important mistakes made in exercises, the most important rules and exceptions. Tests made by game-based platforms activate the students and engage them highly. Students like to use nicknames instead of their real names, but they always agree to share their names with the teacher.

When creating the tests we use multiple choice questions where one of those answers is a joke answer. This helps to reduce student tension. We use also incomplete answers to make answering not so easy. It is important to use short questions and answers to make it easier for the students easier to grasp the topic. Unfortunately such platforms do not support mathematical symbols besides power. That is the reason why we use mathematical expressions in picture format.

The only weakness such tests have is related to the quickness of students' answers. Some students tend to answer too quickly, so they do not read all the given answers. This is the reason why we use some exercises after Kahoot to repeat the most important rules.

3.5. Students as tutors

Students as tutors are used just in the subject "Data and text processing". About 1/3 of the students liked that some of the students act as tutors.

Student 9: It helped me a lot because if teacher explained the topic to someone else, then it was easier for me to ask the tutor for more clarifications. As well as when having problems with independent work I could instantly write to the course mate in a tutor role.

Student 10: The tutor supported us a lot. It changed our communication for the better and the tutor helped and explained well.

In the beginning of the school year I give the students an individual exercise to be solved in the classroom. I then ask the quickest and the best ones to stay as tutors. Most of those students agree but some are not so confident or do not want to learn that way and say no.

The tutors need to solve classroom tasks independently before the class does. They send their exercises by e-mail to the teacher and after that the tutor and the teacher discuss the difficulties in the learning materials, exercise guidelines or exercise. After that the tutor will assist the teacher during the class and help other students outside the classes as well when other students are ending half-finished exercises.

The tutors reported that their motivation increased as an alternative way to pass was available, learning was more thorough, flexible, new teaching skills were acquired and above all – there was a good feeling about the possibility to help others.

Student 11: It helped me as well because I had the possibility to revise what we had to learn.

Student 12: It was good that I could help my classmates. I learned how to coach and help others make a great feeling.

The tutors also improved their time management skills because of the strict deadlines and motivated other students due to the positive example. Their role as tutors were wider.

4. Conclusion

The results of feedback questionnaires demonstrated how the used materials and methods supported and motivated students to pass technical subjects. Such approach to the course “construction” kept the students active during the entire course and motivated their activities. Those students who used course materials got better results than the usual average grades received in these courses. Also the number of repeats has decreased significantly.

Using supporting face-to-face courses by creating e-course as well, inspiring learning materials, grading system, and game-based platforms has resulted in a win-win situation, as both students and teachers achieved their goals. Students are happier when they have a better command of the whole process and higher marks, while having a better knowledge of the topics included. The factors extracted in this research are similar to the studies of Middleton and Spanias (1999), Erwin (2003), Deshpande & Chukhlomin (2017 and Huang (2017), where they found out the way of teaching and instructional design quality have great influence on students’ motivation.

The above-mentioned materials and methodological techniques supported self-studying, therefore, it allowed them to schedule their work in a better way, also helped to self-manage

their studies. Learners need effective learning tools and materials, particularly for supporting independent learning. ICT tools have a great value to support students' learning.

Further work is needed to follow up this study in order to elaborate the results to foster deep learning among university students.

References

- Breen, R., & Lindsay, R. (1999). Academic Research and Student Motivation. *Studies in Higher Education*, 24(1), 75-93.
- Deshpande, A., & Chukhlomin, V. (2017). What Makes a Good MOOC: A Field Study of Factors Impacting Student Motivation to Learn. *American Journal of Distance Education*, 31(4), 275-293.
- Erwin, J. (2003). Giving students what they need. *Educational Leadership*, 61, 19-23.
- Flick, U. (2011). *An Introduction to Qualitative Research*. Los Angeles & London: Sage.
- Hidi, S., & Harackiewicz, J. M. (2000). Motivating the academically unmotivated: A critical issue for the 21st century. *Review of Educational Research*, 70, 151-179.
- Huang, D.-F. (2017). Outcome assessment of the online English learning and management system: A project on educational technology application to English learning in Taiwanese polytechnic higher education. In HEAd'17. 3rd International Conference on Higher Education Advances (pp. 1176-1184). Valencia, Spain: Universitat Politècnica de València. <http://dx.doi.org/10.4995/HEAD17.2017.6713>.
- Lukkarinen, A., & Koivukangas, P. (2017). Getting in and getting out: Predicting the likelihood of graduation of master's program students. In HEAd'17. 3rd International Conference on Higher Education Advances (pp. 1176-1184). Valencia, Spain: Universitat Politècnica de València. <http://dx.doi.org/10.4995/HEAD17.2017.6713>.
- Middleton, J.A., & Spanias, P.A. (1999). Motivation for achievement in mathematics: Findings, generalizations, and criticisms of the research. *Mathematics Education Research Journal*, 30(1), 65-88.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78.
- Uukkivi, A., & Labanova, O. (2017). E-learning materials, methods and tools to activate students. In New learning scenarios in digitalized world: international workshop (pp. 31-39). Bucharest, Romania: Conspress.
- Wiesman, J. (2012). Student Motivation and the Alignment of Teacher Beliefs. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 85(3), 102-108.
- Winn, S. (2002). Student Motivation: a socio-economic perspective. *Studies in Higher Education*, 27(4), 445-457.

Cultural competence: a key component for training global citizens

McHugh-Cole, Amy B.; Russell-Mundine, Gabrielle S. and Simons, Rachael F.

National Centre for Cultural Competence, The University of Sydney, Australia

Abstract

As globalization continues to make cross-cultural interactions more of a reality, the need to develop the cultural competence of students and staff is imperative. The University of Sydney has included cultural competence in its 2016-20 strategic plan, necessitating the embedding of cultural competence across all functions of the University. The National Centre for Cultural Competence (NCCC) at The University of Sydney was created to lead the thinking on cultural competence, which includes creating teaching and learning resources to guide University students and staff on their cultural competence journey. In this paper, we discuss a cultural competence seminar developed and delivered by the NCCC to students participating in a broader program designed to educate and prepare them to be global citizens. We will examine the efficacy of our approach to cultural competence training with this particular cohort of students.

Keywords *cultural competence; global citizenship; globalization; higher education; Indigenous; Australia.*

1. Introduction

The world has altered dramatically over the past few decades as a result of globalization (Zolo, 2007). Technology, modern communication, and enhanced infrastructure has made communication and travel easier, cheaper, and more reliable. As well, global migration movements mean that interactions among people from disparate backgrounds are more common. Whether through travel or in the workplace, the potential for daily interactions with diverse groups of people creates the need for culturally competent global citizens: those who can work respectfully and effectively in a myriad of contexts, have an awareness (of themselves and others), and who are committed to making things more equitable for all in their areas of influence (Sherman, 2017).

The concept of the ‘global citizen’ is particularly pertinent in the higher education landscape. At The University of Sydney (the University), almost half of the employees (academic and professional staff) originate from more than 100 different countries. As well, 38% of the University’s student body is made up of students from more than 170 countries (Mery Joseph, HR Research, Analysis & Reporting, personal communication, January 29, 2018). Working and/or interacting with culturally and linguistically diverse people is to be expected within this University community, which prioritizes developing cultural competence in its staff and graduates (The University of Sydney, 2016, pg. 58).

This paper reports on one cultural competence development seminar delivered as part of a larger University program: the Global Citizenship Award (GCA) program. The GCA program “provides distinctive international and leadership opportunities to prepare students as global citizens. GCA participants attend speaker events and practical skills development seminars around the key themes of global citizenship, leadership in an international context, and community and diversity,” (The University of Sydney, 2018). The program is open to both domestic and international students from all disciplines.

1.1. Cultural competence and global citizenship

Funded by a federal grant, the University of Sydney’s National Centre for Cultural Competence (NCCC) was created in 2014 to lead the thinking and praxis of cultural competence within and beyond the University. The NCCC views cultural competence as the ability to participate ethically and effectively in personal and professional intercultural settings. “It requires being aware of one’s own cultural values and world view [sic] and their implications for making respectful, reflective and reasoned choices, including the capacity to imagine and collaborate across cultural boundaries. Cultural competence is, ultimately, about valuing diversity for the richness and creativity it brings to society,” (The University of Sydney, n.d.). The NCCC specifically locates its understanding of cultural competence in Aboriginal and Torres Strait Islander peoples’ contexts. Universities have

traditionally not encouraged or enabled Aboriginal and Torres Strait Islander peoples' participation in higher education whether that was as students, researchers, teachers or professional staff. The NCCC aims to highlight Aboriginal and Torres Strait Islander peoples' different ways of knowing, being, and doing, and draw attention to the social justice aspects of cultural competence and global citizenship.

There is consensus that 'global citizenship' refers to those who "recognize the interconnectedness of life, respect cultural diversity and human rights, advocate global social justice, empathize with suffering people around the world, see the world as others see it and feel a sense of moral responsibility for planet Earth," (Sherman, 2017). It is for this reason that the NCCC partnered with the Office of Global Engagement to create mandatory cultural competence seminars as part of the Global Citizenship Award program.

1.2. *The program*

The University has committed to providing students with multiple opportunities to build their capabilities as global citizens, thereby supporting the strategic goal of graduating "culturally competent" students. The cultural competence component of the GCA program, created and facilitated by the NCCC, is positioned within the required development seminar section of the program. The cultural competence seminar consists of two components; a two-hour session on critical self-reflection which gets students exploring their values, attitudes, and personal histories (Sisneros, 2008), and a three-hour session which includes a lecture on Aboriginal and Torres Strait Islander Australians' history and context for cultural competence, followed by the setting of a safe space, and continuing with practical work on improving cultural competence capabilities (i.e. behaviors, attitudes, skills, and knowledge). Including Aboriginal and Torres Strait Islander peoples' histories and perspectives is important not only because the NCCC locates its understanding of cultural competence within these contexts, but also because participants in the GCA program generally have limited knowledge of Aboriginal and Torres Strait Islander history in Australia. The NCCC considers that this is an important aspect of our seminar because all of our work takes place on colonised and unceded land. For 150 years, the University has inhabited the land of the Gadigal Peoples of the Eora Nation, and has taught generations of students from a Western knowledge perspective, while diminishing the validity and agency of Aboriginal and Torres Strait Islander peoples' and their knowledge systems.

Through understanding cultural competence as a "philosophy, a paradigm and praxis" (NCCC, 2015), the NCCC works to create transformative opportunities to engage Indigenous knowledge practices and research methods to grow pedagogical models for teaching and learning (Sherwood & Russell-Mundine, 2017, pg. 143). Central to this pedagogical model is the focus on facilitating opportunities for staff and students to understand more about themselves as cultural people. The tendency for those of dominant

groups to avoid, or indeed resist, racialized dialogue (DiAngelo, 2011) means that for many people, exploring their cultural identities can be both new and daunting. Developing resources that engage and provoke participants to think deeply about themselves (i.e. why they think and act the way they do) in a safe environment is a significant challenge. Therefore, it was imperative that a review of the NCCC's aspect of the GCA program be undertaken, to ensure our pedagogical model was effective.

The facilitators of the seminars aim to deliver the content in a way that is accessible to a large group of undergraduate university students whose knowledge of cultural competence prior to the seminar is unknown. Before attending the development seminars, students are asked to complete two online modules created by the NCCC called "Journey of self-discovery," and "What do you mean by "cultural competence"?" This is done to ensure students come to the program with a base level of knowledge. Students are then guided through activities that assist them to understand how their own worldview and socialization affects the ways in which they think, act, and interact.

2. Method

In order to evaluate the effectiveness of our seminars, participants were invited to fill out an online survey via Survey Monkey after attending one of the cultural competence seminars. Participants were contacted by the head of the GCA program with the link to the survey, indicating they were welcome to provide feedback on the seminar, but that participation was voluntary. Ethics approval for this research was sought and granted by the University's ethics committee.

Data was collected over a period of 6 months in 2017 with a 38% response rate (82 respondents in total). A mixed-methods approach was used, asking participants to answer multiple choice, matrix/scale rating, and open-ended questions. Descriptive statistics and thematic analysis were used to analyse the data and to help answer our research question:

R1: Were our development seminars effective in educating participants about the various aspects of cultural competence?

2.1 Data

Participants were first asked whether the content of the topic covered in the seminar was presented in a logical manner. Of the 82 respondents, 100% answered in the affirmative.

The second section of the survey asked participants to rate the effectiveness of various aspects and outcomes of the seminar on a four point Likert type scale (as seen in Table 1).

Table 1. Seminar Effectiveness

	Highly effective	Effective	Not effective	Useless
How effective was this workshop in providing initial information about cultural	47%	52%	1%	0
How effective was this workshop in helping you understand how to develop your cultural competence	41%	51%	7%	0
How effective was this workshop in providing information to assist you to implement cultural	34%	52%	13%	0

Source: National Centre for Cultural Competence (2018).

Three additional quantitative questions were asked, but due to technical issues, the reliability of the data could not be confirmed with that particular set of questions. Therefore, that data was excluded from the analysis.

Finally, a thematic analysis was conducted for the qualitative components of the evaluation survey. Two open-ended questions were asked: “Which feature, activity or interaction in the workshop was the most helpful to you?”; and, “What feature, activity or interaction in the workshop do you think needs to be improved?” The final component of the survey was an open-ended statement: “Feel free to provide any additional feedback in the space below.” Several key themes emerged under each open-ended question (see Tables 2 & 3).

Table 2. Themes regarding feature/activity/interaction that was helpful

Theme	Percentage
Interaction with peers	38%
Resources (videos)	25%
Self-reflection	13%
Indigenous content	12%

Source: National Centre for Cultural Competence (2018).

Table 3. Themes regarding feature/activity/interaction that needs improvement

Theme	Percentage
Presentation (delivery, facilitation, content)	18%
More interaction with other participants (peers)	17%
Seminar length (too long)	10%
Seminar length (too short)	6%
Want more practical applications of cultural competence	6%
Said ‘nothing needs improvement’ specifically	6%

Source: National Centre for Cultural Competence (2018).

The most notable theme that emerged from the feedback was the respondents’ positive response to activities that required **peer interaction**. Respondents highlighted that the socialization activity – where students asked their peers set questions on the topics: family places place, class, religion, race, and gender – was one of the most helpful components of the seminar. This exercise provided students with the opportunity to engage with diverse cultural worldviews. As one student articulated:

“I was inspired by the fact the workshop was oriented in a way to draw our attention to the social norms of different culture, this was incredibly helpful.”

Another student identified that the most helpful aspects of the seminar were:

“the [sic] activities where we got to network and meet new people but also delve into our similarities and differences in world view [sic].”

The positive response to the interactive group components of the workshop was reinforced overall in the respondents’ suggestions on areas for improvement:

“I think less presentation and engaging group activity would be better.”;

“I would have liked a bit more interactive group work with other people attending the seminar.”

These comments reveal students’ shared desire for greater engagement with fellow members of the student body.

Self-reflection emerged as another theme, most notably, through a number of responses to the question regarding which features were most helpful:

“Looking at ones [sic] own culture in order to better understand cultural differences.”;

“thinking [sic] about my own identity as i [sic] always think about others but have never really thought about mine.”;

“The questions in the workbook really made me reflect on my own understanding of cultural competence and think critically about my own personal world view [sic].”

These responses support the effectiveness of the seminar as, from the Centre’s perspective, self-reflection is a critical part of the cultural competence journey.

Eighteen percent (18%) of participants felt different aspects of the presentation could be improved:

“The lecture part was too rushed so it lacked depth and impact.”;

“First half of the workshop didn’t seem to have as much purpose as the second.”;

“There was a lot of the information on the slides that was hard to unpack in a short amount of time.”;

As well, ten percent (10%) of respondents felt the seminar was too long: *“The first part where we had the lecture is a little long and it makes people get bored.”* While six percent (6%) thought it was too short: *“Timing could be improved (i.e. more time for the second half).”*

3. Discussion and conclusion

This data reveals that our pedagogical model for delivering cultural competence to respondents is generally effective. The positive feedback on peer interaction suggests that our inclusion of this type of pedagogy is effective. It is vital for students participating in a global citizenship program to interact with those who have diverse worldviews, and our seminar provides a safe space for those interactions to occur. While the data does show some contradictions (i.e. a percentage preferred a shorter seminar, while others wanted a longer seminar), we recognize the nature of this work holds many tensions. As the journey towards cultural competence is long, we recognize that students will be at different points along their journey, making this program too cursory for some (*“It could have gone more in depth but I think this is maybe because I have had more experience talking about*

these things being 4th year and having friends interested in these issues”), or too intense for others (“Shorten the time to an hour. We don’t need 3 hours to acquire such knowledge.”)

Overall it is evident that students are interested in working together with their peers to work towards becoming more culturally competent global citizens. This feedback has encouraged us to make clearer our purpose for including Aboriginal and Torres Strait Islander histories and contexts, and for choosing the activities that we do.

Were our development seminars effective in educating participants about the various aspects of cultural competence? We believe the data points to ‘yes’. The lifelong journey towards cultural competence will never be complete (National Centre for Cultural Competence, 2016). However, the data indicates that for this cohort of students, our seminars, which develop various aspects of cultural competence (i.e. exposure to various worldviews and practicing critical self-reflection), was effective.

References

- DiAngelo, R. (2011). White Fragility. *International Journal of Critical Pedagogy*, 3(3), 54-70.
- National Centre for Cultural Competence. (2016). *What is cultural competence?* Retrieved 24 January 2018 from <http://sydney.edu.au/nccc/about/culturalcompetence.shtml>
- NCCC. (2015). *Rolling out cultural competence*. In University of Sydney (Ed.), Internal policy document.
- Sherman, P. (September 30, 2017). Why the world needs more global citizens. *The Conversation*. Retrieved 1 February 2018, from <https://theconversation.com/why-the-world-needs-more-global-citizens-84680>
- Sherwood, J., & Russell-Mundine, G. (2017). How We Do Business: Setting the Agenda for Cultural Competence at the University of Sydney. In J. Frawley, S. Larkin, & J. A. Smith (Eds.), *Indigenous Pathways, Transitions and Participation in Higher Education: From Policy to Practice*. Singapore: Springer.
- Sisneros, J. (2008). Self-Awareness, Critical Reflectivity, and Identity. In J. Sisneros (Ed.), *Critical Multicultural Social Work* (pp. 20-37). Chicago: Lyceum Books.
- The University of Sydney. (n.d.). *National Centre for Cultural Competence*. Retrieved 24 January 2018 from <http://sydney.edu.au/nccc/>
- The University of Sydney. (2016). *The University of Sydney 2016–20 Strategic Plan*. Retrieved 24 January 2018 from <https://sydney.edu.au/strategy>
- The University of Sydney. (2018). *Global citizenship award*. Retrieved 24 January 2018 from <https://sydney.edu.au/students/global-citizenship-award.html>
- Zolo, D. (2007). *Globalisation: An overview*. Colchester, UK: ECPR Press.

Educational course ‘Basics of working with fans’ as a factor in the objectification of perception of the 2018 FIFA World Cup and football fans in Russia

Dihor, Victoria A.^a; Serova, Nina B.^a and Narkhov, Dmitry Yu^b.

^a Department of service and health technologies, Institute of Physical Culture, Sports and Youth Policy, Ural Federal University named after B.N.Yeltsin, Russia, ^b a Department of Organizing Youth Work, Institute of Physical Culture, Sports and Youth Policy, Ural Federal University named after B.N.Yeltsin, Russia

Abstract

The FIFA 2018 World Cup is a significant event for Russian society. Ministries carry out various campaigns to promote football in the country. The Russian society of sociologists conducted a survey (4703 respondents) to understand the attitude to the Championship. Further, the teachers of the Ural Federal University conducted a survey of the attitude to football fans. Scientists have found that over the past 7 years, citizens have become more positive about fandoms, but there is of lack of objective information. To solve this problem, teachers at the Institute of physical culture of the Ural Federal University have developed a special course ‘Basics of working with the fans’. The course is designed for students, postgraduates and teachers of physical education departments at universities as well as stewards and volunteers. Since September 2017, 118 students have been trained in this course. The course consists of two parts: theoretical – describing the types of fans, information about the differences between fans from different countries; practical – reviewing the real situations of interaction with fans, communicating with Russian and foreign fans. Classes are conducted by a sports psychologist who studies football fans for 8 years.

Keywords: *the psychology of football fans, the perception of the world championship.*

1. Introduction

On the eve of the World Cup 2018 in Russia, various activities for the promotion of football have been carried out. For example, in each city-participant the stadiums are being reconstructed and/or refurbished, volunteers conduct lessons at schools and universities, famous athletes talk about their successes and local football teams organise charity matches. Such a set of diverse events is aimed not only at informing Russians about the event, but also at psychological training of citizens.

It is natural that the administration of a city-participant carries out large-scale preparation: infrastructure is changed, new roads, stadiums and training sights are built. Special attention is given to the service sector: employees of hotels, restaurants and museums are taught English and receive special training.

Such a large-scale training does not take into account only the attitude of citizens to the World Cup. In social networks, there are many negative reviews of citizens, most are afraid of abrupt changes and do not understand what to expect. Citizens are especially afraid of the arrival of 'inadequate fans' which can act violently in the streets. It is logical that such stereotypes are formed by the media. In 2016, the author of the article conducted a content analysis of the most popular Russian newspapers: 'Komsomolskaya Pravda', 'Izvestia', 'Arguments and facts' [See: 4.]. Articles about fans written from 2012 to 2016 were analysed. Having searched the official websites of selected newspapers for the phrase 'football fan', it was found out that it was mentioned 603 times: 10 – "Komsomolskaya Pravda"; 427 – "Arguments and Facts"; 166 – "Izvestia". The largest number of publications was in 2010, 2012 and 2014, which is associated with the European and World Cup. About 300 articles were devoted to the fans. Most of them described a fight with the police, football players or between firms, only 10-15% is telling us about the 'law on fans' or about the original support team, interesting banners and football views. There is a considerable preponderance of negative information about fans. Often in articles the word 'fan' became synonymous with words, like 'zealot', 'a bully', 'inadequate', 'a herd' or 'uncontrolled crowd'. In these articles, the representative of fan movement is described as a young man at the age of 18-28, often without a degree, with pronounced aggressiveness, intolerance towards others, inability to control himself as well as reduced intelligence. In addition, in such articles there are negatively colored adjectives that characterize fans, such as "dangerous", "uncontrolled", "stupid", "aggressive", "inhuman", "evil", etc. Thus, today's popular Russian media create a negative image of Russian fans, which forms stereotypes for society and then a certain model of behavior.

The results revealed the problem of the lack of objective information, which can contribute not only to the negative attitude to the fans, but also to the World Cup as a whole. The study was carried out to find objective information sources, fan sites and sections on the

websites of the football clubs to find anything failed. It is logical that for an ordinary citizen which is not specifically interested in finding objective information is extremely difficult.

Next, we looked at the results of two surveys done among citizens: 1 – analysis of the perception of The World Cup; 2 – dynamics of attitude to football fans and the phenomenon of fandom (the survey was conducted twice: in 2010 and in 2017). At the end, a brief description of the educational course ‘Basics of working with fans’ will be given, the aim of which is to form an adequate attitude of society to the World Cup.

2. Methodology and results of the study

The Russian Society of Sociologists has developed a questionnaire to identify the attitude of citizens to the World Cup. It consists of 29 questions, including 10 questions about socio-demographic information. 8 questions, like ‘do you consider yourself a football fan?’, are aimed at identifying interest in football. 11 questions are devoted to the relation to the World Cup 2018. Respondents are invited to express their opinion on the organization and the consequences, as well as to indicate the degree of their participation in the event.

The study took part in 4500 questionnaires plus paper unforgettable in the database: 300 – from Tver, 90 – from Moscow and 50 – in a separate database from Ufa and St. Petersburg. In total, 4921 quality profiles of what? were collected. The sample of the study was 6,300 people: 59.2% women and 40.8% men [See: 12.]. All respondents were students and the vast majority of participants were between the ages of 18 and 21 (82.3%).

We will look at the overall results.

First, a one-dimensional distribution of the results.

55.8% of the informants are not interested in professional football. So, more than half of the respondents learn about The World Cup not from sports articles, but only from the news. Probably, they might adopt a negative attitude to the mega-event. The data confirm the hypothesis the results of the response to the question about attending football games: 68,9% were in the stadium only once, only 8.8% regularly attend matches and razorutsya in football.

Not all informants consider themselves to be football fans: 16.8% could call themselves fans. It is logical that this category of respondents will be spectators at the World Cup.

Despite the low interest in football, 53.6% of respondents positively relate to of the World Cup. The most popular positive aspects about this event mentioned by the respondents are: infrastructure development (new facilities, tourism and improvement of living conditions) – 92.8%; growth of Russia's authority in the world – 48.6%. Also, 10% of respondents noted

the spread of patriotic feelings in the country. Thus, these results indicate a positive attitude of citizens to the upcoming mega-event.

The respondents believe that the most negative consequences of the 2018 World Cup are: large financial costs – 50.9%; mass riots of fans – 47.6%; the risk of terracotta – 43.7%. Such results indicate the presence of fear of being unsafe: respondents fear for their lives in advance. Perhaps, that is why only 25.4% of the respondents plan to attend the World Cup matches (13.4% – as spectators; 12.2% – as volunteers).

Next, we will focus on the distribution of results based on the gender of respondents.

It is natural that girls are less interested in professional results (only 37.3% against 54.3% in men). However, despite this, women are a little more positive (54.5%) about the World Cup than men (52.4%).

It is interesting to mention that women (51.9%) are more likely to fear mass unrest among fans than men by 10%. This is probably why such a low number of women attend football matches. Only 9.8% of the surveyed women (18.4% of men) are planning to attend The World Cup as spectators. However, 13.6% of women and only 10.2% of men want to be volunteers. This result confirms the hypothesis of psychologists about the increased level of altruism in girls.

We will finish the analysis of the results on the two-dimensional distribution, taking into account the university majors the respondents did or do at universities. 26,4% chose the humanities, 24% – technical subjects, 17,1% – economic, 9,7% – natural sciences and information technologies, 9,6% – physical education, 2,1% – medicine, 0,8% – military service, 0,5% – art.

Of those surveyed, 33.3% of the students who consider themselves football fans do military service, 24.8% of the students of physical education, 16.1% do a degree in Humanities. Representatives of artistic professions (8.3%) are the least likely to treat themselves to fans. The results confirmed our expectations. We will note that military people and sportsmen are the most involved in interaction with fans.

Summing up, the results of the survey of the Russian Society of Sociologists, we note the low interest of students in professional football, but a positive attitude to the event in Russia. Regardless of gender and chosen major, the majority of respondents consider the mass riots of fans to be the most dangerous consequence of the Championship.

After the study of the perception of The World Cup, we will focus more on the perception of the fans.

A questionnaire (8 questions) was compiled at the Institute of Physical Education, Sports and Youth Policy. The study was conducted in 2010 and 2017. The aim of the study was

not only to understand the attitude towards fans, but also to trace the dynamics during 7 years.

In 2010, the study involved 66 respondents, all students of the Ural Federal University [See: 7.]. In 2017, the number of participants increased to 576 people (students of various higher educational institutions in the region).

Let's start with the results that not much has changed since 2010:

1. The overwhelming majority are positive about sports (76.5% in 2010, 88% in 2017).
2. Most respondents are neutral to the phenomenon of football fandom (in 2010 – 61.7%, in 2017 – 60%).
3. Most football fandom is associated with full stadiums of fans (in 2010 – 50%, in 2017 – 59%).
4. The respondents consider "drunk and aggressive fights of fans" to be the main disadvantage of football fandom (in 2010 – 88%, in 2017 – 94.4%).

Moving on to the most noticeable differences:

1. In 2010, respondents believed that fans are a little afraid (50%) and then either despise (20.5%) or ignore (20.5%). In 2017, significantly more respondents chose the approval and support option (in 2010 – 9%; in 2017 – 35%). Such results may indicate the effectiveness of interventions and awareness-raising activities.
2. If in 2010, the majority of respondents 53% of respondents believed that the phenomenon of football fandom is waiting for "transformation into an inadequate herd" (53%), now there are only 30%.

Such results emphasize the general positive attitude and the need to educate people about football fans.

To solve this problem, the Institute of Physical Education, Sport and Youth Policy at the Ural Federal University has developed the first in Russia training course 'Basics of working with the fans' and published a textbook 'Principles of psychology of football fans'. From September 2017 to January 2018, 118 students which do their degrees in 'Service and 'Physical Education' took the course.

The course is divided into two parts [See: 6.].

The theoretical block forms the basic knowledge about fans and includes five blocks:

1. The evolution of football fandom [See: 10.].
2. Football fans as a social active group. Classification and structural organization [See: 13].

3. Specific features of fans in different countries [See: 1, 2.].
4. Psychological portraits of football fans: personal features [See: 3, 8, 11.].
5. Stereotypes of public perception and features of self-perception of football fans [See: 9.].
6. A study of the possibilities of self-regulation of football fans [See: 5.].

The task of the practical block is to teach students the psychological mechanisms of effective interaction with fans. In the classroom, students solve real cases, communicate with fans from Russia and other countries (Portugal, Germany, Brazil, Serbia, etc.) This section also includes five areas:

1. Establishing contact with the fans.
2. Mechanisms for predicting the behavior of fans on the basis of rapid diagnostics.
3. Hotbeds of risk: schemes for identifying fans requiring special attention.
4. Features of work with the fans, being in altered state: alcohol, drugs, severe emotional stress.
5. Features of group interaction in emergency situations.
6. Psychological methods of work with manifestations of inadequate emotional reactions.

Approbation of the course

Students noted the relevance of the course, visibility and practice-oriented approach. Before doing this course, the majority of students had no sufficient knowledge about fans and considered them to be dangerous and inadequate.

Prospects of the educational course 'Basics of working with fans'

The staff of the Institute of Physical Education, Sport and Youth Policy at the Ural Federal University are planning to include this course in the curriculum of Russian Federal universities, to develop and hold a series of events Providensky about the characteristics of football fans. At the moment, the Rector of Ural Federal University has sent official letters to the Minister of Sport and Minister of Education of the Sverdlovsk region.

The development and implementation of the Russian educational system contributes to the formation of a more objective perception of both football fans and the World Cup as a whole. The Russians who are already positive about the sports event will be able to attend football matches more often because they will be prepared for effective interaction with football fans.

References

- Brimson D. (2000). Barmy Army: The Changing Face of Football Violence, 288.
- Brimson D. (1999). *The Crew*, 292.
- Gizullina A.V., Dihor V.A. (2015) Psychological aspects of the perception of football fans. *Psychological theory and practice-management*, 33–37.
- Dihor V.A. (2016, March 23). The Comparative Analysis of the Sports Fans Stereotypes in the Russian and Foreign Mass-Media. Retrieved from https://urgi.urfu.ru/fileadmin/user_upload/site_15503/Konvent/2016/Mega-events/Viktoriya_Dihor_Mega-Events_Conference_Ekaterinburg_23-24_March_2016.pdf
- Dihor V.A. (2015). The study of emotional reactions from football fans method of biofeedback training. *Bekhterev and modern psychology of humanity: collection of articles of the V international scientific-practical conference (to the 130th anniversary of the first Russian psychophysiological laboratory in Kazan)*, 514–519.
- Dihor V.A., Burkova A.M., Gizullina A.V. (2017). *Basics of football fans psychology*. Retrieved from http://elar.urfu.ru/bitstream/10995/54023/1/978-5-7996-2197-1_2017.pdf
- Dihor V. A., Gizullina A.V. The psychological aspect of the problem of football fanaticism. Retrieved from <http://conf-v.narod.ru/Dix.pdf>
- Enikolopov S. N. (2010). Aggression and motivation of football fans. *Kochenov readings. Psychology and law in modern Russia: Sat. theses of participants of the all-Russian conference on legal psychology with international participation*, 27-28.
- Il'in E. P. (2001). The structure of emotion as properties of the personality. *Psychological problems of self-realization*, 102-110.
- Kozlov V. V. (2008). *Fans. Past and present of Russian football*, 360.
- Mednikov S. V. (2011). Personal and situational prerequisites for aggressive behavior of football fans. *Bulletin of St. Petersburg University. Episode 12: Psychology. Sociology. Pedagogy*, 4, 152-163.
- Update interim results of the study "2018 FIFA World Cup in the estimates and opinions of young people" (2017). Retrieved from http://www.ssa-rss.ru/index.php?page_id=19&id=1452
- Ribokas T. V. (2015). Genesis of the Russian fan movement and the tendency of forming the image of a football fan in our country. *Sociodynamics*, 12, 142-163.

Investigating the Colombian University System: What Does the Future Hold?

Sakkal, Ali

Department of Education, Wake Forest University, United States of America

Abstract

While there are encouraging recent narratives of Colombia as a booming center of innovation and economic growth, this positive commentary does not always match accounts regarding the country's universities. This study investigates Colombia's drastically changing university system through an analysis connecting larger policy initiatives to the sentiments and perceptions of stakeholders at the ground levels of university functions. The focus here is on recent policy decisions, what they look like at the ground level, and how some of these revisions compare to university trends elsewhere. This investigation of various stakeholders at a large public university in Colombia sheds light on growing student and university debt, modifications in university funding, the rapid growth of low-quality private universities, changing roles of faculty, and issues of student access. Recommendations include a more concerted use of student loan disbursement and sustained investment in the public universities.

Keywords: Privatization; University; Policy; Reform; Colombia; Loans.

1. Introduction

Colombia is a unique context for investigating grand and recent educational policies at the ground level. Beginning in the early 1990s, a number of large educational reforms regarding the funding and overall organization of public universities restructured many of the previous approaches and regulations governing these institutions. The first of these regulations came in the form of Ley 30 in 1992, which drastically reduced government funding to public universities (Brunner et al., 2012), and required these institutions to be responsible for fundraising approximately half of their budgets (Izeczson de Carvalho et al., 2013). Decreto 1279 (2002), which aimed to appease many professors by rewarding them financially for their publishing as well being an attempt to quickly raise the status of Colombian universities on the international stage went into effect. Years down the road, it is believed to have caused much strain on public universities to pay the salaries of professors and has now caused a growing debt shortfall. Another reform, *Ser Pilo Paga*, would also be another policy change affecting the status quo in that student funding that had traditionally only followed students going to public universities could now follow students to the private university of their choice (Asmar & Gómez, 2016). All of these monies are administered and controlled by The Colombian Institute of Educational Credit and Technical Studies Abroad (ICETEX) which, in a recent 2017 reform, has also been in charge of distributing monies to public institutions rather than the monies going directly to the public institutions as had been done previously.

These recent reforms, combined with the current narrative of Colombia (and especially Medellín) as a booming center of innovative and economic growth has in many ways affected the management and culture of university education. Current President Juan Manuel Santos learned firsthand that such proposals would not progress easily in Colombia with the 2011 protests forcing the president and The Ministry of Education to recall their proposed changes regarding more private monies entering public universities (El Espectador, 2011). A part of the issue is that Latin America is quite unique in how it values its university education. As early as the Córdoba Reforms of 1918, access to university education has been viewed as a “basic need” (Patrinos, 1990). However, today’s reality in terms of the needs of a booming economy are not being met due to fairly low numbers of students that actually go onto post-secondary education (Brunner et al., 2012). Many advocates of privatization such as the World Bank and President Santos cite the need to increase private monies within public university education as the solution to university expansion (Patrinos, 1990). However, advocates against privatization also shed light on recent negative situations such as an influx of low-quality private universities and lowered research quality as being connected to aggressive privatization (Ibid.).

While there are a number of large-scale quantitative reports regarding schooling populations (Brunner et al., 2012), there are virtually no extensive or deliberate studies that investigate the understandings and opinions of the stakeholders within Colombian universities today. This inquiry aims to provide more insight on the possible disconnect between policy-makers and the entities at the ground level of decision-making.

2. Methods

This study commenced with interviews of approximately ten subjects. These participants included university professors and administrators employed at one of the largest public universities in Colombia, Universidad de Colombia (pseudonym). Additionally, there were two interviews with education policy-makers at the national level. The author conducted numerous open-ended interviews over the course of five months. This initial series of interviews were analyzed through open coding before moving to an axial coding process to help categorize the open coding terms into single categories most mentioned by participants (Strauss 1987, 64).

3. Analysis and Findings

The themes most addressed by participants are analyzed in detail in the following sections. A significant point of interest is there were very few discrepancies between the parties interviewed. All participants, whether professors, administrators, or policy-makers were mostly unified in their sentiments as to the current issues.

3.1. The Money Problems are by Design

The effects of Ley 30 (1992) were felt by all professors and administrators on a daily basis. With the responsibilities of public universities now including finding their own sources of income, both professors and administrators regularly addressed that part of their job was now fundraising. Participants now regularly spend half their time or more locating grant monies while still having to keep up with what have been traditionally more teaching based positions. Participants went on to partially condemn Decreto 1279 (2002), which generated a significant cash flow to professors based on their publications as an unsustainable reform that further stressed the budgets of public institutions. Through a unique reform, this decree raised future salaries for every article published. While the interviewed professors wholly acknowledged that this raised their salaries significantly, they were quick to concede that this has contributed much strain on public universities to pay salaries and has now caused a growing debt shortfall. The belief that such reforms were orchestrated to “divide and

conquer” the once powerful professor unions and run these institutions into debt is in the minds, and on the tongues, of many professors and administrators.

3.2. The Rapid Growth of the Private System is also by Design

Ser Pilo Paga was a reform that changed the status quo, allowing funding that traditionally followed only students attending public universities to now follow them to private institutions. All interviewed parties were open about that fact that it’s much easier to attend private universities, with entrance requirements being significantly lower. Additionally, all participants seemed to have a clear understanding of Colombia’s tiered university system catering to particular parts of the population: elite private universities for the wealthy, large public universities for the upper middle class, and low-cost low-quality private institutions for the lower middle class. The rapid growth of low-quality private institutions sheds light on the fact that these institutions often hire faculty without advanced degrees and fail to meet high quality accreditation procedures (Brunner et al., 2012). All participants looked down upon these institutions, with many referring to them as a waste of money for students. With public money now flowing into these institutions, many feel that the public too may also turn away from future support for all higher education institutions. In essence, participants viewed recent reforms as way to strengthen the public/private divide rather than ameliorate it.

3.3. The Students are Paying the Real Price

Connected to the issue of student access is the unique culture of Colombia for having student loans since the 1950s, a rarity in the region. However, student loans in Colombia did not traditionally help the most needy students, as they often went to higher income families (Patrinos, 1990). Study participants recognized the stresses on incoming students, the first of probably many more generations to have significant loan amounts with valid repayment concerns (Salmi, 2013). Even a short walk around campus at Universidad de Colombia makes clear that an accepted “black market” of students selling anything from t-shirts to homemade crafts and snacks fills up most hallways and communal areas. This is the reality of paying for university for many students. While the narratives of growing university debt and stress has been quite common in the United States for a number of decades (Travis, 2103), this is the first time that many participants are seeing it within their populations. They note that it often affects student performance and the time that they are able to dedicate to their studies.

4. Recommendations and Conclusions

The issues raised by the participants of this study are valid and it is imperative that future Colombian education policies address these gaps, lest they find themselves encountering the inflating debt situations arising in the United States (Travis, 2013) or Chile (Salmi, 2013). Additionally, as the cost of living in a stable Colombia continues to rise at a more rapid pace than salaries (Mejía, 2017), it is urgent that universities be the centers of progress and training for the jobs of the future.

With the rising costs of living as well as schooling in Colombia, we must be extremely cautious of how student loans are being disbursed, and ultimately, collected. Firstly, in a country like Colombia, loans must cover not only tuition, but also forgone earnings so that students are actually able to complete their education. However, with the larger loans needed to cover higher costs comes a rise in repayment difficulties. Without an income-contingent provision, repayment can be a strain on the system (Salmi, 2013), but it can also leave Colombia's ICETEX loan system in a place where it continues to ignore the students that stand to benefit the most, as they are more reluctant to collect loans they may not be able to pay back. Therefore, there must be significant efforts to get sufficient funding to the least advantaged students and tie their repayment amounts to their future salaries.

The harsher reality for the students that need university the most in Colombia is that most of them will never get the chance to step on a university campus. Even when they are lucky enough to enter university, chances of graduation remain slim. As Carlos Alberto Casas Herrera of the University of Los Andes Education Research and Formation Center states, "out of 100 students [who] start primary education in Colombia, only 40 will finish the 11th grade. Out of those, 10 will enter the university, and only five will graduate." (as cited in Izcson de Carvalho et al., 2013). The Government recognizes this and has set goals for half of Colombia's youth to continue their education after high school (World Bank, 2013). Such conditions make clear that the university cannot do it on its own. Pipelines linking secondary institutions to universities are a crucial step to bringing students into tertiary education.

Lastly, with private institutions growing at increased rates in Colombia, both in terms of quantity and student enrollments, government reforms and initiatives must make certain to not forget about their public universities. While the private institutions are generally cheaper to run, most are low-quality, they lack the quality control regulations of the public institutions, can close with little warning, and lack research programs (Patrinos, 1990). Additionally, private institutions rarely offer masters and PhD programs, with public institutions already struggling to produce sufficient numbers of students with advanced degrees. As Brunner et al. (2012) reported regarding one of Colombia's largest public universities, the University of Antioquia, with a population of more than 30,000 students,

“had less than 300 students enrolled in its 23 doctoral programmes and graduated just 19 PhDs.” (p. 155).

If the narrative of Colombia as a place of innovation and growth is to come close to actualization in the coming years, the country will need to produce more graduates from high quality institutions and more graduates with advanced degrees. Looking at the Colombia of the past as well as today, a substantial majority of these individuals will be born of the country’s public universities.

References

- Asmar, P., & Gómez, V. (2016). “Los alcances del ‘Ser Pilo Paga’ son excesivamente limitados”. *El Espectador*. Retrieved from <https://www.elespectador.com/noticias/educacion/los-alcances-del-ser-pilo-paga-son-excesivamente-limita-articulo-600089>
- Brunner, J. J., Gacel-Avilà, J., Laverde, M., Puukka, J., Rubio, J., Schwartzman, S., & Valiente, Ó. (2012). *Higher Education in Regional and City Development: Antioquia, Colombia 2012*. OECD Publishing.
- El Espectador. (2011, November 16). Oficializan retiro de reforma a la educación. Retrieved from <http://www.elespectador.com/noticias/educacion/oficializan-retiro-de-reforma-educacion-articulo-311485>
- Izacson de Carvalho, A., Looi, Y., Saad, F., & Sinatra, J. (2013, January 2). Education in Colombia: Is There a Role for the Private Sector? Retrieved from <http://knowledge.wharton.upenn.edu/article/education-in-colombia-is-there-a-role-for-the-private-sector/>
- Mejía, D. (2017, January 20). Minimum wage to increase by 7% in 2017. Retrieved from <https://thebogotapost.com/2017/01/20/minimum-wage-increase-7-2017/>
- Patrinos, H. A. (1990). The privatization of higher education in Colombia: Effects on quality and equity. *Higher Education*, 20(2), 161–173.
- Salmi, J. (2015). The challenge of sustaining student loan system: Colombia and Chile. *International Higher Education*, (72), 21-23.
- Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press.
- Travis, J. (2012). Privatizing American public higher education: racing down a slippery slope. *Journal of Case Studies in Education*, 4, 1.
- World Bank. (2013, January 24). Colombia’s Goal: More Success in Higher Education, More Opportunities for Youth. Retrieved from <http://www.worldbank.org/en/news/feature/2013/01/24/colombia-more-success-in-higher-education-more-opportunities-for-youth>

Integrating foreign higher education institution (HEI) students to Finnish working life

Kaari, Pia ^a; Ollanketo, Anna ^b

^a Department of International Business and Culture, South-Eastern Finland University of Applied Sciences, Finland, ^b Department of Digital Economy, South-Eastern Finland University of Applied Sciences, Finland

Abstract

According to the Statistics Finland (2017) the unemployment rate of foreigners and citizens of foreign background is approximately double compared with the respective rate of original Finns. Unemployment among young generations is also higher than in older age groups.

According to the research of Centre for International Mobility (2016 ¹), many foreign degree students would like to stay and find employment in Finland after their graduation. The problem, however, is that the companies interested in recruiting foreign students and the foreign graduates don't meet each other.

At the same time, Finland is undergoing a structural change in the working life. Finland has evolved from forestry-based to technology-based economy, and is now under a further transition to service-dominated society (Vesikansa 2008). It is therefore of utmost importance to increase the competitiveness and growth, for which Finland needs all the know-how and competencies available in the country.

The aim of the Kilkas project was to promote the employment of foreign students of Finnish Universities of Applied Sciences (UASs) by developing a model for the staff and students. In addition, the project group piloted and reported agile experiments in practical training, alumni work, career guidance, Finnish language teaching and networking with companies

Keywords: *Employability; foreign students; employment model; practical training; working life; networking*

1. Introduction

International students are a resource for Finland and for Finnish companies, but to some extent not that well known nor utilized in the business life. One could claim that the international students are a forgotten potential when renewing and reviving the Finnish businesses. For example, if a Finnish company aims to start global operations, it could very well use international students for their professional skills, but especially due to their cultural and language knowledge. There are many challenges with regard to international students getting employed in Finland. Among the most important ones are the lack of Finnish language skills, lack of networks and lack of work experience in Finland. In addition, companies have not yet perceived the varied potential of foreign students studying in the Finnish higher education institutions.

Finnish Universities of Applied Sciences (UASs) have been willing - during their 22 years of existence - to promote international students' employment and integration in Finland. However, as some of the obstacles are diminishing, new challenges are rising. In 2016, a coalition of Finnish UASs tackled this problem and created a project network called "Kilkas - Competitiveness and Growth in Promoting the Employment of Foreign UAS students". The project received ESF funding for 2016-2018 with the aim to develop a practical, well-functioning model whereby the chances of UAS foreign students to find employment in Finland could be better. The interactive model is open for public at www.xamk.fi/kilkas.

As its overall objective, Kilkas project was to *design a model* to the Universities of Applied Sciences to promote employment of foreign students. Several different domains of students' study paths were thoroughly screened in order to find the weakest links and the points of development. The project concentrated on incorporating the employment perspective into a series of study units (especially Finnish language), study counselling, thesis process, internships and networking with the companies and with the alumni. Towards the end of the project, information on the results were disseminated to the network of Finnish UASs, to the UAS personnel, regional interest groups and several companies. Dissemination of the results was carried out in different forms: by writing a blog and organizing networking events, seminars, infosessions and workshops.

Altogether about 40 members of teaching staff around Finland were involved in the development work. In addition, international students from different faculties of participating UASs were interviewed, and companies' point of views were collected by interviews, study reviews and discussions.

2. Background

A labour market is a place where employers and workers interact with each other. Labour market comprises of the number of the vacancies, the fields of the vacancies, the terms of employment, and, on the other hand, the number of people looking for a job and their training and professional backgrounds. The labour market changes all the time. Sometimes there is a high demand of employees in a certain field and sometimes it can be very low. (Surakka & Rantamäki, 2013.)

As an immigration country Finland is very young, which also explains Finnish people's slightly negative attitude and image towards the immigration. On the other hand, the attitude towards work-related immigration is more positive. (Ministry of the Interior, 2013.) In 2017, Finland's total unemployment rate was 8,4 %, and rate of foreigners 15,8 % (Statistics Finland, 2017). Like in many other countries, the proportion of entrepreneurs among immigrants is larger than among the total population. Immigrants are more willing to take and tolerate risks than the local population. For some, starting up ones own business is the only option for employment. (Martikainen, Saukkonen & Säävälä, 2013.)

The number of immigrants is steadily growing in Finland, and in the twentieth century it has doubled. Still the number of immigrants is low compared to the other European countries due to the minor need for labor, language barrier and Finland's distant location (International Organization for Migration, 2013, 4-5). The overall number of HEI degree students in Finland in 2016 was 21 061 students and of that number, 9 867 were studying for a degree in a university of applied sciences. The share of international students of all HEI students in Finland is 7,1 %, which is above the average of the OECD countries. (Finnish National Agency for Education, 2016¹.)

Studying a higher education degree abroad is a globally growing phenomenon. Especially Asian students seek education outside their home countries. Also in Finland international students are considered as an important aspect for the internationalization of higher education. Until 2017, there were no tuition fees in HEI degrees in Finland. Since autumn 2017, the HEIs in Finland have been in a new situation as they needed to start collecting tuition fees from students outside the European Union and the European Economic Area. It is likely that tuition fees will have an influence on the number of international degree students, the distribution of nationalities, and the internationalization of HEIs overall. (Finnish National Agency for Education, 2016².)

Most of the foreigners who have completed a degree in Finland are living in Finland after five years of graduation. Nearly half of them are in the working life, a small number has continued studying, and about one fifth of them are staying in the country for some other reason such as being unemployed or on training that does not lead to a degree. 32% of the foreign graduates have left the country. (Centre for International Mobility, 2016².) If a

foreign student does not conduct the practical training in Finland during his studies, he may find it difficult to find a job in Finland after the graduation. Employers appreciate the work experience gained in Finland because then they can expect the student is able to work according to the Finnish working life rules. The study doesn't tell in what kind of positions the foreign graduates have been employed. (Centre for International Mobility, 2016¹.)

Foreign HEI students are a desired group of immigrants. The aim is to internationalize universities and their degree programmes, and bring foreign students' know-how to the Finnish society. Foreign students could have a significant influence to the country's economy if they stayed in Finland and got employed after the graduation. When choosing a studying country, future employment possibilities is one of the contributing factors. And it must noticed that many international students would like to stay in the country where they complete their degree. (Finnish National Agency for Education, 2016².)

3. The model of international student's path to employment.

The developing process of the model of international student's path to employment (Figure1) was started by describing the study path of an international student.

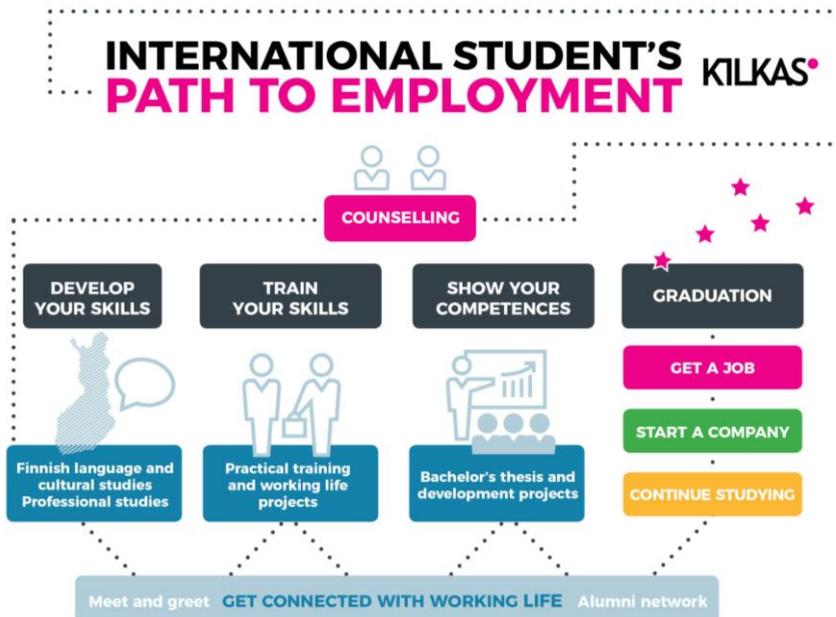


Figure 1. The model of international student's path to employment.

The most important phases of a curriculum – from the employability perspective - were depicted. After processing the draft picture in several meetings and workshops, the project group agreed that there must be two different versions:

1) *Model in Finnish* for lecturers, study counsellors and other interest groups. This model includes descriptions of the agile experiments carried out during the project: new models of practical training, Finnish language course experiments, alumni development work, worklife projects, career counselling pilots etc.

2) *Model in English* for students. This model is a student-friendly version which helps and guides international students to understand what kind of study units and what kind of activities would support their future employment in Finland.

The Finnish version of the model serves as a general description of how to promote the employability of an international student in Finland. This model can be used e.g. in developing the curricula of the international degree programmes. In addition, it is very practical when orientating new teaching staff to the “employability mind set”.

The model describes international student’s study path from the beginning of studies to the graduation. This model doesn’t introduce the whole curriculum and its detailed contents, but concentrates on those phases of studies (or study modules) that support students’ integration and networking, and finally employment in Finland. The model shows the essential development targets and the agile experiments that were piloted during the project.

3.1. Develop your skills

In the beginning of studies students focus on gaining information on school, study methods and a new cultural environment. It is for everybody’s benefit that international students have a smooth start and integrate easily to the new environment. The first courses include e.g. cultural knowledge, language studies and networking skills. The importance of learning a Finnish language cannot be emphasized enough: in Finland even moderate Finnish skills are almost always a precondition for employment (Lantta, 2017).

3.2. Train your skills

When a student continues his studies he needs to complete a practical training period in a company or public organization. Ideally, the student would find a training place in Finland and learn the Finnish working life customs and cultural aspects. In addition, the students could build networks during the training for future employment purposes. Unfortunately only few students find a training place in Finland and therefore most of the students need to return to their home countries or elsewhere, e.g. to Europe, to complete their training period. In the Kilkas project the partners piloted different forms of practical training, such as virtual working and tandem training. The idea for these new forms was to help students

to find training places more easily. For example if a company is located geographically far or if a company doesn't have room for more personnel, they could offer a virtual training place where meetings could be held through Skype or videoconferencing. In this type of training, the equipment, programmes and networks need to be appropriate and functional. In the tandem training, the international student completes the training together with a Finnish student. The idea is to integrate international students to the Finnish organizational and business culture. In addition, the Finnish student can help the international student in different situations and take more responsibility in the tasks that require knowledge of the Finnish language.

One of the most important factors that promotes employment is that the UAS is connected with companies which can provide real project work for students. These assignments can be incorporated into relevant study units. International students are very often used to theoretical lecturing in the school environment, and real assignments from local companies can be an eye opening experience. As a pedagogical approach, project based learning (PBL) is more and more common in Finland, and it has been noticed that this approach can be useful when integrating students into the working life.

3.3. Show your competences

At the end phase of their studies, students write their theses. The purpose of the thesis is to teach the student academic writing and research skills as well as independent working. Equally important is that the student deepens his knowledge of the field he is specializing in. It is a common practice in the UASs in Finland that the topics for theses are given by companies or public organizations. Usually this is a motivational factor for the student: he has a real case to study, and in the best case can present new perspectives and solutions to the problem given. From the student employability perspective, the supervisor of the thesis as well as the company play an important role. The supervisor can support and guide the student to find a topic from such companies that might be able to recruit him at a later stage. In addition, it has been noticed that if the collaboration between the student, the supervisor and the company is close during the process, the chances for employment increase.

3.4. Graduation

When the student graduates, he will, in the best possible case, be employed in his own field of work. Sometimes international students are willing to continue with master studies or consider setting up their own business. The latter option has sometimes been the only, though excellent, alternative to foreigners residing in Finland to find employment.

3.5. Counselling and networking

At the top of the model there is "Counselling". In order to have a smooth start, proper counselling is of utmost importance to international students. One of the main findings of the Kilkas project was that the student counselling should cover the whole, approximately 3.5-year, study path. At the early stage of the studies guidance should concentrate on supporting the foreign students in adjusting to the new environment and the new way of studying. However, after the first year, the counselling should be more employment-oriented. Usually counselling of an international student is more demanding than that of a native Finn, because of the adaptation to a foreign country, culture and educational environment can be challenging and also require more time and resources from the counsellor.

At the bottom of the model there is a wide range of different forms of stakeholder co-operation. It is important that the students create contacts with the Finnish people and understand the Finnish culture and lifestyle, but first and foremost learn to approach and build networks with local businesses, i.e. potential employers. One of the important network channels for both the students and the UASs is the alumni. During the project, it was noticed that in many UASs this important stakeholder group has not been utilized to the full extent. In Kilkas project a model for starting and developing alumni collaboration was created. In addition to alumni networks, other forms of networking channels were also examined. New ways of fostering the existing UAS and working life connections were developed, and new forms of company visits were also experimented.

4. Conclusions

The model we have developed and the agile experiments within are a description of the elements that are crucial when promoting the employability of an international student in Finland. Courses on culture, business environment and Finnish language, internships and working life projects, thesis process, networking and alumni activities as well as proper counselling are all important components that should be linked to each other. One of the most important observations of the Kilkas project was that supervisors and supporting staff should possess "employment perspective" in their own roles. In other words, the employment of an international student should be a common goal shared by everybody in the process.

In every part of the model, there are still areas to be developed. Many practical steps are needed to make true changes towards a common mindset of promoting student's employability. HEIs should support international students' employment by offering practical information on Finland's labour market and how to seek and apply for a job in

Finland. Especially collaboration with the companies should be further intensified as it is the key route to real working-life connections.

References

- Centre for International Mobility. (2016 ¹). Faktaa Express 1A/2016: Suomessa, töissä, muualla? Korkeakoulututkinnon suorittaneiden ulkomaalaisten tilanne 5 vuoden kuluttua valmistumisesta. Retrieved 9 February 2018 from http://www.cimo.fi/instancedata/prime_product_julkaisu/cimo/embeds/cimowwwstructure/89972_FaktaaExpress1A_2016.pdf
- Centre for International Mobility. (2016 ²). Valtaosa korkeakoulujen ulkomaalaisista tutkinto-opiskelijoista jää Suomeen valmistuttuaan. Retrieved 9 February 2018 from http://www.cimo.fi/ajankohtaista/mediatiedotteet/101/1/valtaosa_korkeakoulujen_ulko_maalaisista_tutkinto-opiskelijoista_jaa_suomeen_valmistuttuaan
- Finnish National Agency for Education. Opetushallitus 2016¹. Faktaa Express 6A/2017: Tilastoja ulkomaalaisista tutkinto-opiskelijoista Suomen korkeakouluissa 2016. Retrieved 2 January 2018 from http://www.cimo.fi/instancedata/prime_product_julkaisu/cimo/embeds/cimowwwstructure/164549_FaktaaExpress6A_2017.pdf
- Finnish National Agency for Education. Opetushallitus 2016². Faktaa Express 1A/2016: Suomessa, töissä, muualla? Retrieved 4 January from http://www.cimo.fi/faktaa_express_1a_2016
- International Organization for Migration (2013). The world migration report 2013. Migrant well-being and development. Geneva: International Organization for Migration.
- Lantta, E. (2017). Tehokkaasti Työelämään. Questionnaire of Employment for Companies in Finland.
- Martikainen, T., Saukkonen, P. & Säävälä, M., (2013). Muuttajat. Kansainvälinen muuttoliike ja suomalainen yhteiskunta. Tallinna: Raamatutrukikoda, 223-224; 226.
- Ministry of the Interior (2013). Maahanmuuton tulevaisuus 2020 -työryhmän ehdotus. Sisäministeriön julkaisuja 5/2013, 4-5; 8. Retrieved 18 January 2018 from <http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79043/Maahanmuuton%20tulevaisuus%202020%20-%20työryhmän%20ehdotus.pdf>
- Statistics Finland (2017). Employment statistics. Retrieved 30.4. 2018 from www.stat.fi.
- Surakka, T., Rantamäki, T. (2013). Työelämätaidot. Porvoo: Bookwell Oy, 140.
- Vesikansa, J. (2008). Finnish industry constantly adapting to changing world. Retrieved from <https://finland.fi/business-innovation/finnish-industry-constantly-adapting-to-a-changing-world/>

A Grassroots, Practical Response to Student Belonging through Learning and Teaching Experiences

Wilson, Rachel; Murray, Gabrielle and Clarke, Bronwyn

Office of the Deputy Vice-Chancellor Education, Education Portfolio, RMIT University, Australia.

Abstract

RMIT University is Australia's second largest higher education provider and has a very diverse student body. Taking a holistic approach and capturing the entire student life cycle, the RMIT Belonging Strategy outlines a rationale and plan for delivering belonging interventions across the whole institution. An institution wide strategy requires economic, political and global considerations; however, as grass-roots academics, our work is informed by the philosophy that education can affect positive communitarian and individual change, and that meaningful and authentic relations with staff and students enable genuine collaboration and growth (Chickering, Dalton, & Stamm, 2006; Kreber, 2013). Guided by these principles, we identified five drivers that impact student belonging at the university, and proposed a measurement framework to form an 'index' of belonging that can be tracked and reported. This paper focuses on the innovative and collaborative work of developing an enterprise wide strategy for inclusive belonging and presents a roadmap of the process. We argue that grassroots, practical responses through learning experience interventions have the greatest potential to influence student engagement.

Keywords: *Belonging Strategy; grassroots; curriculum; learning experiences.*

1. Introduction

As an ethos, belonging is highly applicable to education, and work within RMIT University and the sector more broadly has identified that generating a sense of belonging for students has significant positive impact on transition and retention, learning outcomes, engagement, wellbeing and organisational advocacy (Tinto, 1993; Hurtado & Carter, 1997; Walton, Cohen, Cwir, & Spence, 2011; Strayhorn, 2012; Thomas, 2012; Morieson, Carlin, Clarke, Lukas, & Wilson, 2013; Ribera, Miller, & Dumford, 2017). A dual sector, tertiary institution, RMIT University is Australia's second largest university, with additional campuses in Vietnam and Spain. The university offers programs in vocational education and higher education, ranging from certificates through to postgraduate research degrees. In Melbourne, there are close to 60,000 students enrolled and the institution employs more than 5000 academic staff. The RMIT Belonging Strategy builds on the research of the Belonging Project (2011-2015), a four-year, multidisciplinary study, with the chief aim of improving student experience in the School of Media and Communication, at RMIT University (Clarke & Wilson, 2016).

To give shape to an 'ideal' student experience in the School of Media and Communication, we developed a Belonging Narrative Model proposing a three-tier student experience, in line with the three-year structure of the undergraduate degree, to build students' sense of identity and engagement. Students began with a strong disciplinary and professional base before becoming more aware of their place within an interdisciplinary community as future professionals working in a wider world of global connections and experiences (Araujo, Wilson & Clarke, 2015). We introduced five pilot initiatives focussing on orientation, transition, cohort building, student spaces and academic skills and literacies. An important outcome of the project was a prototype for de-identified data-packs for the purpose of providing staff with key socio-economic data on their cohorts. The data-pack initiative was specifically designed to provide evidence-based information aimed at encouraging teaching staff to provide tailored classroom experiences for all their students. The data-packs are now in general use for all teaching staff across RMIT university. Through a range of low cost, small-scale activities such as Cohort Day Out initiatives, coordinated Orientation Week activities and the co-creation of student informal spaces, the Belonging Project delivered a range of positive, discipline based interactions amongst student cohorts and between students and staff. Mix methods evaluation through surveys, focus groups and interviews has shown the initiatives provided a successful way to develop stronger connections amongst cohorts and significantly improved students' sense of belonging (for further discussion, see Morieson, Carlin, Clarke, Lukas, & Wilson, 2013; Araujo, Wilson, & Clarke, 2015; Clarke, & Wilson, 2016).

In 2017, we were invited to assess the feasibility of scaling up the Belonging Project's findings across the whole institution. To be sustainable, the project necessitated an institution wide strategy that required economic, political and global considerations. However, as grass-roots educators and academics, our work is guided by the principal that education can affect positive communitarian and individual change, and that meaningful and authentic relations with staff and students enable genuine collaboration and growth (Chickering, Dalton, & Stamm, 2006; Kreber, 2013). Guided by this philosophy, the RMIT Belonging Strategy has emerged from an extensive internal stakeholder consultation process that has been underway since February 2017. The strategy identified five drivers that impact student belonging at RMIT, and proposed a measurement framework to form an 'index' of belonging that can be tracked and reported. This paper focuses on the collaborative work of developing an enterprise wide strategy for inclusive belonging, and the identification of five drivers of student belonging. We argue that grassroots, practical responses through learning interventions have the greatest potential to influence the student experience and impact learning engagement.

2. Background

Central to our conception of belonging has been Baumeister and Leary's (1995, p. 497) hypothesis that human beings are driven to form "significant interpersonal relationships". The failure to belong or to make human connections is closely associated with ill adjustment, poor health and a lack of well-being, consequently leading to feelings of "isolation, alienation, and loneliness" (Mellor, Stokes, Firth, Hayashi, & Cummins, 2008, p. 213). Belonging is a fundamental human need that refers to "a feeling or sensation of connectedness" (Strayhorn, 2012, p. 4). Strayhorn (2012) has linked a sense of belonging to the transformative mission of higher education in the US, arguing that it should be considered a discrete theoretical concept within the higher education scholarship of learning and teaching. The concept's direct relationship to cognition and "achievement motivation" makes it a particularly useful in the domain of education (Strayhorn, 2012, p. 4). In higher education, belonging refers to the "experience of being important to the group" (Strayhorn, 2012, p. 17). It involves a reciprocal relationship between the individual and the group, which is dependent on the individual (e.g., Aboriginal and Torres Strait Islanders, international, local, rural, and low socioeconomic status students), the context (e.g., the classroom, clubs, campus), and the points at which students enter their studies. This means, as a need, belonging must be satisfied on a continual basis and is context-dependent.

In higher education, belonging has been closely linked to persistence and retention (Tinto, 1993; Hurtado & Carter, 1997), and improved first-year student experiences (Kift, Nelson, & Clarke, 2010; Krause, 2005; Morieson, Carlin, Clarke, Lukas, & Wilson, 2013). In 2010,

Kift, Nelson and Clarke named ‘belonging’ as one of three principles driving Queensland University of Technology’s (QUT) innovative, whole-of-institution approach to the first-year experience. Their approach acknowledged that engaging new learners in their learning requires awareness and access to support services, and “involvement, engagement and connectedness with their university experiences” (Kift et al., 2010, p. 4). Extensive work on belonging took place in the UK under the auspices of the Higher Education Funding Council for England, between 2008 to 2011, and encompassed seven discrete projects involving 22 higher education institutions (Thomas, 2012). The final report identified supportive peer relations, meaningful interaction between staff and students, developing knowledge, confidence and identity as successful higher education learners, and higher education experiences that are relevant to interests and future goals, as the means through which belonging can be successfully nurtured (Thomas, 2012). Supporting the Belonging Project’s findings, the report stressed to improve engagement and success, it was necessary to embed a culture of belonging across whole institutions (Thomas, 2012; Clarke & Wilson, 2016). The RMIT Belonging Strategy outlines a set of goals and interventions to activate an ethos of belonging across the entire student life cycle and beyond, while aligning and coordinate existing and new initiatives to ensure that change to the organisation is sustainable.

3. A Holistic, Grassroots and Iterative Response

As educators and researchers, our work is informed by action research methodology (Kemmis, 2007; Greenwood, Whyte, & Harkavy, 1993), allowing us to reflexively study our own institutional setting. Following the iterative, reflexive and inclusive research method we established on the Belonging Project, we approached the development of the RMIT Belonging Strategy through techniques of co-creation to promote staff ownership and identified ‘Champions’, to ensure we had commitment to sustained and continuous engagement with staff at grassroots level. Between March and June 2017, we facilitated a rolling series of workshops and face to face meetings with academics, professional staff and executives to ascertain what a sense of belonging would look and feel like at RMIT. We developed a deeply consultative and iterative approach, where we regularly meet face-to-face with stakeholders and kept them informed of the process. We had easy access to academic staff and solicited the opinions of Heads of Schools and Program Managers, seeking their advice about disciplinary belonging. Our Champions helped to negotiate meetings with executives, resulting in consultations with the ARG (Academic Register Group), Academic Support, who are responsible for industry and student mentoring, Communications, Governance, Marketing, HR (Human Resources), the Library, including the Study and Learning Centre, and Student Life, who deal with co and extra-curricular activities. Through this process, we also developed a complimentary working relationship

with Ngarara Willim Centre at RMIT, which helped to conceptualise the importance of place within an ethos of belonging, and informed our thinking on how to improve Aboriginal and Torres Strait Islander students' learning experience.

To ensure we understood staffs' perceptions of belonging and the student experience we designed a Qualtrics online survey, which was emailed to all RMIT academic, executive and professional staff across the Melbourne campuses. The anonymous responses confirmed our perception that there is broad agreement among staff that belonging should be a focus for the organisation. An overwhelming majority of staff respondents (n=642) indicated that they believe RMIT has a significant role to play in driving belonging for students. There was also broad consensus amongst staff; 94% either "agree" or "strongly agree" that RMIT should be proactive in striving for a sense of belonging among students. The consultations we undertook also revealed that the tacit knowledge of staff is an essential tool in understanding the student experience within the university, and that interrogating and understanding the staff experience can assist to enhance the student experience. Sustained continuous engagement with staff at a grass-root level is essential if organisational change is to be achieved. This critical insight has proven common to all phases of our research, and affirms the recurring theme of the importance of harnessing the knowledge, expertise and resources of academic and professional staff, addressing their professional development needs and importantly, providing the support and requirement to sustain their commitment and participation (Clarke & Wilson, 2016).

3.1. Five Drivers of Student Belonging

Before developing a range of interventions, we also surveyed our student body with the purpose of gaining a better understanding of what role the university should play in fostering a sense of belonging, and to identify opportunities for improvement. We developed a Qualtrics online *Belonging Survey* and employed students on a casual basis to administer the survey through a series of 'pop ups' across the three RMIT Melbourne campuses. The survey was also delivered online to all students attending the campuses. We advertised through Students Services and employed 10 students on a casual basis to work 3 and 4 hour shifts in the morning, afternoon and evening from the 18th to the 26th May at the City (38 hours), Brunswick (15 hours) and Bundoora (21 hours) campuses. Armed with touch screen iPads loaded with the survey, the students focussed on heavy traffic points such as the library entrances, informal student learning spaces, and eating areas. The survey captured 2780 responses (428 online, 2352 faces to face) during the consultation period and used a 5 level Likert scale for 6 questions, with a final open-ended question asking students to suggest "one thing" that RMIT could do to improve their sense of belonging. While research is still under way to unpack the qualitative data, other insights include that 84% of students surveyed believe that feeling respected and valued for their class contribution is either "somewhat important" or "extremely important". More than half of all respondents

also said that feeling like they “fit in” with others in their discipline is “extremely important” (see Table 1) to their sense of belonging at RMIT University.

Table 1. Responses to question ‘How important are the following experiences in making you feel like you belong at RMIT?’ (N=2780)

Belonging Driver	Survey Question	Count of ‘somewhat important’ Responses	Count of ‘Extremely Important’ Responses	Driver Weighting
Extra-curricular Activities	Having opportunities to participate in organized activities outside my formal classes	1035	854	17.5%
Learning Experiences	Feeling like my teachers respect me, and value my contributions in class	1031	1398	25.5%
Physical and Digital Spaces	Having places around campus where I can be myself and interact with my peers	1148	1211	23.5%
Social Networks	Having a good network of friends who I’ve met whilst studying at RMIT	1148	1211	23.5%
Student Services	N/A	N/A	N/A	10.0%

Student responses to our *Belonging Survey* together with other university student evaluations such as the Student Experience Survey (SES), Course Experience Questionnaire (CEQ), and Course Experience Surveys (CES) were used to determine weightings for a measurement framework to form an ‘index’ of belonging. We identify five drivers of student belonging: learning experiences, social networks, physical and digital spaces, extra-curricular activities and student services. The drivers are points of impact through which we can target interventions and expect to see a direct impact on attrition numbers, improvements in evaluations of the student experience, greater graduate satisfaction and an expansion of alumni numbers and participation. In responses to the survey, the area identified as having the highest weighting and therefore the greatest potential for impact around student engagement was “learning experiences” 25.5% (see table 1), with extracurricular activities and social networks following closely with a weighting each of 23.5%. Both learning experiences and social networks are related to curriculum, whereas extracurricular activities, physical and digital spaces (17.5%) and student services (10%) drive organisational belonging. The RMIT Belonging Strategy seeks

to measure and affect these drivers at different stages of the student journey, with the drivers informing our understanding of what a ‘good’ student experience of engagement at RMIT should look and feel like. These drivers are all factors over which RMIT can have some degree of influence, and it is through the lens of these drivers that we seek to measure and affect student belonging.

3.2. Pilot Innovations: Belonging Program Workshops and Curriculum Specific Based Initiatives (CSBIs)

Our research showed that the greatest impact we can have is in the area of learning experiences. Subsequently, we piloted several curricula based initiatives in 2017, including Belonging Program Workshops and Curriculum Specific Belonging Initiatives (CSBIs). These initiatives are examples of our top-down, bottom up approach. Facilitating workshops with program managers, academics and teaching staff allowed us to inform staff about the importance of fostering an ethos of belonging for their programs and to develop an accurate understanding of their changing student cohorts using a data lead methodology. Together we mapped current offerings for student, and identified further opportunities to enhance disciplinary belonging. We pinpointed best practice within the student space and established a ‘to do’ list of next steps. We also informed programs of targeted resources across unfamiliar parts of the university that could be better accessed to enhance students’ experience.

The evaluations of our workshops were conclusively positive with one of the unexpected responses from staff being how much they relished the rare opportunity to come together as a whole program to discuss their class practice, share their ideas and successes and gain insights for new initiatives. These outcomes supported our decision to document CSBIs and to create a best practice resource. CSBIs are low cost, curriculum integrated activities which help students engage with each other, academic staff, and with their industry or profession. The resource is evolving with 52 case studies currently housed on the [Belonging in Curriculum website](#). The purpose behind the resource is for staff to be inspired by their colleagues’ work and adapt and model ideas. The CSBIs include early assessment with industry, field trips, website and App development and team building activities. The key aspect of each case study is their integration into the disciplinary content of the course or program they are servicing.

4. Conclusion

The RMIT Belonging Strategy articulates a vision for RMIT University to be known for its culture of belonging, where all students feel accepted, respected and valued. It outlines a set of goals and initiatives to help students develop a sense of connection to their organisation,

and to their chosen discipline while they are enrolled as students, and to take with them a belonging mind-set into their future pathways. Of the five drivers identified through analysis of student evaluation data, we found that students consider their ‘learning experiences’ to be the most important and these are the experiences they have with their teachers, peers and industry mentors. We also discovered that engaging with staff at a grass-root level is essential if organisational change is to be achieved. Through developing a resource, the Belonging in the Curriculum website, we have begun to acknowledge the significance of their work as best practice in learning experiences and disciplinary belonging.

References

- Araujo, N., Wilson, R., Clarke, B. (2015). Student engagement for employability: A belonging project case study. *Research and Development in Higher Education: Learning for life and work in a complex world*, 38, 1-10.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497-529.
- Chickering, A. W., Dalton, J. C., & Stamm, L. (2006). *Encouraging Authenticity and Spirituality in Higher Education*. San Francisco: Jossey-Bass.
- Clarke, B., & Wilson, R. (2016). *The Ethos of Belonging: A Narrative Model Approach to Student Engagement 2011-2015*. Melbourne, School of Media and Communications, RMIT University.
- Greenwood, D. J., Whyte, W. F., & Harkavy, I. (1993). Participatory action research as a process and as a goal. *Human Relations*, 46(2), 175-192.
- Hurtado, S., & Carter, D.F. (1997). Effects of college transition and perceptions of the campus racial climate on Latino College students’ sense of belonging. *Sociology of Education*. 70(4), 324-345.
- Kemmis, S. (2007). Action Research. In M. Hammersley (Ed.), *Educational Research and Evidence-based Practice* (pp. 167-180). Milton Keynes and London: The Open University and SAGE Publications.
- Kift, S., Nelson, K., & Clarke, J. (2010) Transition pedagogy: A third generation approach to FYE: a case study of policy and practice for the higher education sector. *The International Journal of the First Year in Higher Education*, 1(1), 1–20.
- Krause, K. L. (2005). *Understanding and promoting student engagement in university learning communities*. Centre for the Study of Higher Education, The University of Melbourne.
- Kreber, C. (2013). *Authenticity in and through teaching. The transformative potential of the*

scholarship of teaching. London: Routledge.

- Mellor, D., Stokes, M., Firth, L., Hayashi, Y., & Cummins, R. (2008). 'Need for belonging, relationship satisfaction, loneliness, and life satisfaction. *Personality and Individual Differences*, 45(3), 213-218.
- Morieson, L., Carlin, D., Clarke, B., Lukas, K., Wilson, R. (2013). Belonging in education: Lessons from the belonging project. *International Journal of First Year in Higher Education*, 4(2), 87-96.
- Ribera, A. K., Miller, A.L., & Dumford, A.D. (2017). Sense of peer belonging and institutional acceptance in the first year: The role of high-impact practices. *Journal of College Student Development*, 58(4), 545-563.
- Strayhorn, T. L. (2012). *College Students Sense of Belonging*. New York: Routledge.
- Thomas, L. (2012). *Building Student Engagements and Belonging in Higher Education at a Time of Change: Final report from the what works? student retention & success programme*. England: Paul Hamlyn Foundation and Higher Education Funding Council for England.
- Tinto, V. (1993). *Leaving College: Rethinking the causes and cures of student attrition* (2nd edition). Chicago: University of Chicago Press.
- Walton, G. M., Cohen, G. L., Cwir, D., & Spence, S. J. (2011). Mere belonging: the power of social connection. *Journal of Personality and Social Psychology*, 102(3), 513-532.

Integration of TED-Ed Lessons and TED and TEDx Talks to Enhance College Classroom Instruction

Lepervanche Valencia, Jose G.

School of Business, Florida State College at Jacksonville, USA

Abstract

Florida State College at Jacksonville (FSCJ) obtained a TEDx license to offer educational events and additional learning resources to enhance college classroom instruction. TEDxFSCJ has organized annual conferences and salons with selected faculty, graduates, and students as speakers. This work presents how TEDxFSCJ Talks and other TEDx and TED Talks have been used to create innovative TED Ed Lessons as tools to expand learning beyond course content and textbooks. Innovative learning experiences include video discussions and roundtables, workshops for faculty to learn how to create TED Ed Lessons, workshops and mentoring to TEDxFSCJ speakers to create their own TED Ed Lessons, combined online discussions in different courses using TED Ed platform, interactive TEDxFSCJ Salons, simulcasts, Learning Adventures, and integration of all TED resources in blogs and Learning Management Systems. TEDxFSCJ Learning Adventures have been used in Management courses during academic year to plan and deliver team projects using selected talks related to leadership, social responsibility and Sustainable Development Goals. Results show that new TED Ed Lessons can be created to follow up engagement. Additionally, team projects in other disciplines can be developed using this innovative methodology. TED resources offer global learning opportunities to build engagement.

Keywords: TEDEdLessons; TEDTalks; TED; TEDx; TEDxFSCJ; GLOBE.

1. Introduction

Florida State College at Jacksonville (FSCJ) is a community college that serves workforce educational need of Northeast Florida, USA. The mission of FSCJ (www.fscj.edu) is to provide high value, relevant life-long education that enhances the intellectual, social, cultural and economic development of our diverse community. One of the resources used to enhance college courses has been TED Ed Lessons and TED and TEDx Talks.

TED (www.ted.com) is a nonprofit devoted to spreading ideas, usually in the form of short, powerful talks (18 minutes or less). Independently run TEDx events help share ideas in communities around the world (TED, 2018). “TED began as annual conference, bringing together the fields of technology, entertainment, and design (hence the name). But in recent years it has expanded to cover any topic of public interest” (Anderson, 2016). TED has also “tapped into the collective wisdom of thousands of self-organized TEDx events” (Anderson, 2016). In TEDx, local organizers apply for a free license to run a local TED-like event. TEDxFSCJ licensed founder and organizer is a Professor of Florida State College at Jacksonville. TEDxFSCJ main events, salons, and simulcasts are planned by a team of professors, staff, and students. Students have a TEDxFSCJ Club and a professor as club’s advisor.

This work includes all the educational events and learning experiences done in TEDxFSCJ events, faculty workshops and courses in the Bachelor of Applied Science in Supervision and Management. The objective is to share how TED resources have been used to find global learning opportunities building engagement inside and outside the classroom. All different learning experiences are explained with a call to action to fellow professor to use these resources in other disciplines. One of the results of these global experiences was the creation of an educational model to facilitate implementation. A global learning model was used to integrate TEDxFSCJ into Learning Management Systems to enhance online and hybrid instruction.

2. TEDxFSCJ: Life Lessons Beyond the Learning Edge

TEDxFSCJ brought the spirit of TED’s mission of ideas worth spreading to Florida State College at Jacksonville. Life lessons beyond the learning edge was our first and continuous theme. According to TED (www.ted.com), independent TEDx events are operated under license from TED. In the spirit of ideas worth spreading, TED has created a program called TEDx. TEDx is a program of local, self-organized events that bring people together to share a TED-like experience. FSCJ main event is called TEDxFSCJ conference, where x=independently organized TED event. At TEDxFSCJ event, TED Talks videos and live speakers are combined to spark deep discussion and connection to FSCJ students and local

community. The TED Conference provides general guidance for the TEDx program, but individual TEDx events are self-organized (www.tedx.com).

3. TEDxFSCJ Conference, Salons, and TED Simulcasts

The initial concept of TEDxFSCJ was to invite selected faculty, graduates, and students to speak about their “life lessons beyond the learning edge” understanding this edge as college graduation or learning beyond courses or terms. From the beginning in 2013, TEDxFSCJ has been looking for ideas that are being generated outside the classroom that are serving to expand education to homes, workplaces, and the community.

TEDxFSCJ has used the yearly main conferences, TEDxFSCJ Salons, TED Live and Women simulcasts, TED Ed Lessons, TED Knowledge Workshops, and integration of TED Ed Lessons, and TED and TEDx Talks to educational blogs and Learning Management Systems (LMS) such as Blackboard. All TED resources have been used in face-to-face and online college courses. TEDxFSCJ main conferences and themes were: “Life Lessons Beyond the Learning Edge” (2014), “Brave New World” (2015), “Engage” (2016), and “Barriers” (2018).

4. TED Knowledge Workshops

Workshops were created, planned and delivered in several FSCJ campuses. "TED Knowledge Workshop: How to Create TED Ed Lessons" is the learning opportunity use to teach professors to embed TED and TEDx Talks in Blackboard online courses and to create your own TED Ed lessons. A recorded video “TED Knowledge Workshop” (Lepervanche, 2016) was added to bring workshop’s content to online professors.

The initial workshop’s presentation encouraged the use of TED resources to show to faculty members how these resources could be integrated to college courses (Lepervanche, 2014). After creating relevant TED Ed Lessons and combined discussions, they were added to Blackboard and later to blogs. Learning blogs posts were organized in global categories by activities, topics, SDGs, and countries. Workshops demonstrated how to create TED Ed Lessons using relevant TED Talks and, it showed how to integrate or embed these resources into LMS of Management Courses in order to enhance classrooms, online discussions, and outdoors learning experiences.

5. TED Ed Lessons in College Education

To date the author has created, shared, and used more than 50 TED Ed Lessons for college instruction. Lessons have been created using own and TED and TEDx videos. Some of the lessons include TEDxFSCJ speakers. “Risk-taking, mistake-making, and lifelong learning” was the talk by TEDxFSCJ speaker Dr. Kathleen Ciez-Volz that was used to create a TED Ed Lesson (<https://ed.ted.com/on/ctIQI79M>). This lesson has been used in Management courses and has more than 25,000 views, including combined Blackboard and TED Ed online discussions.

Lessons include topics in Leadership, Online Learning, Robotics, Business, Space, Information Technology, Social Responsibility, Science, Scouting, Energy and more. A lesson about combined on-ground and online discussions outside specific LMS was created to illustrate these concepts to students and other professors. “Management Learning Online Laboratory: TECHknowledge: Technology & Knowledge” was instrumental to Management and Business students to understand and apply device oriented learning with TED Ed lessons to expand online and offline discussions to different management courses. Students from one course used TED Ed discussion to exchange comments with students from other courses expanding the learning experience beyond the classroom (<https://ed.ted.com/on/s641YS1j>).

One of the takeouts of a TED Talk is to “include a clear and compelling call to action in the closing of the speech” (Karia, 2012). The idea is to tell the audience what need to be done to close the gap to make the idea a reality. Asking TEDxFSCJ speakers to create their own lesson was the way to bring their ideas to action in their classrooms and beyond. For example, TEDxFSCJ speaker Dr. Dianne Fair talked about the “The Fight Against Microorganisms” and she later created her own TED Ed lesson (<https://ed.ted.com/on/od0MVioT>).

6. Adventure Catalysts in TEDxBeaconStreet, TED Active and international TEDx events

The creation of TED Ed lessons for higher education and TEDxFSCJ Learning Adventures were inspired by the “Ideas to Action” powerphrase used in TEDxBeaconStreet’ Adventures (TEDxBeaconStreet, 2014). According to Reissman (2014) TEDxBeaconStreet team has created a template for any TEDx organizer to use to host their own Adventure, offering a toolkit and ample advice. TEDxFSCJ Organizer was invited to be one of Adventure Catalysts to meet with TEDx speakers and other innovators. The objective was to learn how to follow the ideas after the talks to see the results of calls to actions. These

follow up ideas were later used to shape TEDxFSCJ Learning Adventures and to formulate a global learning model to bring international TED learning experiences to classrooms.

TED Active 2015 in Whistler, Canada and TEDx events in Czech Republic (TEDxPrague), and Spain (TEDxCibeles, TEDxUPValencia, and TEDxAlcoi) plus TEDxCommunity blog were added as examples of global learning opportunities. TEDxJacksonville, TEDxOcala and TEDxUF were used as examples of local and regional learning opportunities. It is important to note that TEDxUPValencia is organized by the Polytechnic University of Valencia and TEDxUF by the University of Florida. These are a couple of examples of TEDx licenses organized by higher education institutions.

7. Global Learning Opportunities Building Engagement and TED

After the learning experience with TED Ed Lessons, TED Active and international TEDx events, a collaborative educational model was developed to facilitate the use of TED resources plus other similar global learning initiatives that use innovative instructional ideas. The Global Learning Opportunities Building Engagement (GLOBE) model created by Lepervanche (2016) has been used in Business, Management, and Systems courses and can be used in any global learning area, program, or course. The GLOBE model was presented during the Global Education Conference (2017) (www.globaleducationconference.com). The objective of GLOBE is to: 1. Find Global Learning Opportunities. 2. Building bridges by connecting speakers with Management courses. 3. Build Engagement by creating active and continuous collaboration. GLOBE educational model facilitates global collaboration and creative learning methods inside and outside the classroom to enhance Management programs (Lepervanche, 2016).

In order to expand these learning experiences beyond TED, several blogs were developed to use other non-TED videos and educational resources. Free Campus (<https://freecampusdotorg.wordpress.com>) includes TED Ed Lessons, TED and TEDx Talks, and other instructional videos. Outdoors University (www.outdoorsuniversity.com) uses GLOBE to focus on outdoors learning. All current blogs posts, and TED Ed Lessons are free and available to use.

8. Integration of TED Ed Lessons in Blogs to Enhance Management Courses

Blogs have been used in online education to bring current topics to Management courses. The use of blogs enhance analysis of current events that impact companies. This is an innovative way to enhance online classrooms. “As traditional classroom is changing nationwide and future careers are dependent on strong computer skills, blogging helps your

students develop necessary skills for their continuing education and gainful employment.” (Pappas, 2013).

TED Talks also provide a way to provide deep discussions and extra engagement to online classrooms. Topics range from online education, technology management and data-driven business to enhance online engagement in discussions and assignments. “Each keystroke, quiz, peer-to-peer discussion and self-graded assignment builds an unprecedented pool of data on how knowledge is processed.” (Koller, 2012).

9. Integration of Global Outdoors Learning Blogs, TED Ed Lessons and Global Goals in Management Courses

During academic year 2017-18 integration of TED Ed Lessons and Global Outdoors Learning Blogs was expanded to include UN Sustainable Development Goals (SDGs) to be added to topics in Management courses. Blogs posts and TED Ed Lessons were integrated to LMS using the GLOBE model. The SDGs, otherwise known as the Global Goals, are “a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity” (UNDP, 2015).

The objective was to find Global Learning Opportunities that were useful to our courses or programs. Building bridges included connecting speakers, presenters, adventurers, travelers, facilitators or influencers with Management courses (Global Management, Outdoors Leadership, Youth Leadership, City Management, Strategic Management, Technology Management). Engagement was done by creating active and continuous collaboration using blogs posts and adding TED Ed lessons with TED talks related to specific Management topics and SDGs. Integration of resources to LMS allowed students to be prepared to plan TEDxFSCJ Learning Adventures.

10. TEDxFSCJ Learning Adventures

TEDxFSCJ Learning Adventures were developed following the Adventures model suggested by TEDx Beacon Street “An innovation to extend the TEDx phenomenon beyond a single-day conference format and offer a platform for the community to interface with speakers and innovators throughout the year.” (TEDxBeaconStreet, 2014). The idea of TEDxFSCJ Learning Adventures was to share and to discuss updated topics and lessons using TED and TEDx Talks, with emphasis in the use of TEDxFSCJ Talks.

During 2017-18 FSCJ academic year TEDxFSCJ Leading Adventures were incorporated to team projects in Global Management, International Business, and Global Leadership courses. Students from different courses in the same term used GLOBE educational model to pre-select 10 TED or TEDx Talks related to Leadership, Social Responsibility, and the SDGs. An animated video and flowchart were produced to visualize the steps of the team project “Leadership, Social Responsibility, and Sustainable Development Goals” (Lepervanche, 2017).

GLOBE model integrated United Nations' SDGs with TED Talks related to Leadership and Social Responsibility. Students selected TED videos, defended their pre-selections during class and voted for the top three, and produced an individual report about speaker contributions to one or more SDGs. Teams selected one video to produce a TEDxFSCJ Learning Adventures' presentation for a final roundtable. An event scheduled to host the roundtable and discuss about the selected videos. Presenters shared how the videos related to leadership and corporate social responsibility. They also had to explain how the ideas presented are contributing with one or more of the 17 SDGs. The results of roundtables were useful to create TED-Ed Lessons to be used for upcoming online combined discussions. This GLOBE project idea can be used for future courses in other disciplines including new TED Talks and different SDGs. Similar project was done by online students in the same term. Roundtables were conducted online in a discussion forum. Enhancement and engagement, not only occurred in present term, but a new TED Ed was created to produce additional enhancement and engagement in next term course.

11. Results and Conclusion

This work presented how TEDxFSCJ Talks and other TEDx and TED Talks have been used to create innovative TED Ed Lessons as tools to expand learning beyond course content and textbooks. It showed how using a global learning model such as GLOBE, innovative learning initiatives can be integrated to face-to-face and online courses. Integrated tools allowed to expand and enhance higher education courses beyond course content and textbooks. Tools allow to explore online platforms outside LMS to do combined online discussions or to continue discussion after a course or term is over. New TED Ed Lessons can be created based on conclusions of selected talks and/or roundtables. A survey using the Technology Acceptance Model (Davis, 1989) was delivered to FSCJ students who participated in TEDxFSCJ Learning Adventures. Preliminary results shows acceptance of these resources in terms of usefulness and ease to use. A complete quantitative analysis is planned for future academic year.

TED and TEDx events, salons, TED Ed Lessons, workshops, and presentations are available worldwide to enhance learning engagement in courses and outside the classroom.

These are the recommendations: 1. Incorporate TED and TEDx Talks to courses and to generate post-videos discussions. 2. TEDx events are scheduled in many cities and countries. Invite speakers to be course's guest lecturers or to create TED Ed lessons. 3. Add TED Ed lessons to generate discussions outside the courses. 4. Follow ideas and actions of TEDx speakers and see how their actions benefit their communities, workplaces, or the environment. 5. Join a local TEDxCommunity and be a Learning Adventures catalyst.

References

- Anderson, C. (2016). *TED Talks. The Official TED Guide to Public Speaking*. New York, USA: Houghton Mifflin Harcourt Publishing Company.
- Davis, F. D. 1989. *Perceived usefulness, perceived ease of use, and user acceptance of information technology*. MIS Quart. 13 319-339.
- Karia, A. (2012). *How To Deliver a Great TED Talk*. Lexington: Akash Karia.
- Koller, D. (2012). "What we're learning from online education". TED Global 2012. Retrieved on December 20, 2017 from https://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education
- Lepervanche, J. (2014). TED-Ed, TED and TEDx Talks to Enhance Classroom Learning Experience. Retrieved from <https://www.slideshare.net/jlepervanche/teded-ted-and-tedx-taks-to-enhance-classroom-learning-experience-dr-jose-g-lepervanche>
- Lepervanche, J. (2016). "Global Learning Opportunities Building Engagement (GLOBE)." Retrieved on December 22, 2017 from <https://lepervanchelearning.wordpress.com/2016/09/26>
- Lepervanche, J. (2017, September 7). Leadership, Social Responsibility, and Sustainable Development Goals [Web log post]. Retrieved from https://lepervanchelearning.wordpress.com/2017/09/07/tedxfscjlearningadventures_leadership
- Lepervanche, J. (2018, February 8). TED Ed Lessons used in Management courses [Web log post]. Retrieved from <https://lepervanchelearning.wordpress.com/2017/09/06/ted-ed-lessons-used-in-management-courses-dr-jose-g-lepervanche-tedxfscj>
- Pappas, C. (2013). "How To Use Blogs In the Classroom. Elearning Industry." Retrieved on December 21, 2017 from <https://elearningindustry.com/how-to-use-blogs-in-the-classroom>

Reissman, H. (2014, July 15). Fun and nerdy field trips: TEDx Adventures take to the streets [Web log post]. Retrieved from <https://blog.ted.com/fun-and-nerdy-field-trips-tedx-adventures-take-to-the-streets>

TED (2018). Our Organization. Retrieved from <https://www.ted.com/about/our-organization>

TEDxBeaconStreet (2014). What Are Adventures?. Retrieved from <http://www.tedxbeaconstreet.com/adventures-list>

United Nations Development Programme (UNDP) (2015). *Sustainable Development Goals*. Retrieved from <http://www.undp.org/content/undp/en/home/sustainable-development-goals.html>

Flipped Classroom at the Defence University

Juhary, Jowati and Amir, Ahmad Fahimi

Language Centre, National Defence University of Malaysia, Malaysia.

Abstract

Flipped classroom is not a new concept in education. Students are expected to be well-prepared before coming to face-to-face sessions since they have to read/watch/listen to the lectures through the learning management system (LMS) or an e-learning portal before coming to the classes. What traditionally was practised is that students were given lectures during face-to-face sessions. Now, the lectures are online, and only activities to enhance students' understanding will take place during face-to-face sessions. The concept is now being implemented successfully in some higher learning institutions in Malaysia, including Universiti Sains Malaysia, Penang; Universiti Malaysia Sabah, Sabah; and Universiti Kebangsaan Malaysia, Selangor. In fact, the emphasis is given by the Ministry of Higher Education, Malaysia for all higher learning institutions to incorporate the use of technology in teaching and learning. Given this, the National Defence University of Malaysia (NDUM) must also be prepared to rise to this challenge. This research becomes the main study on the use of flipped classroom at the Defence University.

Keywords: *Defence University; digital technologies; face-to-face sessions; flipped classroom.*

1. Introduction

Flipped classroom is not new in the education landscape. When an instructor asked the students to read page 4 of the textbook, for example, and the next class would be dedicated to discussing and debating what page 4 is all about, it is considered a flipped concept. This is because the definition of flipped classroom has not changed over time; the only thing that changes is the medium of ‘flipping.’ Today, flipped classroom suggests that the students are expected to read/watch/listen to the lectures through the learning management system (LMS) or an e-learning portal before coming to the classes. What traditionally was practised is that students were given lectures during face-to-face sessions. Now, the lectures are online, and only activities to enhance students’ understanding will take place during face-to-face sessions.

The drivers for using flipped classroom, which is part of the tools for e-learning, are threefold, including the National Higher Education Strategic Plan launched in 2007; the National e-Learning Policy launched in April 2011; and the Malaysia Education Blueprint (Higher Education) launched on 7th April 2015. All these highlight the importance of digital technologies in teaching and learning, which promotes more quality digital content and becomes an aggressive push towards making Malaysia a renowned higher education hub.

Given this, the National Defence University of Malaysia (NDUM) must also be prepared to rise to this challenge. The aim of this research is to examine the perceptions of students on the new concept of classroom learning. There are two main objectives including,

- a. to determine the impacts of using flipped classroom on students
- b. to identify the factors that may hinder or influence the use of flipped classroom by students

This research has two main research questions that will help to achieve the aim and objectives of the study. These research questions include,

- a. What are the impacts of using flipped classroom on students?
- b. What are the factors that may hinder or influence the use of flipped classroom by students?

The assumption of this research is that since flipped classroom is new at the NDUM, the researchers argue that it has huge potential to assist students in their learning process. This argument is based on the fact that students attending tertiary education today are digital natives. Therefore, it is assumed that students can rely on flipped classroom, especially to prepare them before coming to the face-to-face sessions.

2. Literature Review

Research on flipped classroom demonstrates that the concept can empower students to take charge of their own learning. There is nothing new about flipped classroom (Lancaster & Read, 2013). In the past, students were expected to read a paragraph or a chapter before coming to class, and further discussion on the reading material would be facilitated by instructors in the classroom. The difference is just the delivery method or medium of 'flipping' and the time spent on delivering lectures during face-to-face sessions. With the demand to use e-learning in the Malaysian higher learning environment, flipped classroom through the LMS *may* encourage instructors and students alike to adopt technology in teaching and learning. Since flipped classroom could also foster learner autonomy, the technology can further assist in this effort.

Further, students who are in flipped classes progress faster because they understand the lessons better (Papadopoulos & Roman, 2010). Perez and Dong (2012) also found that flipped classroom allows students to master design skills effectively. Other researchers suggest that flipped classroom also assists students' understanding of lessons in law and physics and thus, improves their retention of knowledge (Bates & Galloway, 2012).

In Malaysia, some areas of flipped classroom have been studied by various scholars. Embi, Hussin and Panah (2014) found in their study that students at Universiti Kebangsaan Malaysia have an acceptable readiness to adopt the flipped classroom approach. Their study looked at technology access, online skills and relationships, motivation and the Internet discussion, amongst others. Further, another study by scholars in Universiti Malaysia Sabah found that there is a need to evaluate the contribution of flipped classroom in higher education, particularly when it is used as a complementary approach to the face-to-face sessions (Lee Kean Wah et al., 2014). In addition, at the International Medical University, it was found that the most successful faculty in implementing flipped classroom is the School of Pharmacy (Alasagof, Baloch & Hashim, 2014). The other faculties, nonetheless, are also reported to be doing their best in offering unique ways to engage students through flipped classroom.

Recent researches on flipped classroom keep promoting the advantages of using this concept for classroom teaching and learning. Rivera (2016) in her postgraduate thesis found that students' classroom engagement and efficiency improve when they are involved in flipped classroom. Further, McCarthy (2016) argued that flipped classroom provides more meaningful interaction between students. This suggests that students become active participants during classroom learning.

Notwithstanding this increase popularity of flipped classroom, there are also concerns about this concept. Amongst the critical ones is the fact that flipped classroom, as an approach, can be poorly executed. Sam and Bergmann (2012) argued that some instructors would

totally replace themselves with videos uploaded online. Further, the skills of presenting through videos can vary between one instructor to the other, and the different styles of presenting will have to serve various needs of the students. In addition to this, concerns are also heard on the access of the Internet (Schmidt & Ralph, 2014); this suggests that whether students are having the same amount of access at home or wherever they choose to view the online materials before coming to class. Eventually, according to Vanneman and Baker (2017), flipped classroom does not result in a statistically significant increase in knowledge acquisition.

3. Methodology

The research adopts a quantitative approach to research by means of a survey. There were two critical processes; first, students were required to use the online materials (e-content materials) developed by the researchers and attend face-to-face sessions to further explore the online contents, and second, they had to answer the survey online.

3.1 Sample Population

Selected students from the foundation year students were involved in this research. There were about 560 students at the foundation level when the study took place. Questionnaires were distributed online using Google.doc and notification about the survey was included in emails as well as the university's LMS. A pilot study was also conducted to check for validity of the items in the survey.

3.2 Research Instruments

The items in the survey were adopted from various sources (see Camel, 2011; Bates & Galloway, 2012). All questionnaire items will use 4-point likert scale with 1 (Strongly Disagree), 2 (Disagree), 3 (Agree) and 4 (Strongly Agree).

Data collected were analysed using the Statistical Package for Social Sciences (SPSS) Version 25. Descriptive analysis includes using the frequency, standard deviation and mean.

4. Findings and Discussions

The findings originate from the online survey completed by 112 Foundation Year students. The online survey consists of three sections. The discussion starts first with the review of the demographic data of the respondents, followed by the data from the second section which scrutinises the perceptions of the respondents on flipped classroom. An overall

analysis of the assumption will use also data from the third section of the online survey, in which respondents shared their opinions about flipped classroom.

4.1 Data from Section A of the Online Survey

Based on the figures below, it can be summarised that the respondents were mostly male students (62.5 percent) and the rest were female students. This is undisputable since the Defence University is preparing for the future defenders of the nation and thus, there is a positive discrimination against the number of female cadets and officers in the Malaysian Armed Forces. This is due to the limitations of posting areas and positions in the three military services in Malaysia.

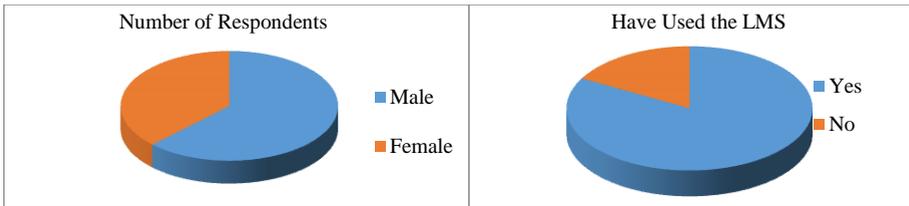


Fig 1. The Number of Respondents

Fig 2. The Experience of Students with the LMS

4.2 Data from Section B of the Online Survey

There are 30 questions in this section, and they are divided into several themes. All items seek respondents’ opinions on flipped classroom. Table 1 below illustrates the findings from selected items of Section B.

Table 1. Selected Items and the Responses (in percentage)

	Items	Agree/ Strongly Agree	Standard Deviation	Mean
1	The activities during Flipped Classroom session increase my understanding of the course key concepts	95.6	.615	3.49
2	The Flipped Classroom session inspires me to pursue further learning for the course	93.7	.662	3.39
3	My level of engagement for this course increases when it is done through Flipped Classroom	92.9	.658	3.31
4	Flipped Classroom allows me to participate more actively in class when compared to traditional lectures	86.6	.776	3.33
5	I think more lectures/classes should be conducted in the Flipped Classroom mode	89.3	.755	3.29
6	Flipped Classroom encourages me to read/find additional materials outside of class	79.5	.788	3.21
7	Flipped Classroom gives me more opportunity to discuss with the lecturer	92.9	.679	3.41
8	I am more motivated to learn through Flipped Classroom	86.6	.697	3.23
9	Flipped Classroom has not enhanced my learning process	29.5	.977	2.10
10	Flipped Classroom is more engaging than the traditional classroom	82.1	.721	3.14
11	Viewing the video lectures/online materials before coming to class allows me to be ready with the class activity	97.3	.551	3.55
12	Flipped Classroom allows me to make use of the class time more effectively with the lecturer	95.5	.659	3.38
13	I would rather be involved in a class discussion than sitting and listening to the lecture the whole time	81.2	.800	3.13

Overall, the respondents were positive about the flipped classroom concept. This is not a surprise since these digital natives are so used to using technology in their daily life. Based on Table 1, more than 89 percent of the respondents chose to agree to these selected and critical items. The items *I think more lectures/classes should be conducted in the Flipped Classroom mode* and *Viewing the video lectures/online materials before coming to class allows me to be ready with the class activity* were positively chosen by 89.3 (standard deviation=.755; mean=3.29) and 97.3 (standard deviation=.551;mean=3.55) percent of the respondents respectively. Notwithstanding this, the respondents were also quite divided between their preferences of the flipped classroom concept. This is because 29.5 percent (standard deviation=.977; mean=2.10) of the respondents agreed that the concept has not enhanced their learning process. The researchers argue that this is expected since the concept is relatively new at the Defence University. This also signals that more exposure to

the use of flipped classroom should be given to students, which ultimately suggests educators should adopt the concept too.

4.3 Aligning the Assumption

It is assumed that flipped classroom helps students to learn better and effectively. Based on the data, this assumption could be accepted but not without its consequences. These consequences fulfil the objectives of this paper; nonetheless, they are impactful to the bigger or major research on flipped classroom at the Defence University. These consequences are twofold as explained below.

First, based on the data gathered, the respondents admitted that the second phase of the pilot study was their first encounter with the flipped classroom concept. This is supported by the respondents' comments in Section C of the online survey, where they implied that they were not able to offer *any comments* because they have no ideas on the concept. This further highlights the importance of conducting further research into this area simply because there is not much information about flipped classroom at the Defence University. This poses another question: whether the educators are aware of the flipped classroom concept and whether they are prepared to apply this concept in their teaching practices. This could perhaps be addressed in another research project.

Second, the respondents were also critical about the e-content materials designed, developed and uploaded as part of the process to complete flipped classroom. Some respondents suggested that the questions/quiz at the end of each lesson should be replaced with educational games instead. The researchers justify this 'request' as a critical requirement of the 21st century learners, who are mostly digital natives. Apart from that, the respondents also suggested that the e-content materials are developed through film making or creative animations. This, unquestionably, could retain the students' interest in learning. On top of that, the researchers would have to validate all materials and retest the flow and activities of the e-content materials.

5. Conclusion

There are three main research findings. Firstly, students today, considered digital natives, are very comfortable using technology for learning. Given this, educators must fine tune their teaching materials and activities to support students' needs. Secondly, using technology to support teaching and learning is more challenging than the conventional approach. The main challenge is to match suitable classroom activities with the contents that have been uploaded on the learning portal (LMS). Those with limited teaching experience may find this as a hindrance to adopt flipped classroom. Thirdly, despite students' positive perceptions towards flipped classroom and their readiness to adopt

technology for their learning, there is a mismatch between their perceptions and the mind-sets. This may also happen to the educators, who appear to be resistance towards the use of technology, let alone flipped classroom. Apart from the lack of training on using flipped classroom and formulating appropriate activities and classroom materials, some educators may view flipped classroom as a substitute for their physical attendance in the classes. Although this research does not seek educators' views on this matter, it is *inconclusive* from the students' opinions on their learning processes, that some educators are *still* lacking in using technology for meaningful engagement.

To conclude, the Defence University must address training of educators to use technology appropriately. Uploading materials on the LMS is not the answer to *teaching and learning with technology*. Aligning the materials uploaded and the face-to-face sessions' activities is critical to ensure successful and meaningful learning engagement. Continuous training and constant monitoring are mandatory to assist educators in adopting flipped classroom.

References

- Alsagof, Z., Baloch, H. & Hashim, N. (2014). Flipping Large Lectures @ IMU. In M.A. Embi. (Ed.). *Blended and Flipped Learning: Case Studies in Malaysia HEIs* (pp. 255-274). Bangi: Centre for Teaching and Learning Technologies, Universiti Kebangsaan Malaysia.
- Bates, S. & Galloway, R. (2012). *The Inverted Classroom in a Large Enrolment Introductory Physics Course: A Case Study*. A Report by the Higher Education Academy.
- Camel, C. (2011). *An Evaluation of the Flipped Classroom*. Retrieved from <https://camelportfolio.files.wordpress.com/2012/03/camel-c-final-epd-for-the-flipped-classroom.pdf> on February 20, 2017.
- Embi, M.A., Hussin, S. & Panah, E. (2014). Flipped Learning Readiness Amongst Graduate and Postgraduate Students in UKM. In M.A. Embi. (Ed.). *Blended and Flipped Learning: Case Studies in Malaysia HEIs* (pp. 209-223). Bangi: Centre for Teaching and Learning Technologies, Universiti Kebangsaan Malaysia.
- Lancaster, S. & Read, D. (2013). Flipping Lectures and Inverting Classrooms. *Education in Chemistry*, September, 14-17.
- Lee Kean Wah, Ng Shi Ing, Tan Choon Keong, Yoon Sook Jhee. (2014). To Flip or Not to Flip the Classroom? Findings from a Malaysian Undergraduate Course in UMS. In M.A. Embi. (Ed.). *Blended and Flipped Learning: Case Studies in Malaysia HEIs* (pp. 227-252). Bangi: Centre for Teaching and Learning Technologies, Universiti Kebangsaan Malaysia.

- McCarthy, J. (2016). Reflections on a Flipped Classroom in First Year Higher Education. *Issues in Educational Research*, 26(2), 332-350.
- Papadopoulos, C. & Roman, A.S. (2010). *Implementing an Inverted Classroom Model in Engineering Statistics: Initial Results*. American Society for Engineering Statistics. Proceedings of the 40th ASEE/IEEE Frontiers in Education Conference, Washington, D.C., October.
- Perez, W. & Dong, J. (2012). *Flipping the Classroom: How to Embed Inquiry and Design Projects into a Digital Engineering Lecture*. Paper presented at ASEE PSW Section Conference, California Polytechnic State University, San Luis Obispo.
- Rivera, V.M. (2016). *Flipped Classrooms: Advantages and Disadvantages from the Perspective of a Practising Art Teacher*. MSc in Visual Arts Education. State University of New York (unpublished work).
- Sam, S. & Bergmann, J. (2012). *Flip Your Classroom: Reach Every Student in Every Class Every Day*. International Society for Technology in Education.
- Schmidt, S.M.P. & Ralph, D.L. (2014). *The Flipped Classroom: A Twist on Teaching*. The Clute Institute International Academic Conference, San Antonio, Texas, USA, 98-104.
- Vanneman, M. & Baker, K. (2017). Studies on the Effectiveness of Flipped Classrooms: Are We Comparing Apples to Apples? *Medical Education*, 51(12), 1.

Game-based learning in an Industrial Service Operations Management Course

Tetik, Müge^a; Öhman, Mikael^b; Rajala, Risto^b and Holmström, Jan^b

^a Department of Civil Engineering, Aalto University, Finland, ^b Department of Industrial Engineering and Management, Aalto University, Finland

Abstract

This study explores how a game-based approach supports students' learning in a graduate course on industrial service operations management. Aalto Manufacturing Game (AMG) has been played for several years as a part of an Industrial Management course to provide students with a realistic view of industrial services and asset management. The game illustrates supply chain dynamics and asset management challenges, with a focus on the quality deterioration problem in service provision (Oliva & Sterman, 2001). In this paper, we evaluate the effect of AMG on participants' learning based on game session feedback and written exam answers. We also evaluate the game as a learning experience through feedback, observations, and interviews. The findings suggest that the gamified version of teaching provides students with the opportunity to learn by doing while having fun in the class. The game enables participants to socially construct knowledge, raising the effectiveness of teaching supply chain challenges by simulating real world problems from different perspectives of actors involved in operations. Based on our research we argue that the game enhances the learning experience through emotionally engaging students in the activity. To this end, the learning objectives should be embedded in the game dramaturgy.

Keywords: Teaching game; Service operations; Gamification.

1. Introduction

The nature of operations management is changing in many industries, as the role of services is increasingly important in the offerings of capital goods manufacturers (Oliva & Kallenberg, 2003). In contrast to producing goods, producing services present unique challenges from an operations management perspective, as they are essentially co-produced by supplier and customer. As a consequence, manufacturers accustomed to managing closed production systems, are faced with ever more open systems where increased interdependence among actors translate to increased complexity and uncertainty in production. This is reflected back on operations management teaching, which needs to prepare students for the complex dynamic environment they will be facing.

Game-based learning has been used to support the learning of complex dynamic phenomena with significant feedback-mechanisms in fields such as military, aeronautics, medicine, management, and engineering (Pasin & Giroux, 2011). The Aalto Manufacturing Game (AMG) teaches the service quality deterioration problem (Oliva & Sterman, 2001) in industrial services, which is a challenging subject to teach due to its inherent complexity characterized by uncertainty and trust issues between service supplier and customer. Despite being a simplification of reality, AMG captures key contextual complexities and offers an immersive experience to participants, who get to experience industrial service operations management challenges first hand from the perspective of the role they are playing.

With AMG being an optional part of the Service Operations Management (SOM) course, we are able to evaluate differences in learning between those who participated in the game, and those who did not. We find that the students who participated in the game could, in a written exam, better articulate the contextual challenges and solutions experienced in the game. Further, through observations of game sessions and participant interviews and feedback, we can also discuss the game session as a learning experience, related to which we highlight the role of emotional engagement in the game situation as a driver of learning. Based on our observations, we discuss how the current game could be developed, along with more general observations for developing game-based teaching.

2. Literature Review

Simulations, including games, have been used and recognized as an effective teaching method (Faria, 2001), enabling students to test their existing knowledge and skills and obtain new ones. Games can illustrate advantages and disadvantages of a situation and facilitate forming different strategies (Kriz, 2003). Modeling diverse situations, participants' behavior and solutions can be observed. Also, games provide opportunities to

make mistakes while not having to concern about adverse outcomes (Geithner & Menzel, 2016). Thus, participants make changes in simulated games without the fear of damaging a real-life system.

In games, participants interact with others and the game. According to Mayer et al. (2011), the transfer of learning is positively affected when the participants work together in a simulation setting. The interactive nature of games encourages active student participation, based on which game-based teaching has been argued to be a more suitable method for today's students, compared to, e.g. traditional lectures (Proserpio & Gioia, 2007). According to Ammar and Wright (1999) simulations are of great use in operations management teaching, where an understanding of challenging and complex operations management concepts benefits from the first-hand experience. Further, Lewis and Maylor (2007) note that almost half of the organizational games have OM-specific themes, implying that the field of OM has adopted games as a useful teaching method.

The learning types that can be associated with the games are active, collaborative and constructivistic learning. Active learning is a method in which students grasp the insights by discovering. It comprises a set of instructional procedures for heavily involving the participants (Wilson & Sipe, 2014). Via collaborative learning, learners pursue a task together. It suggests that the knowledge is built in a group in which the participants connect each other through sharing their experiences and take on different roles (Mitnik, Recabarren, Nussbaum, & Soto, 2009). Constructivistic learning is learning of the individuals through interacting each other and their environment, where the teacher takes the role of a facilitator rather than a lecturer. Kim (2005) suggests that the interaction among the participants is important as the instructor can design the best solution and help in discovering a solution and supervise participants' progress. Thus, collaborative learning tools such as games are required to achieve this type of learning.

3. Aalto Manufacturing Game

The AMG has been played for the last eight years at Aalto University by graduate students in industrial engineering and management, taking the service operations management course. The course comprises of lectures and article reviews, to which AMG is an optional complementary learning activity. Whereas the reading materials and lectures give a theoretical perspective on the subject, illustrative case examples and visiting lecturers from industry are also included to give some insight to practice. AMG is included to offer the students a chance of experiencing the theoretical and practical challenges first hand.

The game development process was iterative and included several test sessions to improve game design and playability. During The first phase of the process, the learning goals were

built into the structure of the game. In the second phase, the game was tested by faculty with the objective of improving game characteristics and playability. In the third phase, the game was tested with two student groups, with a focus on improving the game design with respect to how well the game was able to reach its designated learning goals. Finally, after the game being included in the curriculum, experiences from game-sessions (3-4 per year) have been used to develop the game process, with a focus on the learning experience.

The learning objectives of AMG are to provide the participants with an experience on 1) diverging incentives within supply chains, 2) uncertainty caused by limited demand visibility and 3) balancing performing and improving. Coordination and communication between the members of the supply chain in the game are vital for each member achieving their performance goals. The interactions provide an environment to observe the motives of other members in order to grasp the significance of asset management in supply chain.

The basic setup of the game includes five teams; a distributor, two factories and two maintenance providers. Within the factory there is a designated Production Manager, as well as Machine Operators and Warehouse men. Factories produce boats, which are assembled from LEGO® bricks during gameplay. Each factory has two machines, which work in two shifts, enabling a maximum production of four boats per factory per turn. The boats produced by the factories are then sold to the distributor based on a negotiated price, while the distributor sells the boats onward to her final customers for a fixed price.

At the outset of the game, AMG is presented as a competitive game where each team should seek to maximize its profit and minimize its costs. The game standings are checked every 5 rounds, informing the teams of their standing relative to other teams. As the game progresses, the players experience the problems caused by conflicting incentives in the game setting. After the first part of the game, the participants are asked to reflect on solutions for the problems caused by conflicting incentives, upon which rules are changed so that game dynamics favor cooperation within the supply chains. Later, the rules are again changed to illustrate the introduction of condition monitoring technology to support maintenance decision-making. This change gives participants a firsthand experience in how decisions subject to risk become easier to make with increased visibility.

4. AMG as a learning experience

At the end of every game session participants are asked to fill out a feedback form, asking the participants to reflect upon what they have learned, how the game was as a learning experience and whether they had any ideas for improving the game. Further, for the last two years, the feedback form has also included Likert-scale evaluations which are intended to specifically gauge the game session as a learning experience. The results of the participants (N=67, from 6 different game-sessions) Likert evaluations are included in Table 1, debajo

de, based on which we can make some interesting observations (role-specific averages are according to D = distributor F = factory and M = maintenance provider).

Table 1. Feedback

Question <i>On a scale of 1 to 5, where 1 is "Disagree completely" and 5 is "Totally agree"</i>	All answers (N=67)		Role averages (N)		
	Average	Variance	D (6)	F (44)	M (17)
The game was approachable and the rules were easy to understand	4,37	0,443	4,17	4,34	4,53
I actively participated in my team's decision-making	4,45	0,884	4,20	4,61	4,12
I was emotionally engaged in the game (I felt angry/happy during the game)	3,80	0,946	3,67	3,93	3,50
Winning the game was important for me	3,50	1,098	3,33	3,60	3,29
Playing the game was a pleasant experience	4,51	0,489	4,50	4,55	4,41
I mainly learned from observing the other teams	2,76	1,197	3,33	2,43	3,41
I mainly learned from discussing/deciding with my team-mates	3,71	1,266	2,40	4,20	2,82
Game-based learning works well for me	4,42	0,542	3,67	4,43	4,65

Overall the game-sessions were perceived as a pleasant experience, with little role-specific variation. Participants on average indicated that winning was important to them, which in turn correlated (0,486) with the participants indicating that they felt emotionally engaged during the game-session. There was slight role-specific variation in emotional engagement and desire to win, with the factory-role being more engaging than the two other roles. Further, while participants in general felt that game-based learning worked well for them, there were significant role-specific differences, where maintenance providers gave the highest scores on this point. Whether game-based learning works well for the participant correlated with the extent to which the participants felt the game was approachable and the rules were easy to understand (0,382) and to whether playing the game was a pleasant experience (0,400).

In the course of the game sessions, we typically observed initial excitement when the participants explored their role and figured out what strategy they should use to win the game. As the initial excitement wore of, the emotions expressed in the session could be characterized as gradually growing frustration, as the behavior of the maintenance provider would mitigate any strategy pursued by factories or distributor. Before the end of the first part of the session, the frustration is quite tangible, with factory participants questioning the motives of the maintenance providers, through observed exclamations such as *"How can we trust you?"*, *"What does that mean, I don't understand!"*, *"Are we sure that the cranes were maintained, shouldn't they be perfect?"* and *"Are you cheating on us?"*.

There are role-specific differences in whether the participants participated actively in their team's decision-making, and whether they learned mainly from observing other teams, or discussing /deciding within their team. These differences stem from differences in team sizes, as distributors were the sole member of their team, and maintenance providers occasionally did not have other members in their team. Despite these roles also producing good results in terms of learning, the written feedback by some factory participants raised concerns that other roles did perhaps not learn as much from the game as the factories. Occasionally this was echoed by feedback from distributor and maintenance provider participants expressing a desire to also try out other roles during the game session. The role specific perspective was however also seen as the strength of the teaching approach as especially the maintenance provider experienced the conflicting incentives first-hand.

5. Learning outcomes of AMG

The students were asked to reflect on their learning in the session feedback forms, based on two open ended questions – “What were your key-learnings from playing AMG?” and “Did the game session give you any surprising insights on industrial service operations (things that you did not think of before playing the game)?”. The answers to these questions reflect the learning objectives of the game, with slight differences in emphasis between students, which could reflect different student backgrounds. Roughly the half of the participants reported having surprising insights, and of those who did not, many still added that the game session did however provide an opportunity to see the (a priori known) theories in practice.

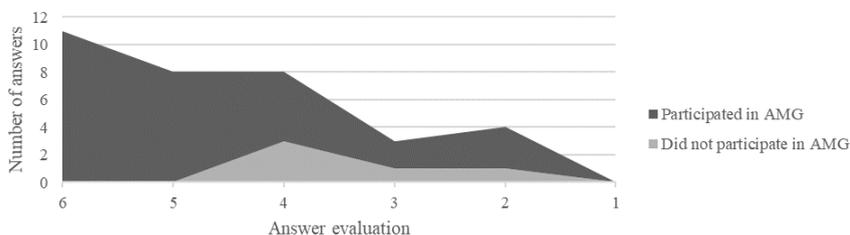


Figure 1. Exam (2016) answer evaluations (on a scale of 0-6)

The exam questions related to the learning objectives of the game were evaluated based on students' ability to elaborate on the mechanisms which were present in the game (excerpt of 2016 grading included in Figure 1). Due to the game being optional in the course, we were able to compare the exam answers of those who did, and those who did not participate in the game. When comparing good answers by students who participated in the game, with good answers by students who did not participate in the game, we observed a general tendency for game participants to write more articulate answers when reflecting theory

against practice. We also noted that game participants were generally able to produce more in-depth elaboration on conflicting incentives, compared to those who did not participate in the game. There were however exceptions to both cases.

6. Discussion

In this paper we have studied game-based learning in a service operations management course. Based on our results we conclude that the AMG is an effective way to teach the service quality deterioration problem and the impact of misaligned incentives in industrial services. The AMG augments students' cognition about managing industrial services by embodying a built-in conflict between different stakeholders. The behaviors and intentional confrontations of the teams enable students to get acquainted with the multi-faceted context that involves the potential conflicts among actors. Our data shows that participants were emotionally engaged in the game, and, winning was important to them, which has been associated with positive effects on learning (Burguillo, 2010).

Educational games have been argued to foster a more comprehensive understanding of methods and concepts in complex systems (Kriz, 2003), enabling the modelling of different situations and different solutions for different roles. Based on the participant feedback the game helps students to understand the role of asset management as part of the supply chain, and especially the role-specific perspective to supply chain incentives. This was also reflected in the game participants' ability to elaborate on the exam questions using the learnings from AMG. The game enables participants to socially construct knowledge through facilitating collaborative and active learning as the participants are involved in the simulation and interact in order to achieve the goal shared by their team.

In developing the game sessions, we have sought to increase emotional engagement of the game participants, expecting it to lead to better learning experiences (Moon, 2004). The built-in conflict in the game works well in this respect, as it heightens tensions between the teams. However, the actions of the teacher as the facilitator of the game sessions is vital, as it can increase the tension by offering plausible, yet unlikely explanations for the experiences. Also, it can offer rational and theory-informed explanations of why things are going the way they go. Tensions are then defused in a constructive manor through changing game rules, so that the problems causing frustration no longer do so.

The focus on participant emotional engagement and the game as a learning experience has led us to see the experiential learning cycle manifested in game design, where participants within each game-round shift between abstract conceptualization, active experimentation, concrete experience and reflective observation in a continuous spiral (Kolb & Kolb, 2005). Over the course of the game session, the learning objectives can be seen as having distinct

dramaturgical curves, reaching their peaks where tension is defused through changing game rules. We argue that considering the above in game design (in terms of both structure and facilitation) enable teachers in the field of operations management to craft game-based learning experiences, preparing students for the ever increasing intricacy and complexity which characterizes the new normal in operations management.

References

- Ammar, S., & Wright, R. (1999). Experiential learning activities in Operations Management. *International Transactions in Operational Research*, 6(2), 183–197.
- Burguillo, J. C. (2010). Using game theory and Competition-based Learning to stimulate student motivation and performance. *Computers and Education*, 55(2), 566–575.
- Faria, A. J. (2001). The Changing Nature of Business Simulation/ Gaming Research: A Brief History. *Simulation & Gaming*, 32(1), 97–110.
- Geithner, S., & Menzel, D. (2016). Effectiveness of Learning Through Experience and Reflection in a Project Management Simulation. *Simulation and Gaming*, 47(2), 228–256.
- Kim, J. S. (2005). Effects of a Constructivist Teaching Approach on Student Academic Achievement, Self-concept, and Learning Strategies. *Asia Pacific Education Review*, 6(1), 7–19.
- Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning and Education*, 4(2), 193–212.
- Kriz, W. C. (2003). Creating effective learning environments and learning organizations through gaming simulation design. *Simulation and Gaming*, 34(4), 495–511.
- Lewis, M. A., & Maylor, H. R. (2007). Game playing and operations management education. *International Journal of Production Economics*, 105(1), 134–149.
- Mayer, B. W., Dale, K. M., Fraccastoro, K. A., & Moss, G. (2011). Improving Transfer of Learning: Relationship to Methods of Using Business Simulation. *Simulation and Gaming*, 42(1), 64–84.
- Mitnik, R., Recabarren, M., Nussbaum, M., & Soto, A. (2009). Collaborative robotic instruction: A graph teaching experience. *Computers and Education*, 53(2), 330–342.
- Moon, J. A. (2004). *A Handbook of Reflective and Experiential Learning*. New York: RoutledgeFalmer.
- Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2), 160–172.

- Oliva, R., & Sterman, J. D. (2001). Cutting corners and working overtime: Quality erosion in the service industry. *Management Science*, 47(7), 894–914.
- Pasin, F., & Giroux, H. (2011). The impact of a simulation game on operations management education. *Computers and Education*, 57(1), 1240–1254.
- Proserpio, L., & Gioia, D. A. (2007). Teaching the Virtual Generation. *Academy of Management Learning & Education*, 6(1), 69–80.
- Wilson, L. E., & Sipe, S. R. (2014). A Comparison of Active Learning and Traditional Pedagogical Styles in a Business Law Classroom. *Journal of Legal Studies Education*, 31(1), 89–105.

Learning in the Era of Online Videos: How to Improve Teachers' Competencies of Producing Educational Videos

Guseva, Yulia and Kauppinen, Tomi.

Aalto University School of Science, Finland.

Abstract

Online videos have gained huge popularity among people seeking for entertainment, and increasingly also among learners. People seek for tips in videos, ranging widely from improving language skills to bike reparation, or from solving mathematical equations to indoor decoration. At the same time teachers are facing challenges of producing professional videos that can support learners to learn the variety of topics. Teachers at the higher education institutes are often professionals in presentation skills in classrooms, but can face challenges when presenting in videos. In this paper we present a process for improving skills needed to produce educational videos. The process starts from the assumption of often explicit question by the teacher: "How can I produce professional educational videos?" The process includes identifying main challenges teachers face, and continues with a series of hands-on workshops targeted to develop each of the skills followed by the video production itself. We report also an evaluation of the process with teachers from the Aalto University, discuss the implications and resulting categorization of production models.

Keywords: *online learning; blended learning; video production; educational videos; community building; agile and lean methods.*

1. Introduction

In online and blended learning settings teachers provide examples, explain them by theories, and map theories to a bigger context. This comes in handy for settings like flipped classroom, where students are engaged with learning materials before the face-to-face sessions. Storytelling becomes vital to connect these learning elements together; and videos provide a natural way to tell stories. For this, it is also important to understand how students make use of the videos (see e.g. Seaton 2014). The goal is to engage and motivate the learner to feel the ownership of his or her own learning and associate himself or herself to the stories of the course. Making videos that carry the story to the learner requires key elements all the way from a good script and storyboard to acting in front of the camera or in some other way with sound and visuals. It is essential to support engagement of the learners (see Guo, Kim and Robin 2014, Lin et al., 2017) and take into account cognitive issues, for instance that learners learn from short videos (see Hsin and Cygas 2013) rather than from long ones.

However, as we have evidenced, teachers' abilities to produce engaging and learning supporting videos call for new ways of thinking. In this paper our contribution is to address this challenge by: i) a video production process for educational videos and ii) a set of workshops created in agile and lean fashion for teachers to obtain necessary skills and iii) community building around improving these video-making competences.

This paper is structured as follows. In section 2 we present emerging needs of teachers to prepare good quality videos and the corresponding challenges. In section 3 we present our approach to match these requirements. Section 4 discusses the community feedback, and the resulting categorization of video production types. In section 5 we provide concluding remarks.

2. Understanding challenges in producing educational videos of good quality

We have analyzed (with a permission) “first educational videos” made by teachers in our community within the Aalto Online Learning (A!OLE)¹ project (Kauppinen and Malmi, 2017) at the Aalto University. As we have evidenced the main challenge has been that the resulting video is simply not engaging; however, this can be a result of several different reasons, each of them that can be tackled. We have categorized the challenges and issues into the following groups:

¹ See <http://onlinelearning.aalto.fi/>

Presentation skills. We have evidenced stiff postures and monotonous intonations, wandering eyes, unclear articulation and anxiety while presenting. People are not used to presenting on camera; it is simply a new skill for them to obtain.

Content. Teachers usually try to apply either a traditional lecture format or scientific paper approach to the video making. As a consequence, there are plenty of videos that are overloaded with information — they are simply too long and hard to digest. Besides, teachers tend to ignore the planning of the video content “because they have given this lecture many times to a real audience”. As a result of this, videos are lacking a compelling structure, i.e. they are not straight to the point. Further on, in this setting it can also be troublesome for the post-production team to align visuals with the speech.

Visuals. The common issues on the visual side are text-heavy contents, poorly organized slides, a non-consistent slide design, lack of visuals and unauthorized image use. Visuals in the video need to be very clear since there is not much time to process them (about this see e.g. discussion about system 1- vs system 2- kind of thinking by Kahneman, 2011). Furthermore, many students nowadays watch videos on their mobile phones. This implies that if the slides are overloaded with textual information, it is simply not possible to follow them. Another challenge is “a boring talking head”. If a teacher just talks out the information on slides, it hardly adds any value. A creative use of visuals can help to better support grasping the topic.

Video or audio quality. Due to budget and time constraints, people try to make videos on their own without professional help. Sometimes it can work out just fine, but if not, then certainly an obscure image or a hissing sound can be detrimental to the video.

Lack of understanding of the video production process. Every video production project has three stages: pre-production, production and post-production. It is essential to realise what happens at each stage and that actually most of the work happens outside of the video studio. Some teachers tend to underestimate the importance of pre-production and post-production and the effects these stages have on the final video.

Since teachers generally run into the same problems and at the same time have a wish to produce good quality videos, we decided to implement an agile and lean improvement of video production skills via community building events. With this approach, teachers have a chance to go through a series of workshops and events to enhance their skills needed for video production.

3. Approach: agile improvement of video production skills via community building events

A typical wish by a teacher wanting to support online learning is “I would like to have online videos where I explain essentials about the course topic to the students.”

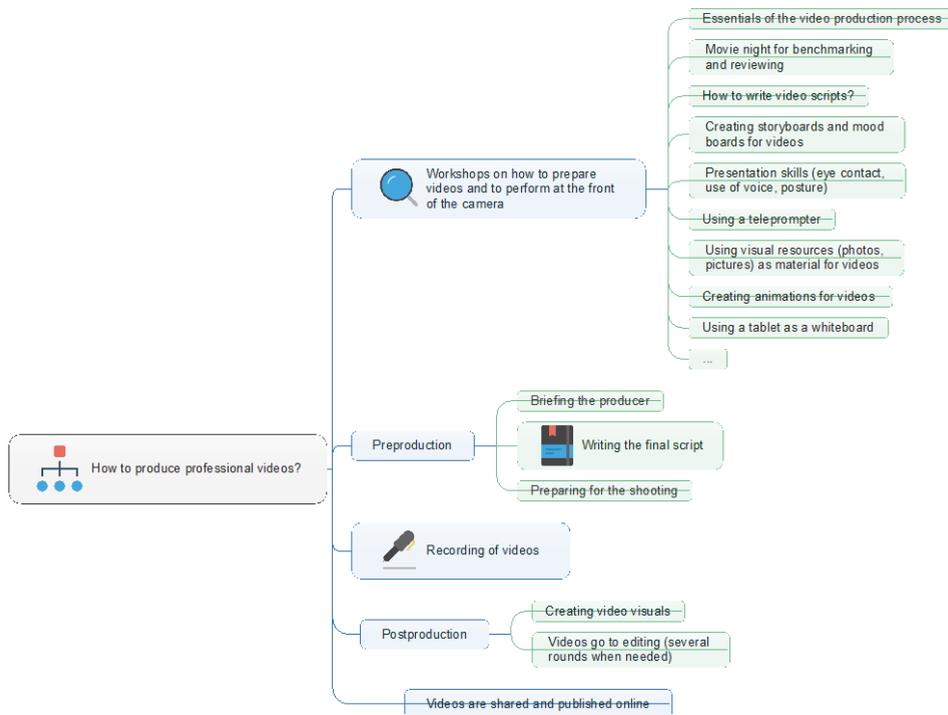


Figure 1. Process for engaging people to join the video producing community; getting improved videos as a result.

Now there are a range of professionals available to help teachers produce the videos, such as cameramen, sound recordists, gaffers or set designers. However, there is a crucial gap between the original wish by the teacher and being able to provide a brief to the producer on what exactly should be filmed. The gap is essentially to both plan what should be achieved with the video, i.e. how and what students should learn by watching it, and to help our teacher to get prepared for the production.

Our proposal to fill the gap is three-fold: 1) we request the teacher to join a number of workshops helping her or him to get prepared and to plan the video, 2) join the community

of other educational video makers within the university and 3) we provide a brief for the producer to start the production of the video. Figure 1 depicts our process, ranging from workshops via pre-production to recording of the video, and to post-production and publishing of the video.

The goal of the hands-on workshops is to tackle the typical challenges teachers face, get essential skills needed in the video production and to learn by doing how to use certain tools. It is also vital to get tips from professionals, and exchange experiences and best practices.

Usually pilots in our Aalto Online Learning project have had six months to one year to achieve their goals. In the beginning of the project pilots are asked to go through three or four workshops that will help them in the pre-production stage. Examples of workshops are “Essentials of the video production process”, “How to write video scripts” and “Benchmarking online courses”. Then we move on to the production stage where we run workshops like “Developing presentation skills”, “How to use a teleprompter” and “Using tablet as a white-board”. For the post-production phase the workshops include “Using visual resources in your video” and “Creating animations for your videos”.

Within the Aalto Online Learning project we have since May 2016 organized tens of these kinds of workshops related to video production. Here we provide a representative selection of these workshops to give an idea of their contents, activities and aimed deliverables.

Essentials of the video production process. “In this workshop we go through each stage of video production process and give tips to teachers regarding their upcoming video production. “

Movie night for benchmarking online courses. “Before you start making videos, it is good to know what is happening on the online course arena, familiarize oneself with best practices and also learn from bad examples. In this event we watch together and discuss different educational videos to get some ideas and inspiration for your own video production. “

How to write video scripts? “In the workshop participants are given tips on how to write a successful video script, what needs to be avoided and how to establish a more personal connection with the viewer. They can also get feedback on their own scripts.”

Developing presentation skills. “In this workshop participants train how to use gestures, postures and intonation to amplify words, how to look natural on camera and to feel comfortable presenting.” Related to this, Figure 2 shows an example of practicing interview-style presentations in front of a camera in one of our workshops.



Figure 2. An example of an interview-style setting from our workshop to practice presentation skills.

Using a teleprompter. “In this session participants revise what a teleprompter is and how it works, why it is widely used in video production, then get a feel of it and try how it actually works with their own scripts. After this they move on to setting it up and the workshop is concluded by reflecting on the experience.”

Using tablet as a whiteboard. “One way to make a video more interactive and easier to follow is to use a tablet as a whiteboard. It is especially important for those subjects where writing on a board is a must in general, like math or physics. Every participant gets a tablet to use as a whiteboard and can test how it works and how to record the whiteboard writings as a video.”

Using visual resources in videos. “In this workshop we discuss how teachers can use music, images, footages in their videos without violating copyrights. The guidelines on using creative commons materials are also given and creative common licenses are analyzed.”

Creating animations for your videos. “Animations can help to carry a story and help learners to see the contents via visual examples. In this workshop we learn how to create animations with selected online tools, and to include them as a part of the educational videos.”

4. Evaluation via feedback from the community and resulting categorization

With our approach, teachers not only broaden their knowledge and develop new skills but also become a part of the community. Thus they can more easily share their experiences with like-minded people, learn from each other and exchange best practices. From a cognitive point of view, it is much safer to dive into a completely new domain when you know you have support from peers and you are not the only one on that unknown road.

After our activities we have received informal feedback from teachers saying that the environment has been encouraging and safe to practice. Teachers have appreciated the idea of learning by doing, and found workshops to be very insightful and intense.

As a result of developing and evaluating the approach now for almost two years, we have distilled a production model for educational videos, consisting of four categories (see Figure 3). Thus we offer deliverables ranging from self-service studio quality through good quality fast all the way to videos of high production value and to top quality videos. After the teacher has gone through a number of workshops, we make a brief to the producer about a video (or a set of videos) for an online course, and select the best fitting production category.

The factors that influence the choice of the category are, for instance, presentation skills and experience of the teacher, the planned use of the video and timespan within which the video needs to be produced. Based on that, we offer a case setting for the teacher and the producer takes the project forward.

<i>Deliverable</i>	Self-made quality	Good quality fast	High production value	Top-quality video
	Recording or streaming a video in a lecture room, or in a self-service studio. Tech assistant's help is available.	One teacher and one cameraman in a suitable space (classroom, lobby, outdoors, self-service studio).	3-4 person crew (cameraman, sound designer, editor, graphic designer) in a pro studio, or other suitable space.	10 person crew, director involved, a compelling story, pro studio and setup. Global target audience.
<i>Timespan</i>	2 days to 1 month	5 days to 1 month	2 weeks to 2 months	3 to 6 months
<i>Persona</i>	Emil, wants to make videos	Sara, good presentation skills	Jack, good presentation skills, eager to learn	Tina, experienced, excellent presentation skills

Figure 3. Production categories.

5. Conclusions

Educational videos can support moving from traditional teacher-centered settings to learner-centered settings. Flipped classroom methods, for instance, imply that students have checked the theory via online materials before entering the face-to-face sessions coached by the teacher in a classroom. However, making videos to be supporting learning remains a challenge: videos are simply a completely different medium than lecturing to an audience from a podium. Good postures, eye contact, talented use of voice and engaging storyline are obviously also present in lecturing, but can and should take quite different forms in front of

the camera. In this paper we proposed a process to improve teacher's competencies for supporting them to prepare better educational videos. Our approach consists of a set of workshops on different aspects of video production, ranging from presentation skills and script writing to working with advanced techniques such as animations and use of teleprompters. We described a representative set of workshops we have used, and the four categories of different production types for educational videos, all having characteristics and personas helping to create a brief for the production.

References

- Guo PJ, Kim J and Robin R (2014). *How video production affects student engagement: An empirical study of MOOC videos*. ACM Conference on Learning at Scale (L@S 2014)
- Hsin WJ and Cigas J (2013). *Short videos improve student learning in online education*. Journal of Computing Sciences in Colleges 28, 253–259.
- Kahneman D (2011). *Thinking, Fast and Slow*. Macmillan.
- Kauppinen T and Malmi L (2017). *Aalto Online Learning - a pathway to reforming education at the Aalto University*. In Proceedings of EUNIS 23rd Annual Congress (EUNIS2017) - Shaping the Digital Future of Universities, pp. 212–221. Münster, Germany.
- Lin S-Y, Aiken J, Seaton D, Douglas S, Greco E, D. Thoms B and F. Schatz M (2017). *Exploring physics students' engagement with online instructional videos in an introductory mechanics course*. Physical Review, Physics Education Research.
- Seaton D, Nesterko S, Mullaney T, Reich J, Ho A and Chuang I (2014), *Characterizing Video Use in the Catalogue of MITx MOOCs*. In proceedings of European MOOC stakeholders summit. Lausanne, Switzerland.

Theatre Teaches

Bannò, Mariasole^a; Albertini, Andrea^b; Bendar, Ahlam^a; Bodini, Ileana^a; Trento, Sandro^c and Villa, Valerio^a

^aDepartment of Industrial and Mechanical Engineering, University of Brescia, Italy, ^b La Betulla, Theatre Company, Italy, ^c Department of Economics and Management; University of Trento, Italy

Abstract

Theatre Teaches is a new experiment carried out at the University of Brescia. The growing importance of transversal competences i.e. those skills that essentially concern attitudes in the workplace and interpersonal relationships such as team work, language and communication skills, gave us the idea to develop an educational innovation to help students bring out these skills. We asked students to write a play using topics seen in class and get him to scene. Not to be confused to business theatre, this method is applicable in any framework. The assessment results reveal that students appreciate this method because this work helps them to express themselves better and, in general terms, they could improve their non technical skills. In conclusion, we can say that this experiment has been a success and gave the students the opportunity to show transversal competences. The ability to communicate, to teamworking, to manage conflicts, to speak in public, to problem solving, creativity, imagination, the ability to manage unforeseen situations and tolerate pressure and stress, leadership skills, negotiation skills and the ability to motivate are just few of the emergent competences.

Keywords: *Learning techniques; theatre, transversal competences; educational innovation, Economic, managerial and engineering education.*

1. Introduction

To play is present even in the most primitive social organization, with various aims and in different ways. In Greece, in the fifth century B.C., to play took the form and the glossary that we still use. For the ancient Greeks, if philosophy was the science, then theater was a laboratory activity, to focus on the dilemmas that anguished ancient questioners. This practice is actual, even today. Just think of the tragedy of Antigone, in conflict between respect for the law or his deepest values: does it not correspond to the current need, which many of us meet, to have to address an ethical committee when projects involve the privacy of people?

The authors are well aware that knowledge, skills and ability have to be considered together and integrated when working on teaching design (Krathwohl, 2002). Moreover, Fredricks et al. (2004) and Kahu (2013) say that involvement of the whole person is achieved through an approach that includes intellect, practice and emotion. For example, comic book stories can be useful to break the ice with the most struggling students. As Metraglia et al. (2014) say, comics tell the typical work situations in a funny way, or they help self-recover pre-requirements gaps (Baronio et al. 2016). The most advanced instruments tested by Violante et al. (2016) for online learning environments with three-dimensional functions should also be evaluated. Finally, Motyl et al. (2017) underline that providing the expertise, which will be required of future graduates, is an important task.

Now, talking about theatre, what happens if we ask 63 graduates of economics and engineering to process and stage scripts that address the themes of their studies? How is their creativity at stake? What happens to their ability to interact, listen and communicate? What happens to their self-image and self-esteem? As will be illustrated in this paper, this mode, which has been called Theatre Teaches, is different from the more traditional "Teatro d'impresa®" offered to managers of companies.

2. Methods and Objectives

In the first phase, but only after the professor carried out the more traditional part of the teaching, we tried to know each other, teacher and students, without the typical first-meeting-embarrassment, also trying to remove mental oxidations typical of our individual society, such as halfway gestures, voices that can't be heard, etc. (Pfeiffer et al., 2017). To create a group imprinting, a scream of war was chosen to start each lesson, in order to free the tension, create a slogan, a recognizable sign within the same group. "Ut! Ut! Ut!" (Out! Out! Out!) was chosen, which was the motto that the troops of Aroldo II shouted to the Bretons of William the Conqueror during the battle of Hastings. The 63 diaphragms, half boys and half girls, made the walls of the Athenaeum to vibrate, overwhelming us like a

wave. To liberate the primordial instinct students were asked to move, scream and communicate as monkeys in order to gain awareness of their body, space and voice. Finally, in the most authentic spirit of theatrical improvisation, the students were asked to alternate in small and stage a small performance without preparation choosing among the subjects of the course (Amaral et al., 2017; Senje, 2017). This has resulted in extemporaneous, exhilarating, grotesque and significant situations in which everyone was involved. After this first liberating phase, the Actor illustrated the characteristics of theatrical techniques, here proposed in Table 1.

Table 1. Techniques of the theatre

Individual	Group
<p>To enhance expressive and communicative skills, through the use of body and voice; to widen the perception of physical and imaginary space; to develop the imaginary through improvisation, internalizing the characters and the stories; to sustain to verbalize feelings and emotions; to improve self-image and self-esteem; to discover the infinite possibilities that body and voice have of expressing themselves, through control and empowerment; to try to communicate experiences, emotions, and moods in an authentic and creative way; to read a script, developing contents, gestures, rhythms and vocal emission; to learn how to use symbols and objects for a staging; to remove masks and embarrassments by promoting expressiveness.</p>	<p>To encourage the ability to listen oneself and within the group, promoting relationships with others; to learn how to know themselves, their own limits and resources and those of the group; to bring out and promote potentialities and capacity, and putting them in relation to those of others; to acquire control and knowledge of space; to develop a 360° perception of the environment in which to move and how this can change in relation both to the presence of people in the group and to their imagination; to analyze people, everyday and non-daily situations to be represented on the scene; to characterize characters; to increase self-confidence and trust with each other; to help each other through the common goal of the final representation.</p>

Source: Our elaboration.

In the second phase the students were allowed to self select into groups of 7 to 10 people and wrote a script, dealing with directing, with the description of the characters, the creation of movements within the stage space, the choice of furnishings and costumes, lights and music. The added value of this theatrical exercise was the writing of an original script by students, as the result of their ideas and fantasy (Pfeifferet al., 2017). The script was then given a more institutional scenic form by the Actor then it has become a real play where the actors and technicians were the same students that wrote the play. All pieces have been performed in one of the most important theatres in the city, under the patronage of the municipality.

3. Experimental Activity: Different Point of View

3.1. The Actor

I believe that acting a character in theatre is an expressive way of communicating with features that go beyond all other forms of communication. Acting a script character, treading the boards, is not just a narcissistic exercise to show themselves, but it is, above all, a team effort. Remember your own words and movements, but also pay attention to words of the other characters and, in the same time, also to their change of position on the stage, their scenic times. A mutual help, trying to let words and feelings flow, to achieve the exact viscosity of the entire theatrical mechanism. A narrative mechanism created to tell: body, voice, symbols, acting one of the endless possible realities, one of the infinite symbolic possibilities. Free from rigidity, from masks, from that arid and binding attitude that thickens during the days and often does not allow us to be ourselves. Fiction must be relegated to the stage, not to everyday life. Theatre requires feelings to be brought to the paroxysm, to their extreme expression, to their ultimate meaning, so that they can become the symbol of a story. Students, after a first dubious and doubtful involvement in the project, have then expressed their enthusiasm. All played on the stage. Nobody wanted to give up. Those who haven't acted, have coordinated the music or helped the others in a thousand other ways: writing the script, getting the props and costumes, choosing the songs. This was also the purpose of this experience. What the students really are have been shown: their contradictions, certainties, hardships, abilities, fears. The play showed life, a cross-section of the infinite kaleidoscope of reality, one of the possible innumerable stories and not just a business case or an economic or engineeristic situation. Fiction, but not untruth, not a lie. Making theater actually makes everything more true and the people more authentic.

3.2. A student

(...) we were worried to make a fool of ourselves in front of the other colleagues, those serious, that would have seen us out in the garden making improvisation exercises, trying to act out machine parts too: that's crazy! We forgot that the course wouldn't be like the other ones. (...) By the way, in state of the emotional distress, we just let things get out of hand. We have not decided, we have accepted. (...) "But Prof, how I can do this? I've never done this before!". You'll learn, of course, you'll learn. And what happen when you put the squeeze on someone? He's doing, It's an inherent part of us, called self-preservation. And when everything goes on a roll, you feel like a super human, a hero that beat the villains. So, you discover that you have talent in managing tasks, often last-minute-assigned. And you immediately think about your father that has to deal unforeseen events or to make planning. And you can feel that you learnt how to do this you too. And you are ready to address next difficulties. Theatre Theaches isn't only the theatre that we know. It's public

speaking, improvisation, open-mindedness, overcoming the awkwardness, bringing us closer together, learning the topics in an alternative way, involving our senses to the topics studied. Making theatre means letting on the line visual memory, associative memory, and why not, sensorial memory too. Our active involvement let us to learn and to remember best. This is the deep meaning of the "Learning Pyramid" (Molenda, 2003). Thinking about the studied topics, all of us felt that we had learnt them in a better way, because they were something we associated to practical examples and experiences that we lived. Lately we talk a lot about "soft skills", but do we know what these are? They aren't something that someone can teach, they are predispositions or elements that we can acquire by experiences. And experiences like theatre can spur us on develop them. These are competences that we aren't able to develop by the teaching we are used to. So, if participating actively to theatre means know best the topics, if it means let us to find our best and it let us to be more ready to enter to the world job, then all of this it's not more a craziness!

3.3. A team of Students: the Script

Figures 1 to 8 of this paragraph are neither numbered nor captioned so as not to disturb the reading of the screenplay. (Source: all the photos are of our production)

This play is about Time, its meaning and how it brings changes. The title is: Waves' thoughts. A man's rise or defeat depends on the flowing seconds just like the surface water is ruffled by the waves. The comparison between a businessman thoughts and the voices of two economists of the past lights the endless daily flow of concerns of the modern businessman. However, the best advice to overcome hardship of life will come from his mother.

(We are on a beach. The beach is done of nothing. The sea and the song of the birds are background sounds. On the left, a man sits on the ground and plays a guitar: "The sound of silence". The guitarist is always on the stage, on a side, sitting downstage, cross-legged, on the ground)



*(A barefoot man arrives, wearing pants with cuffs to not soak them.
He sits on the ground, in the sand, and starts talking)*

BUSINESSMAN: What have we lost? We lose our creativity or we were not from the beginning? Sometimes I ask myself how are the other me, the one who didn't go the university: better go to work. Or the one who didn't catch the bus that Saturday morning. You want to be a good guy, so you stop at crosswalk to let a woman with Russian eyes to cross the street. She thanks you and comes back home just 4.7 seconds early, so that a brick falls on her head. The Russian-eyed woman is dead now. You wait a minute, and think about how many people have you

killed without knowing. Maybe none. Maybe one. Maybe one is my good friend. Another sucks. But the “butterfly effect” sucks, and fortunately we don’t see it.



(A man wearing ‘800 clothes arrives in a ridiculously way. He sits on the ground, next to the businessman)



ADAM SMITH: Where are we? || BUSINESSMAN: I don’t know. It seems a beach. Who are you? || ADAM SMITH: Adam Smith. || BUSINESSMAN: Ah ah ah, good! And what are you doing here? || ADAM SMITH: I’m, somehow, waiting. Do you want a cigarette? || BUSINESSMAN: No, thanks. I’m not smoking. || ADAM SMITH: Good boy, smoking is a bad habit.

[...] awkward silence

BUSINESSMAN: Tomorrow I will have to shut down my business, my firm. It will not be exactly tomorrow, but tomorrow will be the day in which I will have to tell people. For a minute I’d like to be the head of a corporation: you are not required to look in the eyes your 600.000 workers when you’re firing them. 21 people work for me. When 21 people work for you, if you don’t look them in the eyes you’re being rude. I know their name, in some terrible cases I also remember their wife’s name, o their parrot. || ADAM SMITH: Never in a month of Sundays! || BUSINESSMAN: Ok! I know you came from the past, but you can talk normally! || ADAM SMITH: Thank you, you’re doing me a favor. You have sympathy. You’re nice, don’t worry, but I don’t mean in that way. You have sympathy, I mean, you are involved with emotions. Stoicism thinks the universe as a big living being, constantly crossed by the living spirit, the “pneuma”. The sympathy is the interdependence between all the parts of the universe, where each event is related to every part of the world. || BUSINESSMAN: Wow. Did you copy it? || ADAM SMITH: Yes, I did. ||

[...] awkward silence

ADAM SMITH: And what could you do? Instead of closing, I mean?
BUSINESSMAN: To slowly bankrupt, I think.

(A woman enters, slowly, and sits on the ground)



BUSINESSMAN: And who are you? || GEORGESCU: I am Nicholas Georgescu-Roegen - BUSINESSMAN: And why don't you talk Romanian? || GEORGESCU: (Trying to hardly speak Romanian) sarutmana... pentru... masa... || BUSINESSMAN: Give it up. Why are you a woman? || GEORGESCU: Does it make a difference? I will give you an advice: you are too egocentric. Do you think you can decide on people's future? You think you're worth something? You think you can make a difference? Does the control you think you have on others turn you on? Have you ever heard of bio-economy? Physics laws are inevitable, and also economics sciences have to take them into account. Have you ever thought our blood as an endless battlefield of organisms, globules and so on? If this perfectly equilibrated conflict will end our body will not work anymore. Maybe you are not considering the problem from the right point of view. Don't you think you are a pawn in a bigger and inscrutable plan?

A guitar life performance of "the sound of silence" starts. The guitarist is always on the stage, on a side, sitting downstage, cross-legged, on the ground.



BUSINESSMAN: Just a question. Do you also hear a music? || ADAM SMITH: Of course, it is "The sound of silence". Whoever the musician is, he is undoubtedly poor. But this song is like the sea: you surely cannot complain even if it continues endlessly.

A simply-dressed woman enters, and sits.

BUSINESSMAN: Oh my God, Mum, what are you doing here. Let me be, I'm thinking. || MOTHER: My son, you are disappointing me. I would have been there in the right moment you broke. In the right moment you became blind, and you stopped to look at your men. || BUSINESSMAN: But I know them, one by one. || MOTHER: No, you know how to count them. You know how to divide, multiply and weight them according to their productivity. Their time is money for you, and their life the added value on you CV. || BUSINESSMAN: Mum, how things got so complicated? Why do we feel so lonely in this universe, even if we behave as if someone is always looking at us? Mum, I have calculated the world debt: it is infinite. There is not enough money on this Earth to repay it. And, what name will we have to write on the check? || MOTHER: The tide's coming in, I have to go. || ADAM SMITH: "Mercy to the guilty is cruelty to the innocent". || GEORGESCU: "It's all an entropy question, after all". || MOTHER: Wake up, and dig in the future.

The alarm rings, darkness. The end



4. Discussion and Conclusion

To analyze the effectiveness of this type of teaching, a simple question was put to the students during the written examination, with regard to the reasons why the proposed initiative was more effective than other ones: “What are the positive aspects and what are the negative ones, related to the teaching experience of the course?” A first analysis of responses, carried out by simply identifying keywords, reveals the results in Figure 1.

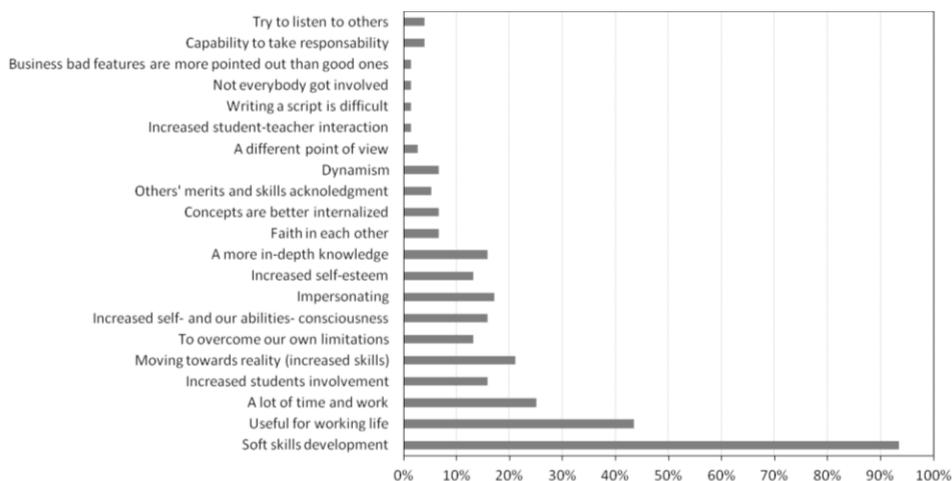


Figure 1: Percentage of answers for every single identified competence Source Our elaboration.

The students recognize the transversal competences, as positive aspects, and divide them in three main categories: relational soft skills (e.g.. communication skills, team-working skills, conflict management skills, public speaking); cognitive soft skills (e.g. problem solving skills, creativity, imagination, the ability to manage unforeseen situations and to tolerate pressure and stress); managerial soft skills (e.g. leadership skills, negotiating skills and the ability to motivate). To better analyze these answers Figure 2 has been computed.

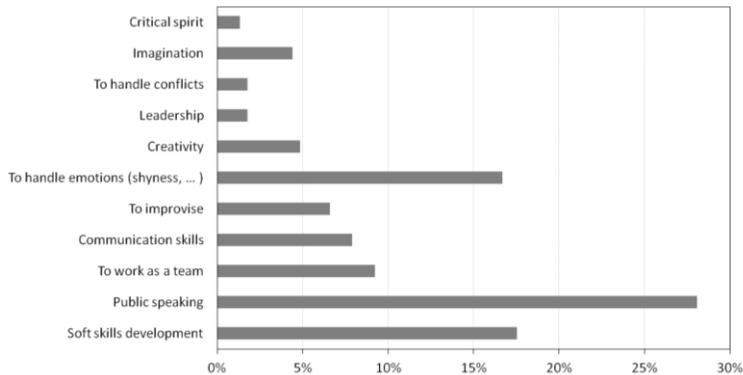


Figure 2: Percentage of answers for every single identified soft skill. Source: Our elaboration.

According to Fredricks et al. (2004) and Kahu (2013), these categories compose the "Student Engagement": emotional engagement, i.e. students' feelings towards teachers, peers, the course and learning; cognitive engagement, i.e. task-specific thinking that a student develops and uses while undertaking in an activity; and behavioral engagement, i.e. physical participation in an activity. The result of this experiment indicate that there is a significant potential to improve students' competencies through creativity which is developed using Theatre Teaches.

References

- Amaral, S. V., Montenegro, M., Forte, T., Freitas, F., & Cruz, M. T. G. D. (2017). Science in Theatre. An Art Project with Researchers. *Journal of Creative Communications*, 12(1), 13-30.
- Baronio, G., Motyl, B., & Paderno, D. (2016). Technical Drawing Learning Tool Level 2: An interactive self learning tool for teaching manufacturing dimensioning. *Computer Applications in Engineering Education*, 24(4), 519-528.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, 74(1), 59-109.
- Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into practice*, 41:4 pp. 212-218.
- Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in higher education*, 38(5), 758-773.
- Metraglia, R., & Villa, V. (2014). Engineering graphics education: webcomics as a tool to improve weaker students' motivation. *Research Journal of Applied Sciences, Engineering and Technology*, 7(19), 4106-4114.
- Molenda, M. (2003). Cone of experience. *Educational technology: An encyclopedia*.
- Motyl, B., Baronio, G., Uberti, S., Speranza, D., & Filippi, S. (2017). How will Change the Future Engineers' Skills in the Industry 4.0 Framework? A Questionnaire Survey. *Procedia Manufacturing*, 11, 1501-1509.

- Pfeiffer, F. M., Bauer, R. E., Borgelt, S., Burgoyne, S., Grant, S., Hunt, H. K. & Schmidt, D. C. (2017). When Theater Comes to Engineering Design: Oh How Creative They Can Be. *Journal of biomechanical engineering*, 139(7).
- Violante, M. G., & Vezzetti, E. (2017). Guidelines to design engineering education in the twenty-first century for supporting innovative product development. *European Journal of Engineering Education*, 42(6), 1344-1364.
- Senje, Siri. "Formatting the imagination: A reflection on screenwriting as a creative practice." *Journal of Screenwriting* 8.3 (2017): 267-285.

Clinically relevant medicine label-based exercises: a friendly bridge between medicinal chemistry and pharmacotherapeutics

Giorgi, Giorgio^a and Bravo-Llatas, Carmen^b

^aDepartamento de Química en Ciencias Farmacéuticas, Universidad Complutense de Madrid, Spain, ^bÁrea de Gobierno de Tecnologías de la Información y de Apoyo Técnico al Usuario - Apoyo a Investigación, Universidad Complutense de Madrid, Spain.

Abstract

Aims. To make the students of Medicinal Chemistry (MC) course for doctor of pharmacy (PharmD) understand how strongly connected the chemical properties of drugs are to their clinical profiles and therapeutics, and determine students' satisfaction degree.

Design. Students in the spring 2013 section of the MC course were taught in a traditional teacher-centered manner. Students in the spring 2015 and 2016 ones had additional guided clinically relevant medicine label-based exercises. They worked in structured self-selected teams and chemically explained the clinical aspects of the selected drugs during oral communication sessions. They were given a 1 to 4 Likert-type scale satisfaction questionnaire, the data were collected and statistically treated.

Results. The project was useful to show the connection between the chemical aspects of drugs and their clinical profiles (mean=3.33±0.65) and globally satisfactory (mean=3.07±0.47). The additional didactic material helped the students in the spring 2016 make the most of the MC course (mean=3.38±0.74, p=0.002).

Conclusions. Medicine label-based exercises seem to be helpful to understand the connection between medicinal chemistry and pharmacotherapeutics. Feedback from students is generally quite favourable. The approach taken will continue to be modified and expanded.

Keywords: medicinal chemistry; clinical relevance; medicine label-based exercises; team-based learning.

1. Introduction

Medicinal chemistry is a subject that studies the design, synthesis and analysis of drugs: Avendaño (2001). This subject offers pharmacy students the foundational concepts of drug design, drug mechanism of action, structure-activity relationships, acid-base/physicochemical properties, and absorption, distribution, metabolism, excretion and toxicity profiles: Khan *et al.* (2011). Faculty members teaching medicinal chemistry have sometimes struggled to demonstrate the importance of the discipline to students who will practice pharmacy, as some students struggle to find its relevance and connection to the clinical drug profile, while having their own negative beliefs toward the study of chemistry: Currie *et al.* (1994). The challenge continues and a historical literature that describes the major efforts by medicinal chemistry faculty members to introduce clinical relevance to the study of the medicinal chemistry is reported: Alsharif *et al.* (2006) (Table 1).

Table 1. Historical literature describing integration of clinical relevance into Medicinal Chemistry Courses.

Timetable	Contribution
1985	Article by Roche utilizing chemical knowledge in rational therapeutic decision making
1990-2006	Several articles published highlighting different strategies to introduce clinical relevance in the teaching of medicinal chemistry
1994-1998	Patient related case studies in medicinal chemistry and Case Study Textbook in Medicinal Chemistry published
1997-2001	Structurally Based Therapeutic Evaluation concept was introduced as a way to bring relevance, practical applications, interdisciplinary teaching and meeting specific ability based outcomes for pharmacy students in medicinal chemistry
1994-2006	Computerized tutorial in medicinal chemistry
2003	Foye textbook introduces case studies at the end of each chapter
2008	Evaluation of an Instructional Model to teach Clinically Relevant Medicinal Chemistry in a Campus and a Distance Pathway: Alsharif <i>et al.</i> (2008)
2010	A Process-Oriented Guided Inquiry Approach to Teaching Medicinal Chemistry: Brown (2010)
2014	Laboratory Exercises to Teach Clinically Relevant Chemistry of Antibiotics: El Sayed and Chelette (2014)

Source: Alsharif *et al.* (2016).

Students of Medicinal Chemistry I course, part of the sixth semester within the PharmD curriculum, are taught in a traditional teacher-centered manner, with the majority of class time spent on lectures, seminars, tutorials and laboratory activities. They have the opportunity of synthesizing and analysing drugs in the laboratory, however, there are no designed activities to make the students appreciate how clinically relevant the concepts they study during the medicinal chemistry course are.

2. Objectives

The objectives are:

- To introduce students to how knowing the chemical properties of a drug can help understand its kinetics, mechanism of action, place in therapeutic decision making and potential adverse effects on the biological system.
- To prepare additional guided medicine label-based exercises.
- To integrate team-based activities.
- To determine the outcomes.

3. Design and development

Students in the spring 2013 Medicinal Chemistry course section were taught in a traditional teacher-centered fashion, however, students in the spring 2015 and 2016 were involved in this project. Participation in the project was optional. This project is composed of three parts:

- The selection and preparation of the additional didactic clinically relevant medicine label-based material.
- The students' team-based work.
- The preparation of the students' feedback questionnaire, the data collection and their statistic treatment.

3.1. Selection and preparation of the didactic material

First of all, the medicine labels were chosen between the most widely dispensed drugs in Spain and included in the subject contents. Afterwards, guided medicine label-based exercises were prepared and uploaded to the blackboard before the semester began. They comprised 15 enzymatic inhibitor drugs (7 β -lactam antibiotics and 8 inhibitors of human enzymatic systems) and 4 drugs that interacted with pumps and ionic channels. The

exercises consisted of questions about chemically focused explanations about the pharmacokinetics and pharmacodynamics profile of the selected drug, the pharmacophore, the structure-activity relationship and the verification of the Lipinsky rule for oral forms. The chemical synthesis and IUPAC name were also asked to be proposed. Spring 2016 students had more exercises available on the blackboard, as the spring 2015 Q6 questionnaire data were analysed before the following academic year began.

3.2. Students' team-based work

During the first day of class, the students were briefly introduced to the team-based work, explaining the different roles the students would be playing in their self-selected groups, the goal of the project and how to use the didactic material. Each group was comprised of 3-4 students (one student was the recorder), did the exercises and prepared an oral report. The students worked on the didactic material, prepared their oral presentations and all the experiences were shared at the University during the corresponding 2 hour sessions (3 for the spring 2015 and 5 for the spring 2016 students). Spring 2016 students had more sessions, as the spring 2015 Q6 questionnaire data were analysed to make some improvements before the following academic year began.

3.3. Students' feedback questionnaire, data collection and statistic treatment

An anonymous 1 to 4 Likert-type scale questionnaire was constructed to invite students' feedback. Students were asked about their global satisfaction regarding the project (Q1), if participating in the project was useful for them to better understand the relationship between the chemical properties of drugs and the clinical profile (Q2), if they received complete information about the development (Q3) and the goal of the project (Q4), if they would make the most of the Medicinal Chemistry course because of participating in this project (Q5). The survey also included a question in order to obtain an open answer in which students could freely express their comments and suggestions about the project (Q6) (Figure 1). The data were collected at the end of the last session. Data were described by using percentages and means. Non-parametric Mann-Whitney and exact Fisher test were used to analyse the differences between spring 2015 and spring 2016 data distributions. Resampling Bootstrap method with 1000 random samples was applied to analyse the mean differences. Wilcoxon signed-rank test was applied to analyse differences between related data distributions (answers to Q1, Q2 and Q5) and related mean differences (data coming from Q1, Q2 and Q5) were analysed by the resampling 1000 random sample Bootstrap method. In both cases, Bonferroni p-values correction was applied, multiplying p-values by the number of paired comparisons (3). Considered statistical significance level was 0.05. SPSS 22 was the software used.

QUESTIONNAIRE

1. On a scale from 1 to 4, indicate how satisfied you are about participating in this project:

1= very dissatisfied 4= very satisfied

2. On a scale from 1 to 4, has your participation in this project helped you better understand the connection between the concepts studied during the Medicinal Chemistry course and the pharmacotherapeutics?

1 = no, not at all 4 = yes, absolutely

3. Do you consider having received complete information about the development of this project?

1 = no, not at all 4 = yes, absolutely

4. Do you consider having received complete information about the goal of this project?

1 = no, not at all 4 = yes, absolutely

5. Do you consider that participating in this project will help you make the most of the Medicinal Chemistry course?

1 = no, not at all 4 = yes, absolutely

6. Comments and suggestions regarding this project:

Figure 1. Questionnaire.

4. Results and discussion

Students in the spring 2015 (n=34) and in the spring 2016 (n=8) participated. Results will be globally presented for both groups (n=42), separately when statistically significant differences were found. 78% were satisfied and 14.6% very satisfied with the project. Only 9.5% stated the project was not useful to understand the connection between the contents of the subject and the clinical drug profiles, however 47.6% stated it was useful and 42.9% very useful (Figure 2).

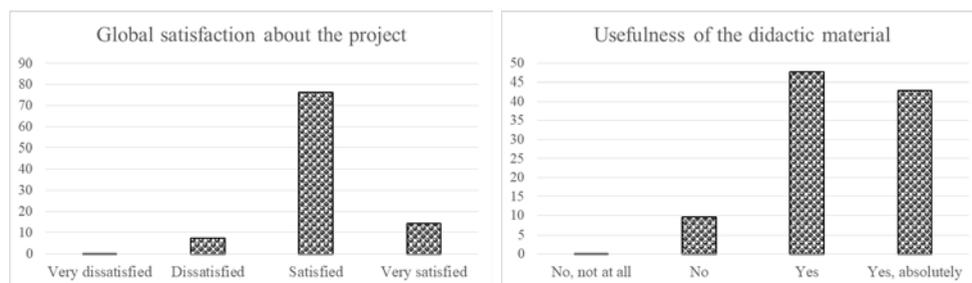


Figure 2. Distribution (%) for Q1 and Q2.

47.6% considered having received complete information regarding the development and the goal of the project. 26.2% and 35.7% considered having received complete information regarding the development and the goal of the project in a very high degree of agreement (Figure 3).

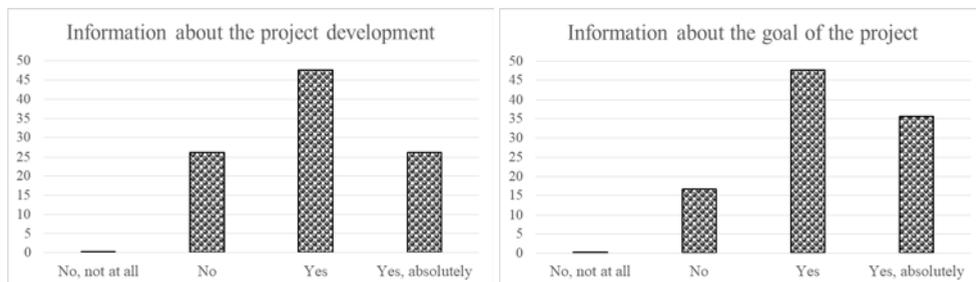


Figure 3. Distribution (%) for Q3 and Q4.

42.9% (11.9% in a very poor degree) stated that participating in the project would not be helpful to make the most of the Medicinal Chemistry course, however 57.1% (14.3% in a very high degree) stated it was (Figure 4).

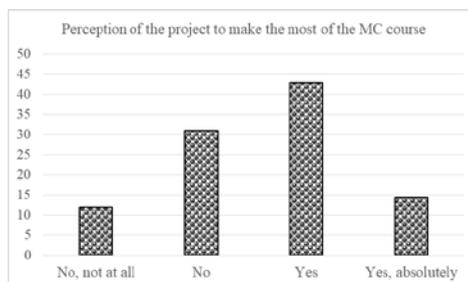


Figure 4. Distribution (%) for Q5.

The means (\pm the standard deviation) corresponding to each question of the questionnaire are reported in table 2.

Table 2. Means (\pm standard deviation) corresponding to each question of the questionnaire.

Questions	Q1	Q2	Q3	Q4	Q5
Mean \pm sd	3.07 \pm 0.47	3.33 \pm 0.65	3.00 \pm 0.73	3.19 \pm 0.71	2.60 \pm 0.88

Spring 2015 students' Q6 data analysis showed that students were generally satisfied with the project but a longer session time or more team-based oral presentation sessions were asked to be considered. They also suggested that the oral communication sessions were more dynamic. Thanks to these suggestions, some design and development changes were

carried out for the spring 2016 MC course. Spring 2016 students had more medicine label-based exercises, more sessions to put in common the team-based work and more active participation was required to dynamise the session. These changes led to a statistically significant Q5 related difference between the two groups (spring 2015 and 2016 students). The difference in mean (2.41 ± 0.82 for spring 2015 students and 3.38 ± 0.74 for spring 2016 students) ($p=0.002$) and in the value distribution were statistically significant (Mann-Whitney, $p=0.008$; Fisher, $p=0.022$). 50% of spring 2015 students stated that participating in the project would not be helpful to make the most of the Medicinal Chemistry course contents. Only 5.9% of them stated that the participation in the project would be very important to make the most of the Medicinal Chemistry course, while 50% of spring 2016 students did (Figure 5).

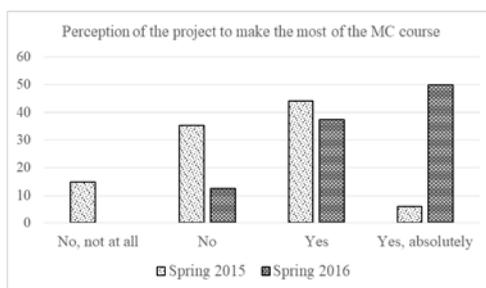


Figure 5. Difference in distribution (%) for Q5.

Value distribution and mean about the usefulness of the project (Q2) were higher than those regarding the global satisfaction about the project (Q1) (Wilcoxon, $p=0.015$; Bootstrap, $p=0.012$). 34.1% gave higher values to Q2 than to Q1, only 9.5% did the opposite. 52.4% gave higher values about the usefulness of the project (Q2) than about the help of the project to make the most of the MC course (Q5) (only 7.1% did the opposite) and 39.5% gave higher values about the global satisfaction (Q1) rather than about the help of the project to make the most of the MC course (Q5) (only 11.9% did the opposite). Moreover, 23.8% and 11.9% of students gave a 2 or 3 unit higher answer, respectively. Q5 value distribution and mean (2.6 ± 0.89) were lower than those of Q2 (3.33 ± 0.65) (Wilcoxon, $p < 0.001$; Bootstrap, $p=0.003$) and Q1 (3.07 ± 0.47) (Wilcoxon, $p=0.015$; Bootstrap, $p=0.015$). Statistical differences shown in this paragraph are due to spring 2015 students' data.

5. Conclusions

Medicine label-based exercises showed to be a well accepted and powerful tool to make the PharmD students understand the connection between the drug physicochemical properties and their clinical profile. This additional new didactic material seems to be a friendly bridge

between Medicinal Chemistry and pharmacotherapeutics. The spring 2015 and 2016 students' feedback was quite favourable about the usefulness of the project to connect the concepts studied during the medicinal chemistry course and the clinical drug profile. 78% of students were globally satisfied and 14.6% very satisfied about the project. 50% of spring 2015 students stated that participating in the project would not be helpful to make the most of the Medicinal Chemistry course contents. After carrying out the spring 2015 students' suggestions to improve the project, a statistically significant difference was observed between spring 2015 and 2016 students. 87.5% of spring 2016 students considered that the participation in the project would be helpful (37.5%) and very helpful (50%) to make the most of the Medicinal Chemistry course.

References

- Alsharif, N.Z., Galt, K.A., Mehanna, A., Chapman, R., Ogunbadeni, A.M. (2006). Instructional Model to Teach Clinically Relevant Medicinal Chemistry. *Am. J. Pharm. Educ.*, 70(4), article 91.
- Alsharif, N.Z., Galt, K.A. (2008). Evaluation of an Instructional Model to Teach Clinically Relevant Medicinal Chemistry in a Campus and a Distance Pathway. *Am. J. Pharm. Educ.*, 72(2), article 31.
- Avendaño, M.C. (2001). *Introducción a la Química Farmacéutica*. Madrid: S.A. McGraw-Hill/Interamericana de España.
- Brown, S.D. (2010). A Process-Oriented Guided Inquiry Approach to Teaching Medicinal Chemistry. *Am. J. Pharm. Educ.*, 74(7), article 121.
- Currie, B.L., Chapman, R.L., Christoff, J.J., Sikorski, L. (1994). Patient related case studies in medicinal chemistry. *Am. J. Pharm. Educ.*, 58, 446-450.
- El Sayed, K.A., Chelette, C.T. (2014). Laboratory Exercises to Teach Clinically Relevant Chemistry of Antibiotics. *Am. J. Pharm. Educ.*, 78(2), article 37.
- Khan, M.O.F., Deimling, M.J., Philip, A. (2011). Medicinal Chemistry and the Pharmacy Curriculum. *Am. J. Pharm. Educ.*, 75(8), article 161.

Designing Lectures as a Team and Teaching in Pairs

Zehetmeier, Daniela^{a,b}; Böttcher, Axel^a and Brüggemann-Klein, Anne^b

^aDepartment of Computer Science and Mathematics, Munich University of Applied Sciences, Germany, ^bDepartment of Informatics, Technical University of Munich, Germany

Abstract

A technique that is frequently used in modern software development is the so-called pair programming. The proven idea behind this technique is that innovative work in a highly complex environment can benefit from the synergy between two persons working together with well-defined roles.

The transfer of this technique as a metaphor for teaching has repeatedly been reported as a successful teaching strategy called pair teaching. In this paper, we describe our experiences with designing and teaching a complete lecture on software development as a pair.

Our contribution is the definition of patterns for role-assignments to both persons. These include patterns for the design of the lecture as well as patterns for the teaching in class itself. Our experience shows that there also exists a couple of anti-patterns namely role distributions that should be avoided.

First evaluation results are promising in the sense that the reception of structure and content as well as students' satisfaction increased significantly with the introduction of pair design and pair teaching.

Keywords: *Pair teaching; team teaching; computational thinking; cognitive apprenticeship.*

1. Introduction

The presentation and discussion of topics by two people is common practice in several fields, like educational TV-shows, debates, or in interviews. Furthermore, working in pairs has become a traditional approach in the field of software engineering and is called pair programming. As this practice has proven highly efficient (Williams, 2000) and we are familiar with it, we transferred it to our lecture design and later to our teaching.

In this paper, we present our experience with designing lectures in pairs and later teaching them in pairs. We already did this for several small units over the last year and the results were consistently positive. Thus, we wanted to bring these positive experiences to a larger scale for the winter semester 2017/18. Hence, we designed the whole module “Software Development I” in this kind of setting. We will add a description and discussion of possible definitions of roles that can be used during design as well as throughout the teaching of lectures.

The module “Software Development I” is a compulsory module of our first semester Computer Science Bachelor curriculum. The module has 8 ECTS and consists of two times 1.5 hours lecture and 1.5 hours lab session per week. Students need to hand in and pass several lab exercises in order to be admitted to the final written exam.

2. Related Work

This work is guided by several influencing factors from various disciplines: pair programming, a well-known technique in the practice of software development – computational thinking, an overall goal in higher education – cognitive apprenticeship, which is a teaching method adopted from craftsmen training to cognitive processes and the distinction between cooperative teams and coach.

2.1 Pair Programming

A well-known and established approach in the domain of Software Engineering is pair programming as part of extreme programming (Beck, 2000). Pair programming denotes the cooperation of two people working together at one workstation on the same task and with a well-defined role distribution: the driver and the navigator. The driver is the actively programming person being in control of the keyboard – whereas the navigator monitors the activities with some distance. Several positive aspects of this model of cooperation are reported in (Williams, 2000):

- **Pair Pressure:** Increase of motivation as you don’t want to let your partner down.
- **Pair Thinking:** Especially in the complex process of developing software, several different solution strategies are possible at any point in time. A pair of developers helps to permanently have them in mind and distill the currently best one of them.

- **Pair Relaying:** Pairs achieve solutions that a single one often had not reached. The main reason is that different points of view complement each other.
- **Pair Reviews:** As reviews are typically peer group discussion activities (Gilb & Graham, 1993) they are the natural tool for cooperative work, e.g. in our case during the preparation of lectures.

The approach of teaching in pairs or larger teams has already been described in several publications, like (Huber, 2000), (Burden, Heldal, & Adawi, 2012) and (Liebehenschel & Schäfer, 2017). All authors report positive influence on lecturers and students. Nevertheless, the papers are lacking a discussion of differentiated roles. We expect added value when taking different perspectives that are apparent to the students.

2.2 Computational Thinking

As we educate future computer scientists, we teach them specific professional competences. Computational thinking denotes a class of many skills and abilities, computer scientists need. These competences are independent from a specific implementation in a concrete programming language. Thus, this might be an interesting point where to differentiate the roles in a pair of lecturers.

The term of computational thinking is strongly influenced by Jeannette Wing. A general definition is: “Computational thinking involves solving problems, designing systems, and understanding human behavior, by drawing on the concepts fundamental to computer science.” (Wing, 2006)

However, computational thinking comprises a huge variety of processes and techniques. We focus on some that are relevant for our approach. All of these are based on (Wing, 2006):

- Evaluation of the aesthetics, and the design of a system, rather than just focusing on correctness and efficiency.
- Applying abstraction in order to find an appropriate representation of a problem or modelling all significant aspects.
- Using heuristic reasoning to come up with a solution.

2.3 Cognitive Apprenticeship

Most of the processes defined in computational thinking cannot be taught and done like following instructions in a recipe. Thus, students need to learn the processes experts use to handle complex tasks. In one characteristic, cognitive apprenticeship is defined as a learning-through-guided-experience with focus on cognitive processes (Collins, Brown, & Newman, 1988).

3. Patterns for Pairing of Roles

During the cooperative design and teaching of our class on software development we experimented with various roles and their pairing. The class of patterns we propose as a result of our experiences can be subdivided into two categories. Furthermore, we also found a couple of anti-patterns which we include as a third category. Pair teaching can occur in several constellations, as the lecturers can take different roles. From our perspective, each formation has its own intended use, strategies and thus advantages and disadvantages. It is important that each role is personalized by a lecturer (Andersson & Bendix, 2006).

From our point of view, the fundamental success factors that must be given are that both involved persons see each other as peer and must both be committed to the success of the module. Additionally, they should have similar didactical knowledge and teaching experience.

3.1. Patterns for the design and preparation phase of lectures

Didactic vs. professional. On the one hand side, it is necessary to simplify examples from professional tasks with respect to students' current level of knowledge. On the other hand, it is important not to design teaching examples that are contrary to professional practice. Here both peers need to discuss and find the best way to satisfy these requirements.

Analytically vs. holistically. This setting helps us to deal with the huge content of the curriculum. One peer focuses on the details and in-depth knowledge of a (sub)topic. Whereas the other keeps track of the overall curriculum. In our daily practice, this supported us to stick to our mantra: "everything we teach is correct – but we do not discuss every detail".

Reviewer vs. creative. After several design workshops, we came up with a process of defining requirements and teaching goals, which we build our lecture and lab on. In order to keep this process running, one of the peers constantly reviewed the process and investigated whether we still work on the requirements or not. The other peer was the creative one, who again and again came up with new ideas.

3.2 Implementation/teaching phase

As computer science is built on a solid theoretical basis like many other disciplines, it is necessary to show novice programmers the differences between the scientific concepts and the concrete implementation, as they need to master both later on.

Theorist vs. practitioner (Böttcher, Utesch, & Moore, 2009). This is the role distribution for the classical situation where students learn a theory and apply it later. In this case one lecturer takes the role of the practitioner and the other acts as theorist. The practitioner

works on a real problem that is adjusted to the students' level of knowledge. The theorist teaches the theory and points to the theory students learned during the lecture/module.

Audience oriented vs computer focused. In case of software development and coding live in class it is very helpful, when one peer is coding and thus focused on the computer. Meanwhile, the second peer can keep an eye on the audience. Usually one is able to recognize whether students can follow the coding or not. If not, the peer in the audience oriented role should interrupt the coding in an appropriate moment and ask the peer or the students questions to clarify the decisions before they continue.

When considering computational thinking and cognitive apprenticeship, we came up with several more pairs, which are focusing on education in computer science, but might be transferrable to other disciplines.

Real world vs. software orientation. In their later profession, students need to deal with non-computer scientists as domain experts in order to collect requirements and transfer them to software. In this constellation, the process of translation from real-world abstractions to programming concepts is accompanied by one person focusing on real-world domain and one focusing on the software-based representation of that domain. Equivalent to the case above there exists the role of a practitioner which is in our case a software engineer. The pair is completed by a person that concentrates on the concrete real-world entities the software is intended to represent later.

Computational thinking vs implementation. Another important aspect in teaching computer science is to focus on processes represented in computational thinking and to consider it independent of a concrete implementation. In this case, both roles need to have a background in software development. One focuses on identifying the general concepts like categorization, repetition, or discrimination of different cases in order to solve a real-world problem. During this process, he or she demonstrates the application of key competences like logical or abstract thinking and highlights evaluation criteria. The other transfers the abstract concepts into appropriate constructs of a specific programming language. For both roles, it is important that they make their thinking tangible and highlight decision-points as expressed in the framework of cognitive apprenticeship.

Beside the technical and didactical roles, we unintentionally came up with three more roles.

Breaking point vs flow. In this setting the flow person continues with the new content. In contrast the other peer focusses on predetermined breaking points and intervenes if students did not come up with the predicted questions. Thus, the content flow stops here and the lecturers start a discussion with the students. At this point we often discuss software design decisions.

Checker vs speaker. Is similar to breaking point vs. flow. One peer focusses on the new content. The other one asks students questions about the necessary prerequisites. A good metaphor for this setting is “cruise control”. One concentrates on a continuous pace, whereas the other checks for obstacles, like missing knowledge and thus adjusts the speed.

Focused vs overviewing. This last setting proved as a good tool to remind students that they have to perform follow-up course work. While one peer again concentrates on the new content, the other one analyses the questions immediately. If the question has already been discussed in the lecture, we reference to the specific location or just repeated it quickly. Otherwise we can either answer it or put a reminder to the white board.

While teaching it is not always necessary to take contrary or complementary positions. Pair thinking also happens if both peers act on the same level. This could help to identify misconceptions, interpretation of students’ questions as they are not also clear. Another advantage is that the students have access to two perspectives and explanations. Furthermore, one can write down questions, tripping points, and much more. Following the lecture, both can reflect on the lecture in order to improve it for upcoming semester, to identify content that needs to be repeated or to plan next steps.

3.3 Beware of Anti-Patterns

Especially during the teaching phase, the pair needs to beware of typical anti-patterns. Often one does not intend to make this happen, but they might occur. A typical example is that one takes the role of a professor or lecturer and the other one acts as a student or even worse an airhead. This intellectual hierarchy lets the second person appear non-professional.

Another anti-pattern that occurred during the design phase, did arise from the job hierarchy. However, from personal experience, we immediately recognized this pattern and planned the lectures in a way that this would not show up. The supervisor or professor should not act with her or his employee e.g. PhD candidate as they are not on the same level.

4. Results of Evaluation

When starting this teaching approach, we had some criteria in mind we would like to improve. On the one hand, we wanted to enhance constructive-alignment (Biggs, 1996) throughout lecture, lab and exam. Furthermore, we wanted to arrange the topics to teach in a sequence where all prerequisites have already been covered at any time. Moreover, we wanted to create demand for the following concepts respectively.

After approximately six weeks we held a lecture where we reflected on the course with our students. Students were asked to think of obstacles that currently reduce their speed of learning and reflect on characteristics why software development is difficult for novices.

What we found interesting was that students were aware of thinking processes, computational thinking and the translation of real world problems into the software context. They were no professionals although they were already able to communicate the necessary steps they need to understand and accomplish in order to become professionals. We observed that the pairing of computational thinking and implementation has established at least the awareness that typical ways of thinking exist in computer science and that the translation of concepts into source code is a process separate from finding the right concept. An example statement is “I have not internalized the way to think yet” or “I’m still suffering with translating text into code”.

At the end of each semester there is a university-wide lecture evaluation, which is a solid data basis we can use to evaluate our teaching. The questionnaire consists mainly of items, whose answer format are Likert scales with values ranging from 1 (fully disagree) to 5 (fully agree). We have data from previous courses taught in winter semester 2014. These can be compared with data collected with help of the same questionnaire in winter semester 2017 where we designed and taught a complete lecture in a pair.

The evaluation results we obtained for this make us feel optimistic. A statistically significant improvement can be seen in the questions listed in Table 1. We think that these represent our goal of increasing constructive-alignment and enhancing the topic arrangement.

Table 1. Results of an unpaired t-test, showing the significance level for improvement between lectures in the years 2014/15 (n=40) and 2017/18 (n=29).

Question	Average 2014	Average 2017	Signifi- cance
I can understand the content structure of the course.	3,1	4,2	≥ 99.9%
In my opinion, the two parts of the course complement each other well.	3,2	4,1	≥ 99.9%
I can clearly see what the learning goals of the course are.	3,4	4,1	99.8%
The applicability of the course content is clear to me.	4,1	4,6	99.8%
Complicated issues were explained to me in a comprehensible manner.	3,5	3,9	95%
In my opinion, the practical exercises are well adjusted to the taught content.	3,2	3,9	99.8%

5. Conclusion

From our lecturers’ perspective, this approach is great. During the design phase, we could experience pair pressure as we worked much longer and harder than we would have been working on our own. If we try to quantify the additional effort we spent on the lecture, it is about 25% more preparation effort than we invest in our regular preparation. Pair relaying and pair thinking enhanced our work significantly, as we shared and discussed many ideas.

Even during the lecture, we experienced pair thinking and relaying for example when dealing with students' questions. Often students cannot formulate their questions precisely and have underlying misconceptions. We were much more effective in identifying the bottom line and correcting them immediately.

During the review of this semester, the question was raised, whether one can take the different roles on his or her own when disciplined enough. In our opinion it could be possible, but it is necessary to be aware of all the different roles and to take them one by one. Furthermore, we think it is necessary to concern and embed the roles already in the design phase.

Nevertheless, some constellations of roles just occurred during the phases and we did not plan them ahead. Thus, the approach added value to our teaching. Furthermore, effects like pair pressure, relaying and thinking can just occur in pairs. Hence, we recommend to try this approach and experience the great improvement if possible.

References

- Andersson, R., & Bendix, L. (2006). Pair Teaching--an eXtreme Teaching Practice. 4: *e Pedagogiska Inspirationskonferensen*.
- Beck, K. (2000). *Extreme programming explained: embrace change*. addison-wesley professional.
- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher education*, 32, 347-364.
- Böttcher, A., Utesch, M. C., & Moore, A. (2009). Erfahrungen mit Pair Teaching für Software Engineering: Kooperation von Hochschule und Industrie. *SEUH*, (pp. 5-15).
- Burden, H., Heldal, R., & Adawi, T. (2012). Pair lecturing to model modelling and encourage active learning. *Proceedings of ALE*.
- Collins, A., Brown, J. S., & Newman, S. E. (1988). Cognitive apprenticeship. *Thinking: The Journal of Philosophy for Children*, 8, 2-10.
- Gilb, T., & Graham, D. (1993). *Software inspection*. (S. Finzi, Ed.) Addison-Wesley Longman Publishing Co., Inc.
- Huber, B. (2000). Team-Teaching. Bilanz und Perspektiven. *Eine empirische Untersuchung im Kärntner Volksschulbereich/Integrationsklassen (Schuljahr 1998/99) zur Thematik/Problematik der Zusammenarbeit im Zweierteam*. Frankfurt a. M.: Peter Lang.
- Liebehenschel, J., & Schäfer, J. (2017). Teamteaching-ein Fallbeispiel. *SEUH*, (pp. 91-99).
- Williams, L. (2000). *The collaborative software process*. Ph.D. dissertation, The University of Utah.
- Wing, J. M. (2006, March). Computational Thinking. *Commun. ACM*, 49, 33-35.

The higher education in modern russia as institute of cultural transfer and transformation

Narkhova, Elena N.^a; Narkhov, Dmitry Yu.^b; Kalyuzhnaya, Ekaterina G.^c

^a Department of the theory, methodology and legal support of the public and municipal administration Ural Federal University named after B.N. Yeltsin, Ekaterinburg, Russia, ^b Department of Organizing Youth Work, Ural Federal University named after B.N. Yeltsin, Ekaterinburg, Russia, ^c Department of management in the sphere of physical culture and sport, Ural Federal University named after B.N. Yeltsin, Ekaterinburg, Russia

Abstract

The problem of changes in modern Russian education is analyzed in the article. Modernization of the Russian education system staticized questions of a ratio of traditions and innovations in education, about maintaining parity of training and education. The article's purpose is to define the mechanism for implementation of upbringing in the system of modern Russian education as culture traditions (2014-2017).

The research of the relation of workers from science and pedagogical sphere, students, administrative personnel and management to this issue influences on their activity effectiveness. Extent of consent with different points of view actualizes the potential of communities of education that appears in the form of the social capital.

Authors emphasize the value of an educative role of education institute as a culture translator because people get their own perception of the world, of the appraisal system the system of coordinates, including values in the course of education and comprehension of the world. The cultural background that the person perceives in the process of education, gives the chance to perceive both modern reality and him or herself in this reality more multilaterally.

Keywords: *higher education; traditions; social institutes; cultural polistilizm; modernization of education, upbringing of students*

1. Introduction

One of the main cultural institutes is education. Its model defines the direction of society development in general and formation of the personality certain type. The civilizational mission of education is the transfer of sociocultural experience to new generations. The system of the higher education is an important social institute of cultural values broadcast as a part of professional education, professional formation and development of the personality.

The processes that could be seen at the modern Russian higher school as multidimensional and ambiguous phenomena can be described and defined within the social transformations happening in modern Russian society. These transformations are inseparably linked with reevaluation of the ideas and search of the new semantic reference points that may give Russian society stability that is in a condition of an anomy. The kernel of values of the Soviet culture is destroyed, and new one is still developing, there is a search of various valuable models and options. The culture of modern Russian society is contradictory, ambivalent, "polistylistic" (term by L.G. Ionin, 1996) that is caused by the nature of modern culture which is opened, has a set of valuable systems, interaction and mutual enrichment of national cultures. Other aspect of modern culture – commitment to the idea of a deconstruction of traditional norms, samples, the values developed by mankind during history (Kurennay V. A., 2011). During an era of mass culture and devaluation of moral values the higher education loses the elitism, the personal forming and socializing functions, turning into ordinary educational service (Ogurtsov A. P., 2001).

However the higher school as an institute and the mechanism of cultural reproduction in society is urged to support creative tendencies and to resist destructive calls of the present. The combination of various cultural models is the cornerstone of historical development experience of the higher school (Karrye G., 1996). Values, content of preparation, mechanisms and the corresponding standards of creation of educational process have always been caused by the ideology dominating in society and the cultural dominant generated by it (Shutenko A. I. 2013). So, in the Soviet society the ideology has subordinated the higher school to political goals and tasks. Based on the concept of a power culture dominance, the higher school first of all had to form such values as "devotion" and "fidelity" to the ruling party or to the individual person.

What can provide stability of an educational process creation in the Russian higher school today in the era of uncertainty?

In the conditions of searching the Russian society education development vector the question of correlation between functions of upbringing and education in educational process is debatable. Some authors (traditionalists) prove the need of preservation of both functions for their close interrelation that corresponds to traditions of Russian education

(Yemelyanova I.N. ect., 2012; Medvedeva O. Yu., 2002; Vidt. I. E., 2006). Innovators, who support modernization changes, allocate cultural functions in the list of the universities' social functions, insist on "gradual rapprochement of the training and bringing up activity in the form of integration ..." (Vidt. I. E., 2006, p. 179), but leave a question of a correlation between upbringing and education opened (*The Role of Universities*, 2010). Foreign researchers criticize the federal universities for obvious focus on social responsibility which disturbs competitiveness at the global level (Jonson, M., 2010, p. 19).

The discussion is conducted not only in Russian but also in the whole world educational space. In particular, there was a speech in the deployed keynote of professor Piet Kommers at the last HEAd conference '17 (Kommers, P., 2017) about a role of "the understanding education", based on L.S. Vygotsky philosophical views. The understanding is connected with familiarizing with meanings of human activity and with process of a sense retreatment and determined by the spiritual potential of the subject, its system of worldview values and socio-cultural prerequisites of reality understanding.

The type of the personality that is motivated on self-change, self-development and capable to create socially significant products of own professional activity is demanded in the modern world. In this case, the personality becomes the education purpose, and education as institute of culture becomes a factor of the personality development. The priority of the personality forms an axis of educational process building at the higher school and establishes a dominant of culture. It defines opportunities for educational practices aimed at the personality development in the unity of its consciousness (valuable orientations) and activities.

2. The studied structures, processes, phenomena and methods

The research is intended to reveal the changes in functioning of higher education institute caused by the societal consequences of transformations of the Post-Soviet period and the followed multivector modernization of the higher education. Considerable changes are implemented in the structural, institutional and substantial directions. The greatest discussions both in scientific community and among public servants in the last decades cause the problems connected with educational activity of higher education institutions. We were interested in the relation towards the process of educational activity of scientific and pedagogical workers and students.

Results of the next researches are the basis for work.

1) Federal complex sociological poll of teachers of higher education institutions (2013-2014), N=1115, quota representative selection, the basis for quoting – the status of higher education institution acquired as a result of structural modernization (national, federal,

national research, other) 51 state and private higher education institution from 32 cities of Russia.

2) The federal sociological poll of students devoted to problems of justice and inequality in modern society, a method of casual selection, N=3964, 71 higher education institution from all regions of Russia;

3) Regional complex sociological poll of students of Sverdlovsk region (2016), N=2170, two-step quota representative sampling, the basis for quoting – the number of students, the place of a location of higher education institution and specialty.

4) Content analysis of personal pages of students and research and teaching staff of the universities, 2016-2017, N=230, social network VKontakte (vk.com).

3. Discussions and results

Formation and development of the personality continues in the conditions of learning in higher education institution. Training of the younger generation to professional activity at the higher school can't be limited to gaining a certain sum of knowledge. Except gaining knowledge and professional skills, future expert need to orientate on moral and ethical standards that is significant in the conditions of values and standards system blurring of modern society. However, at the state level an indicator "educational work" isn't considered at higher educational institutions accreditation in the Russian education system. It doesn't promote the solution of an important task – upbringing the identity of the expert. According to teachers, modernization changes in universities haven't led to any increase of a role of the teacher in educational activity (which we consider as the most important element of education tradition). Every second teacher is the participant of federal survey in 2014 told about it (and every fourth one hasn't chosen the answer). Nevertheless, the missionary mentality of university staff has remained. As a result, the cultural potential of scientific and pedagogical workers is implemented mainly in classrooms (table 1).

Table 1. Extent of participation of teachers in educational work with students, 2014, % of number of answered

Ways of participation	Do not participate			Participate actively		
	1	2	3	4	5	Index*
I form an active civic stand by all available means	9	14	22	22	33	0,57
I am engaged in educational activity only on occupations	9	9	26	27	29	0,58
I participate in the events held within educational activity together with students, at faculty, in higher education institution	24	14	20	16	27	0,08
I participate in organization of events within educational activity of faculty, higher education institution	29	13	18	19	22	-0,08
I am engaged in educational activity as the curator of the academic group	57	4	9	14	16	-0,72
I participate in the events held within educational activity together with students, in the city, the territorial subject of the Russian Federation	48	16	15	11	11	-0,77
I participate in the events held within educational activity together with students, in the all-Russian and international actions	57	14	12	10	8	-1,00
I participate in organization of events within educational activity in the city, the territorial subject of the Russian Federation	58	13	12	9	8	-1,04
I participate in the organization of the all-Russian, international actions within educational activity	67	10	9	7	7	-1,22
I direct educational processes and youth policy at the level of the city, the territorial subject of the Russian Federation	72	8	5	7	8	-1,29
I direct educational processes and youth policy at the all-Russian, international level	85	8	3	1	4	-1,69
I direct educational processes and youth policy at the level of faculty, higher education institution	88	6	3	2	2	-1,75

The numerous problems of the younger generation are the result of the lack of attention to purposeful educational work at the higher school that is caused by lack of accurate system of values which may appear due to the only way – through education. At the regional level it was shown in structure fluctuations of Sverdlovsk region students' valuable orientations:

high degree of hedonism (Vishnevsky Yu.R. ect., 2017, STUDENT..., pp. 395-407), education shift from the category of terminal values in tool [Vishnevsky Yu.R. ect., 2017, STUDENT..., p.421], slowly decreasing share believing that it is optional to observe laws (in 2007 – 77%, in 2016 – 64% had justifications to break the law, most often because the law limits the rights of the personality) [Vishnevsky Yu.R. ect., 2017, STUDENT..., p. 505]. At the all-Russian level the cultural anomy and broad dispersion of students has proved in estimates of the Russian society as rather unfair, than fair (3,78±0,13 on a 10-mark scale). Such assessment reflects ambiguous socio-economic and socio-political installations created by education with discrepancy in valuable orientations: on the one hand, installations on own forces, enterprise abilities and creativity, so far as concerns own wellbeing, and on the other hand, installations on paternalism, guardianship from parents and the state, so far as concerns wellbeing of surrounding social space (Vishnevsky Yu. R. & Narkhov D. Yu., 2017, p. 36-37).

At last, the analysis of personal pages of students on social networks confirms a conclusion about dispersion of valuable orientations. Along with an interiorization of examples of high academic culture, an avatar of students also shows a considerable participation in countercultural processes, such as trolling, deviant subcultural samples, etc.

Meanwhile, one of the modernization theory representative R. Inglehart claims that transition to post-industrial society brings cultural wealth to the forefront again. The understanding of the purpose and sense of human existence is again regarded as the issue of paramount importance. At the same time he notes: "expansion of not materialistic values happens very quickly that this phenomenon is connected with alternation of generations and caused by gradual change of motivation, increase in material well-being and growth of educational level of people. Considering that development of post-materialistic values causes economic and cultural progress of the western countries in recent years, it is possible to seriously doubt in reality of the entry of Russia into a number of post-industrial powers, to get rid of the illusions existing in this respect" (Inglehart F. P., 1990, p. 247).

4. Conclusion

Now educational work at the higher Russian school isn't a priority as the higher school is considered as the level of professional education that assumes formation of professional qualities, and the educational component is considered in the context of the training strategy formation. Personal qualities aren't programmed by standards of the higher education as they enter common cultural mix and inherit the tradition which has come from the fundamental education where upbringing work is one of the important vectors of the personality development.

Education values for the teacher of higher education institution need to be considered at three levels: education in the course of training, education at the level of realization of the

practice module and in the course of out-of-class activity. Teachers, as a rule, aren't engaged in out-of-class activity, therefore the educational component is shown in the context of teaching and work with students on practitioners.

On the one hand, in a pursuit of professionalism, based on competence-based approach, authors of the program of modernization of the Russian higher education "have lost sight" of the cultural expert for some time, having placed emphasis on especially professional, technological competences of educational process to the detriment of common cultural competences. The latter remains the declaration of working programs of disciplines, but not educational practice. We believe that maintaining traditional balance between training and education in Russian education, the active and positive social position of the university teacher is defined by prospects of the higher education. In this regard as a practical measure it is correct to return educational activity to number of accreditation indicators of the universities. In wider plan if the true professional (but not the robot performer) is needed, it is worth paying attention to experience of modernization of education, based on maintaining traditions in education (see: He Chuanqi, 2011).

On the other hand, it is difficult to divide the training and educational functions of higher education institute. Process of students upbringing carries out as well an educational function (especially in the sphere of humanitarian knowledge) when through the culture of the past comprehension and own valuable orientations formation the person also acquires the system of internal reference points when the peculiar interiorization of culture of the past happens (for example, in the context of culture of the past experience reflection the person can analyze processes of modern sociocultural reality). The cultural background which the person perceives in the course of education gives the chance to more multilaterally perceive the modern reality and him or herself in this reality. Educational work in universities shouldn't be considered as something isolated – as soon as a complex separate from lectures and seminars of educational actions. For example, within teaching disciplines of a humanitarian cycle, students ability development to more difficult understanding of the world and themselves is already supposed. The task of higher education, at least of its humanitarian part, is "to make" people more complicated, to teach them not unilinear but volume view of the world and perceptions of diverse reality. Such task can be quite incorporated in a framework of training process at the higher school and the cultural values transfer can be carried out through the transfer of the culture itself and cultural samples of the past and the present in their interaction, through the story about how the image of the world during different cultural eras changed as cultural samples were transformed. The solution of this task contributes to the development of students' ability to correlate different valuable paradigms, views of the world for formation of understanding of complexity of the world and awareness of impossibility to cross all-humanistic sides of human life.

It is important to acquaint students with problems and calls of the present and with certain transitional situations in modern culture when there is a need to form new meanings and values instead of the unstable ones. Partly remaining, values of traditional culture have to be complemented with some new meanings. The 20th century has generated a situation of loss of immutable belief in some traditional values, the syncretism of perception of a picture of the world declared by a certain ideology has disappeared. But whether it means a loss of meaning? If this is so, then the anomy becomes norm. The goal of culture in new conditions is to help to find new personal meanings, to find somewhere a support in former meanings, to formulate new ones.

Modernization processes in the Russian system of the higher education have to be aimed especially at providing of the education and students qualities upbringing in the framework of their professional training and the inclusion of an upbringing component in the educational process.

References

- He Chuanqi (2011). *Summary report on the modernization in the world and in China (2001-2010)* Translated from English. Under the editorship of N.I. Lapin. Moscow: Publishing house "Ves Mir". (In Russ.).
- Inglehart F. P. (1990) *Culture Shift in Advanced Industrial Society*, Princeton University Press.
- Ionin L. G. (1996) *Culture of Sociology*. Moscow: Lagos. (In Russ.).
- Jonson, M. (2010). Rediscovery of Public Research Universities in 21th century: The Balance of Global Competition, Regional Partnership and Community Engagement. In: *The Role of Universities in the development of region: papers for Consideration* (2010). International Conference, January 28-29, 2010; Ekaterinburg, USU, CASE & Civil Chamber of the Russian Federation, pp. 16-21. (In Russ. and Eng).
- Karrye G. (1996). Cultural models of the university. *Alma mater*, 3, 15 – 24. (In Russ.)
- Kommers, Piet. (2017). Learning for Societal Evolution (Keynote). *3rd International Conference on Higher Educational Advances*, June 21-23, Valencia, Spain.
- Kruzhalin V.I. (ed.) (2010). *Quality of university education: state, problems, prospects: scientific works of Institute of complex researches of formation of Lomonosov Moscow State University*. Moscow, *Dialogue of cultures*, 68-79. (In Russ.).
- Kurenay V. A. (2011). Bastard of a modernist style. About the current crisis of the university. *The Emergency ration*, 3 (77), 103-110.
- Medvedeva O. Yu. (2002) Cultural tradition in education. *Outlook and culture: collection of articles*. Under a general edition of the prof. V.V. Kim; The Russian philosophical

- society, etc. – Ekaterinburg: Bank of Cultural Information publishing house, 303-309. (In Russ.).
- Ogurtsov A. P. (2001). Postmodern image of the person and pedagogics. *Person*, 3, 5-17. (In Russ.).
- Shutenko A. I. (2013). Sociocultural measurements of steady pedagogical process at the higher school. *Knowledge. Understanding. Ability*, 4, 249-251. (In Russ.).
- The Role of Universities in the development of region: papers for Consideration* (2010). International Conference, January 28-29, 2010; Ekaterinburg, USU, CASE & Civil Chamber of the Russian Federation, 144 p. (In Russ. and Eng).
- Vidt. I. E. (2006). *Education as culture phenomenon*. Tyumen: Printer publishing house.
- Vishnevsky Yu.R. (gen. ed.), Bannikova L. N. [etc.] (2017). *STUDENT of 1995-2016: dynamics of sociocultural development of students of Central Ural Mountains*, Ekaterinburg: Yeltsin UrFU. (In Russ.).
- Vishnevsky Yu. R. & Narkhov D. Yu. (2017) What society is just: views of Sverdlovsk region students. *Sociological studies*. 5, 35-46.
- Yemelyanova I. N. (gen. ed.) ect. (2012). *Formation of the spiritual and moral environment of educational institution*. Tyumen: Publishing house of the Tyumen state university (2012).

Student and instructor attitudes toward CALL and MALL in the L2 classroom

Pagel, James W^a; Lambacher, Stephen^b; Kikuchi, Hisayo and Mori^c, Sachiko^a

^aCollege of Science and Engineering, Aoyama Gakuin University, Japan; ^bSchool of Social Informatics, Aoyama Gakuin University, Japan; ^cSchool of Global Studies and Collaboration, Aoyama Gakuin University, Japan.

Abstract

As part of an ongoing study focusing on language learner and instructor attitudes toward the use of computers and mobile devices in second language (L2) learning contexts, the authors attempt to identify to what degree language instructors value the use of computers and mobile devices in their teaching. We compare the responses of a survey administered to an “in-house” group of instructors within two faculties of a private university in Tokyo, Japan, with the responses collected from a similar survey administered to instructors solicited through various CALL organizations. The number of respondents of the “in-house” survey during the first three years was relatively low; however, in the final year was considerably much higher, with the number from both full-time and part-time staff totaling 34. The total number of survey respondents from the CALL organizations totaled 121, with the participants’ places of employment ranging from Europe to the Asia Pacific Rim. In addition to offering an interpretation of a sampling of the Likert scale items found on the surveys, the authors focus on comparing the responses offered by both groups of instructors regarding which skills they focused on in the CALL classroom, as well as what mobile applications they encouraged their students to use.

Keywords: *survey analyses, intrinsic motivation, mobile applications, adoption of mobile technologies*

1. Introduction

The incorporation of computer-assisted language learning (CALL) and mobile-assisted language learning (MALL) technologies by foreign language educators worldwide has significantly altered the role of the teacher, leading to a validation of Kurzweil's prediction that "education will advance from 2009, with students using computers nearly exclusively for learning, with teachers available as motivators," (Kurzweil, 2000). However, as language education surges forward, does the incorporation of these technologies benefit the learner or simply satisfy the instructor's need to be innovative? Also, why are some teachers still hesitant to incorporate these potentially effective technologies? The main goal of this study is to try to answer these questions as a way to help gain a better understanding of the current and future states of ICT technologies and methodologies, and how they can be more effectively utilized to improve foreign language education. We attempt to achieve this goal by administering two surveys – the first survey to English language instructors employed at our university in Tokyo, and the second survey to CALL practitioners living and working at universities in Europe and the Pacific Rim region. Our main goal is to gauge the attitudes of instructors regarding their use of CALL and MALL technologies in teaching English as a second/foreign language. We were also interesting in finding out the most commonly used applications being used by instructors and whether they were having a positive impact on their students' language learning in and out of the classroom. Additionally, we focus on ascertaining what the main obstacles are that prevent educators from embracing these rapidly advancing technologies.

MALL has indeed emerged as the next generation of e-Learning. One reason for this is due to the high availability of mobile devices worldwide. The smaller screen size and touch interface of smartphones and tablets also leads to a more concentrated learning, as the student typically has running in the background just a single program at any given time, as opposed to the more common multitasking operations found on desktop and notebook PCs (Gualtieri, 2011). MALL is motivating to learners to improve foreign language skills, as it offers them a rich, informal, contextual, and ubiquitous learning environment. Mobile learning technologies are rapidly gaining popularity around the world as an effective way to enhance foreign language learning education. M-learning is motivating to learners because it offers rich, informal, contextual, and ubiquitous learning environment for learners to control their time, environment, and speed. The use of mobile technologies for language learning purposes has numerous advantages over other methods, for example, the countless number of English news programs, language learning apps, podcasts, and videos that are easily accessible and free or reasonably priced. Web-based resources using Web 2.0 tools and mobile computing technologies can be easily integrated to promote collaborative learning activities.

In second language (L2) learning, and in CALL in particular, there has been an increasing body of research dedicated to the use of mobile devices in language learning over the past several years. Teachers and researchers use the term MALL as if it were familiar to everyone in the field. It is not our intention here to trace the roots of MALL and its place in language learning today (see Stockwell (2012) for a more detailed discussion). Instead, our purpose here as educators is to try to determine whether mobile-assisted learning holds benefits for our students, to see how and why students come to use this technology, and how mobile learning compares with more traditional classroom approaches.

Much prior research has focused on how CALL compares with more traditional classroom approaches; see in particular Levy and Stockwell (2013), both of whom give exhaustive coverage to this important area but in different eras. The literature on learning using mobile devices and student reactions—other than criticism as it pertains to the devices' limitations, size and thus readability (see Chinnery, 2006)—is still rather limited, as publications to date tend to describe the types of devices used, e.g., PDAs, cell phones, etc., and outcomes expected.

During the past five years at Aoyama Gakuin University (AGU) in Tokyo we have surveyed both our students and instructors annually within two schools – the College of Science and Engineering and the School of Social Informatics, respectively. A key motivating factor for this research has been the total revamping of one of our school's English curriculum, which went into effect in April 2012. The surveys were thus developed to serve as part of a faculty development endeavor to evaluate instructor reactions to the new curriculum, which required all classes be held in CALL classrooms and for instructors to adapt their teaching methods to take full advantage of the available facilities and technology. The total number of student respondents from both schools has averaged nearly 350 annually. Our “in-house” teaching faculty has been comprised of nine full-time and 26 part-time instructors across the two schools.

2. Method

2.1 International Survey

The surveys were created using SurveyMonkey®. The “international” survey was comprised of 42 questions based on Likert scale five-item response type (1 “Strongly Disagree” to 5 “Strongly Agree”). We targeted organizations comprised of CALL practitioners. The survey was distributed to volunteers solicited through the LinkedIn™ CALL page (i.e., targeting EUROCALL membership) and direct solicitations made to JALTCALL and APACALL membership through their respective organizations. All survey responses from the CALL organizations totaled 121. The respondents' employment locations, as could be expected given the sources tapped, ranged from Europe to Asia, including Japan and other Asia Pacific Rim countries, with a few exceptions. In terms of

age, the respondents were equally distributed in the 30s, 40s, and 50s. Male respondents outnumbered females 57% to 43%. Additionally, 80.9% of the respondents were employed as full-time instructors engaged in L2 teaching.

2.2 In-house Survey

The In-house survey was comprised of 32 questions of the same Likert scale five-item response type. The survey was administered four times over a four-year period. To ensure anonymity, all questions regarding personal information, such as age and nationality, were eliminated. The number of teaching staff of the two faculties currently totals 34. While the total number of respondents participating during the first three years averaged only 16, this number increased in the final year due to an increase in the number of instructors employed within both faculties as a result of an expanded English curriculum.

3. Results

3.1 Survey (CALL)

Table 1. Mean ratings for survey items related CALL.

	Mean rating	Std Deviation	Sig.
<i>CALL technology is readily available at my university.</i>			
In-house	4.4	.79	p < .05
International	3.7	1.13	
<i>I feel comfortable using CALL.</i>			
In-house	3.5	.89	p = .938
International	4.3	.90	
<i>Using CALL is not worth the trouble.</i>			
In-house	2.3	.95	p = .723
International	1.9	1.08	
<i>I require my students to use CALL for learning English.</i>			
In-house	3.9	.96	p = .129
International	3.6	1.08	
<i>My students enjoy using CALL technology to learn English compared with traditional methods.</i>			
In-house	3.5	.72	p = .204
International	3.7	.88	
<i>Using CALL technology has improved my students' English skills</i>			
In-house	3.5	.80	p = .173
International	3.9	.77	

Table 1 shows the mean response ratings of a select number of survey items related to CALL. We were interested in gauging both groups’ attitudes toward their use of CALL in the classroom. Overall, a significant difference was exhibited in how both groups responded to the item “CALL technology is readily available at my university,” with the “in-house” group responding higher than the “international” group (4.4 vs. 3.7). Conversely, the “international” group was more confident than the “in-house” group in their comfort level using CALL (4.3 vs. 3.5), albeit a nonsignificant difference. In response to “Using CALL is not worth the trouble,” the “in-house” group agreed slightly more than the “international” group (2.3 vs. 1.9). As shown above, both groups’ mean ratings were somewhat high for the following three items related to using CALL for English language learning: “I require my students to use CALL for learning English during class,” “Using CALL technology has improved my students’ English skills,” and “My students enjoy using CALL technology to learn English compared to traditional methods.” However, it should be pointed that some of the responses indicated that facilities were not available for students on campus from universities outside of Japan.

3.2 Survey (MALL)

Table 2 MALL-related survey items.

	Mean rating	Std Deviation	Sig.
<i>I use a mobile device to facilitate my own foreign language learning.</i>			
In-house	3.4	1.21	p = .61
International	3.5	1.29	
<i>I feel comfortable using MALL technology.</i>			
In-house	3.3	.89	p < .05
International	4.8	1.11	
<i>Using MALL is not worth the trouble.</i>			
In-house	2.4	.95	p = .075
International	2.4	1.27	
<i>My students enjoy using MALL technology to learn English.</i>			
In-house	3.4	.67	p = .227
International	4.6	.80	
<i>Using MALL technology has improved my students’ English skills.</i>			
In-house	3.3	.64	p < .01
International	4.4	.96	

Table 2 shows both groups’ responses to a select number of MALL-related items. As shown, the “international” group was significantly more confident in using MALL than the

“in-house” group (4.8 vs. 3.4). In response to “Using MALL is not worth the trouble” both groups were equally divided (2.5 vs. 2.4). In response to the two items “Using MALL technology has improved my students’ English skills” and “My students enjoy using MALL technology to learn English,” the “international” group was substantially higher than the “in-house” group (4.4 and 4.7 vs. 3.3 and 3.4, respectively).

Another area of concern was the type of applications instructors recommended and the ones the students actually used. The responses were very disparate and non-specific – dictionary and social networking were common responses. This may indicate the respondents misinterpreted the two questions – “what applications do you recommend” and “which do you observe your students using.” Despite the ambiguity of the responses, the applications commonly recommended can be categorized as “vocabulary,” “dictionary,” “testing,” “comprehensive” (inclusive), “management,” and “social networking” in descending order. The applications instructors observed their students using were similar, with the inclusion of “radio.” In future surveys, the authors will rephrase the questions so as to elicit more accurate responses. However, the authors want to emphasize that the instructor’s role in guiding the students to worthwhile applications is crucial. Students may have mastered technology, but they are apt to use the easiest, most common applications available. It also should be pointed out that more than a few of the international respondents commented that they were unaware of available mobile applications, with one commenting that mobile learning was inappropriate for lower level students. Such comments stood out but were clearly not in the majority. See Ali and Miraz (2018) for a brief survey of language learning applications implemented on mobile computing devices.

Our final area of inquiry was to ascertain the skills that instructors focus on with their students using mobile devices and computers. The overall pattern of responses for both groups (shown below in percentages, averaged across both groups) were similar concerning mobile devices, with the following skills preferred: *vocabulary* (82%), *listening* (77%), and *reading* (67%), with *pronunciation* (44%), *writing* (36%), *speaking* (28%) and *grammar* (26%) receiving substantially fewer responses. In contrast, the response patterns for skills when using computers were less congruent. For example, the “international” group favored *listening* (80%), *reading* (76%), and *vocabulary* (71%), followed by *writing* (67%) and *speaking* (60%), while the “in-house” group preferred *listening* (85%), *writing* (69%), *reading* (65%), and *vocabulary* (58%). Overall, both groups emphasized receptive over productive skills when using mobile devices, although with computers the tendency was to focus on both receptive and productive skills.

4. Discussion and Conclusion

Overall, the results revealed that both groups’ attitudes towards CALL and MALL varied. The “international” group felt more comfortable and positive using CALL and MALL

compared to the “in-house” group. Similarly, the “international” group was more in agreement that MALL can be effectively utilized to improve students’ language skills and that their students enjoyed using mobile devices to study English. These results should come as no surprise, since a majority of the “international” participants were CALL specialists, while “in-house” participants included a significant number of non-CALL practitioners. Moreover, a majority of the “in-house” respondents lacked experience in using MALL. An unexpected result was both groups responded similarly to questions about CALL technology and language learning, as both were positive with regard to its impact on their students’ English acquisition and satisfaction and preference for it compared to traditional methods, as also noted by Stockwell (2012) in his analysis of how CALL stacks up with traditional classroom approaches. We are hard-pressed to provide a sensible explanation for this particular response by the “in-house” group. One possible reason could be that since all “in-house” instructors were required to conduct their classes in CALL classrooms and strongly encouraged to use the available technology, some may have felt inclined to respond more positively than they would have otherwise. The results also showed that *vocabulary*, *dictionary*, and *testing* apps were the most commonly recommended apps. Additionally, both groups emphasized receptive over productive skills, at least when their students utilized mobile devices.

After careful review of the instructors’ individual comments regarding the MALL section, it was apparent their students did not possess nearly the same number of mobile devices as the “in-house” Japanese students, hence the fewer responses regarding MALL applications. In short, if no mobile devices or applications are available, then none will be used. However, the international instructors did indicate that they would use additional applications should they become available.

5. Future directions

Our plan is to continue to examine student and instructor attitudes towards mobile devices used in L2 learning environments. However, the Japanese Ministry of Education, Culture, Sports, Science and Technology has recently been focusing its efforts on adopting the Common European Framework of Reference (CEFR) to assess both student and instructor levels of communication skills as they fit into language classes starting at the middle school level (MEXT, 2012). This plan is referred as the “English Education Reform Plan Corresponding to Globalization.” As this move will have a significant impact within our own institution, we are in the process of investigating the recognition and implementation of CEFR at institutions in Japanese and around the Pacific Rim, as well as reviewing the standing of CEFR within its European home base.

References

- Ali, M., & Miraz, S. K. (2018). Mobile Assisted Language Learning (MALL)—A Brief Survey. *Annals of Emerging Technologies in Computing (AETiC)*, 2 (2), pp.37-45.
- Chinnery, G. (2006). Going to the MALL: Mobile assisted-learning. *Language Learning and Technology*, 10 (1), pp-9-16.
- Gardner, R. (2007). Motivation and second language acquisition. *Porta Linguarum*, 8, pp.9-20.
- Gualtieri, M. (2011, April). Mobile app design best practices: When it comes to designing the mobile user experience (UX), context is king. Retrieved from http://www.forrester.com/rb/Research/mobile_app_design_best_practices/q/id/59132/t/2
- Kurzweil, R. (2000). *The age of spiritual machines: When computers exceed human intelligence*. New York: Penguin.
- Levy, M. (1997). *Computer-Assisted Language Learning: Context and Conceptualization*. New York: Oxford University Press.
- Levy, M., & Stockwell, G. (2013). *CALL dimensions: Options and issues in computer-assisted language learning*. Routledge.
- MEXT, Japanese Ministry of Education, Culture, Sports, Science and Technology (2012). http://www.mext.go.jp/b_menu/shingi/chousa/shotou/082/houkoku/1308375.htm (last accessed November 11, 2017).
- Stockwell, G. (ed.) (2012). *Computer-assisted language learning: Diversity in research and practice*. Cambridge: Cambridge University Press.

A comparison of a first and final year UG enterprise unit: lessons from experiential learning and interdisciplinarity

Sanchez-Romaguera, Veronica and Phillips, Robert A.

Manchester Enterprise Centre, Alliance Manchester Business School, University of Manchester, UK

Abstract

Drawing from several years of experience, this work describes lessons learnt in designing, delivering and assessing two interdisciplinary enterprise units offered to undergraduate students from any discipline studying at the University of Manchester in the United Kingdom(UK). Both units are electives (optional). One unit is delivered to first year undergraduate students whereas the other unit is delivered to final year undergraduate students. Experiential learning and interdisciplinary cohorts are core aspects of both units. Students work on 'real-world' projects to develop a credible creative solution to a tight dead-line.

In this paper, findings are drawn from data collected from staff and teaching assistants observations, students' reflective diaries and students' feedback. Findings showed that in general, students at both levels, year 1 and year 3/4, regarded the experience as challenging at first due to the 'unusual' learning environment when compared to the education that most students have experienced prior to the units here discussed. However, most students regarded highly the interdisciplinary experiential learning experience. This paper contributes to the growth of knowledge and aids understanding of how experiential learning and interdisciplinarity have been effectively combined and introduced in the university curriculum. Although this work focusses on enterprise education, the experience-based guidance described is also applicable to a much wider range of situations and academic areas of study.

Keywords: *Enterprise and Entrepreneurship Education; Employability; Experiential learning; Interdisciplinary education.*

1. Introduction

1.1. Enterprise and Entrepreneurship Education (EEE), Employability and Higher Education

Across the globe, governments and policy makers have recognised that an entrepreneurial society offers a sound basis for sustainable environmental stewardship, economic renewal and social inclusion, for the creation of new jobs and advances in human welfare (Volkman *et al.*, 2009). To some extent, in response to such agendas, Higher Education Institutions (HEIs) are increasingly taking a key role developing new enterprise and entrepreneurship education strategies and practices approaches to encourage entrepreneurial mindsets and enterprising behaviour among university students through their enterprise and entrepreneurship teaching initiatives (Jones *et al.*, 2015).

A multitude of definitions of EEE exist can be found in the literature. Here we followed definitions from QAA (2018) guidelines for enterprise educators, which have their foundations in Gibbs' (2005) framework. **Enterprise** is defined as the generation and application of ideas, which are set within practical situations during a project or undertaking. Skills, attributes and behaviours associated to enterprising individuals combine creativity, originality, idea generation, design thinking, adaptability and reflexivity with problem identification, problem solving, innovation, communication, initiative and practical action. **Enterprise education** focuses upon the development of the *enterprising person* and the *enterprising mindset* through a demonstration of enterprising skills, behaviours and attitudes across a diversity of contexts. **Entrepreneurship** is defined as the application of enterprise behaviours, attributes and competencies into the creation of cultural, social and/or economic value. **Intrapreneurship** is the application of enterprise behaviours, attributes and skills within an existing micro or small business, corporate or public-sector organisation. **Entrepreneurship education** is very much focused on the processes and practicalities of how to start a business and is often taught via the development of a business plan.

It has been widely recognised that learning 'about', 'for', and 'through' Enterprise and Entrepreneurship whilst at university can have several benefits, including enhancing students **employability**, according to Knight and Yorke (2003), within a higher education contextis defined as 'a set of achievements - skills, understandings and personal attributes - that make individuals more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy.' EEE can help develop a 'can-do' attitude, confidence, a creative questioning approach, and a willingness to take risks, enabling individuals to manage workplace uncertainty and flexible working patterns and careers. Enterprising competencies, such as teamwork and the ability to demonstrate initiative and original thought, alongside self-discipline in starting

tasks and completing them to deadlines, are essential attributes that have been identified by employers as priorities. Further to that, it gives students alternative perspectives on their career options and ultimately, the confidence to set up their own business or social enterprise. Enterprise competencies will be useful to those in employment, or those who become self-employed and work on a freelance or consultancy basis. Therefore, EEE can help young people develop a range of skills and attitudes that are useful for modern employment as well as widening their social perspectives as well as place self-employment and entrepreneurship on a par with 'traditional' forms of employment (Jones and Iredale, 2014; QAA, 2018).

With the growing demand for EEE, in a quest for the identification of the best pedagogical approaches, several scholars have examined the evolution and effectiveness of pedagogies in EEE. In recent work Jones (2015) concludes that among scholars, there seems to be a consensus that the best results in enterprise and entrepreneurship education are achieved when students are exposed to **experiential learning** approaches rooted in Kolb's experiential learning theory (Kolb, 1984). These approaches known as Problem Based Learning (PBL), Enquire Based Learning (EBL), amongst others, have been shown to be an effective learning pedagogy by integrating problem-solving, creativity, and reflection. A comprehensive literature review including scholarly publications examining the evolution and effectiveness of experiential learning pedagogies in EEE was recently published by Kappler (2016).

1.2. Enterprise and Entrepreneurship Education at the University of Manchester (UK)

The University of Manchester, following the trends of HEIs discussed earlier as well as explicitly requests by employers and the various professional bodies that accredit HE undergraduate and postgraduate programmes at the University, launched in 2000 the Manchester Enterprise Centre (MEC). Initially, MEC became the provider of EEE for science and engineering students. However, recognising the importance and benefits that such education can have on students from *any* discipline, since 2010, within Alliance Manchester Business School, MEC delivers EEE to students from *any* discipline of study. Nowadays, MEC is a recognised leader in EEE and an integral part of the University's commitment to provide enterprise and entrepreneurship learning opportunities to *any* student studying at the University. Through curricular and extra-curricular enterprise teaching, learning and business start-up support, MEC aims to develop graduates who can spot an opportunity, solve problems, innovate, manage risk and apply their subject knowledge in a commercial manner in order to transferring knowledge from the classrooms and laboratories to market opportunities whether as an entrepreneur or intrapreneur (MEC 2018; Phillips, 2010; Phillips, 2017). Further to that, MEC and the University of Manchester recognise that on leaving university and entering employment, graduates will face complex 'problems' of increasing interdisciplinary nature. Therefore,

interdisciplinary education (IE) is key to MEC's activities. IE is here defined as combining of two or more academic disciplines into one activity to foster a learning environment that "analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole" (Alvargonzález 2011, p. 388).

In the following sections, drawing from the literature and our own experience, we discuss lessons learnt from embedding EEE in the university curriculum. We focus on the design, delivery and assessment of two interdisciplinary enterprise undergraduate units.. We discuss our findings in the light of data collected from staff and teaching assistants' observations, students' reflective diaries and students' feedback. Finally, we draw some conclusions for the future development of interdisciplinary enterprise units with potential application to a much wider range of situations and academic areas of study.

2. Description of two interdisciplinary enterprise units

Exploring Enterprise (EE) and Interdisciplinary Sustainable Development (ISD) are two elective (optional) enterprise units offered to first year and final year UG students studying any academic discipline at the University of Manchester, respectively. Units were designed following guidance for EEE discussed earlier but were adapted bearing in mind the level of study as well as institutional requirements and constraints. Common features to both units are:

Interdisciplinary. A typical student cohort tends to include students from the following disciplines: Civil Engineering, Mechanical Engineering, Physics, Biology, Chemistry, Maths with Finance, Computer Sciences, Environmental Sciences, Geography, Economics, Politics and Modern History and Business .

Experiential Learning based on PBL pedagogy. Students are presented with a 'problem' using a 'consultancyproject' brief. Students work in interdisciplinary teams and are expected to conduct research, meet outside of formal sessions to work on the project and manage their own time to submit project deliverables (coursework) to a tight dead-line. . This approach effectively gets students' minds focussed on a problem-solving attitude, ownership of the learning responsibility, in a move away from being spoon-fed with knowledge. Regular reflective practice is encouraged and captured in the form of an individual reflective diary at the end of the unit.

Delivery. Both units are delivered as weekly 2 hours sessions for 12 consecutive weeks. Interactive lectures, workshops and group activities are a key part of the weekly sessions. Both units include elements of learning 'about' enterprise and learning 'for' enterprise. Learning 'about' enterprise consists of introducing theoretical concepts with traditional lectures. Learning 'for' enterprise takes place with practical exercises through facilitated

workshops, in class-activities and through working on projects. The ratio learning ‘about’/‘for’ decreasing from the first year unit to the final year unit, in line with EEE QAA (2018) guidelines. .

Assessment. Typically consists of an individual or team consultancy-like reports, a team presentation and individual *reflective diaries* as shown in Figure 1.

	Y1: EE	Y3: ISD
Lectures	12 hrs	7 hrs
Workshops A: Application of theory	6 hrs	7 hrs
Workshops B: Individual and team development	6 hrs	11 hrs
Assessment	- Individual report: 60% - Team project: 25% - Individual Reflective diary: 15%	- Team project 1: 20%* - Team project 2: 40%* - Individual Reflective diary: 40% *moderated by peer-assessment

Figure 1: Delivery and assessment comparison for EE and ISD unit

2.1. Exploring Enterprise (EE) unit

EE is delivered for first year undergraduate students, the aim of the unit is to provide a link from the students subject area to the commercial world with knowledge of enterprise and entrepreneurship and to develop skills useful in any work environment such as team working, research skills, time management and working with others from different disciplines. The cohort size ranges from 70-90 each year. Weekly sessions are delivered as one hour lecture followed by one hour workshop. The students prepare a report suggesting recommendations for a chosen ‘real company’ based on analysis of the business environment and market plus basic finance using tools and resources they have learned in class. This is assessed by individual report, team presentation and an individual reflective diary. Assessment weighing is shown in Figure 1. Further details about this unit have been published elsewhere (Phillips, 2008).

2.2. Interdisciplinary Sustainable Development (ISD) unit

ISD is delivered for final year undergraduate students. The aim of this unit is to develop students’ knowledge, skills and competences needed to tackle global challenges and creating change towards sustainable development in a complex world. The cohort size ranges from 40-65 students. This unit adopts a blended learning approach. Theoretical concepts are primarily introduced using a virtual learning environment. Weekly sessions are mainly dedicated to workshops. Through tackling two short team projects based on ‘wicked’

problems based on 'real world' scenarios, when possible devised by 'real world clients', students gain understanding of the complex issues surrounding change towards sustainable development. The students prepare two consultancy-like reports for the 'real world client'. Two reports enable cumulative learning. 'Solutions' are expected to integrate and balance environmental, economic, social and ethical considerations. Assessment methods and weighing is shown in Figure 1. Further details about the origin and evolution of this unit have been published elsewhere (Tomkinson *et al.*, 2008; Sanchez-Romaguera *et al.*, 2016).

3. Findings and discussion

At this stage we were interested in reflecting on findings to inform our teaching. Findings are based on data collected from staff and teaching assistants' observations, students' reflective diaries and students' feedback. Student feedback was collected through various mechanisms: informal discussions in class, e-mails to the unit leader but mostly via standard institutional unit evaluation questionnaires which are made available to students at the end of the unit and provide an opportunity for students to provide anonymous feedback in a quantitative and qualitative manner (i.e. short comments).

Findings from Exploring Enterprise (EE), first year unit

Students on EE tended to have little experience of group work within a university context and no experience of writing a reflective journal, therefore this was a new experience to many. Some did not always see the relevance of the course beforehand and showed a lack of awareness of how their subject discipline fitted to the real world. Time management and organisation skills for many was poorly developed but there was evidence on completion that they were able to relate enterprise to their subject areas. Whilst face to face meetings between the students were also proven challenging, students used social media extensively to aid in sharing research with each other. It was found the journal acted as a mechanism to ensure all students contributed to the project and also encouraged attendance as it gave the students more material to reflect on. For students grades, it was found that the unit grade for EE was similar to the marks the students were achieving in their home schools, therefore despite differing assessment methods students did no better or worse in enterprise than their assessments elsewhere, showing that the best students are able to adapt to the differing requirements of different units. The students were comfortable working in interdisciplinary groups and this seemed to have no detrimental effect on the students experience.

Findings from Interdisciplinary Sustainable Development (ISD), final year unit

Prior to taking this unit most students have no interdisciplinary and no PBL experience. Interdisciplinary teamwork as well as working on 'real world' consultancy-like projects

were found to be determinant factors for these students in choosing this unit. Ready to enter employment, students seemed keen to develop enterprising skills that employers are looking for. The format of the sessions was also positively received: very few traditional lectures, on-line resources and formative self-assessment to develop knowledge depending of specific needs (usually discipline related), and opportunity for challenging team discussions. In class time to reflect on the team performance in order to develop strategies for improvement was generally well-received. The anonymous peer-review assessment, compulsory for all teams, was also highly regarded by students who felt there was a 'fair' mechanism to assess individual contributions to team projects.

However, for a few students the PBL experience was "too radical" and struggle with experiential learning, expecting some 'spoon-feeding'. This was the case particularly for specific disciplines. It is possible that such expectations were due to the university education students have received to date. One of the major challenges for some engineering and science students was being faced with 'no right answer' projects, possibly more used to assessment with a right answer (e.g. calculations). One could argue these challenges are 'discipline' related issues. The mix of disciplines in the group was generally a positive experience. Generally the more interdisciplinary the group the higher quality deliverables. Although, in some cases, interdisciplinary was found to hinder the learning experience of some students who really struggle to work with students from other disciplines. The mix of discipline and differences in timetables did have an impact on students availability to physically meet outside the classroom as a team. However, students developed their own strategies, such as working in subteams and made very good use of technology to have 'virtual' team meetings. In terms of students performance, most teams find the projects challenging but engaging and tend to perform very well. In terms of the reflective diary, students had no prior experience. Over the years, as the unit evolved, guidance on reflective practice was introduced. However, despite such efforts, the majority of students would like the reflective diary to be removed from the unit. Some see it as a waste of time especially when is due during a busy period for them, just before exam period. Generally, most students highly regarded the experiential interdisciplinary experience and feedback that should be a *must* in HE.

4. Conclusions

In this work we have shown that although most students while initially finding the interdisciplinary experiential learning challenging, generally found it a valuable experience. Based on our experience, we found that interdisciplinary teamwork doesn't seem to have much of an impact (positive or negative) on a first year unit as it does in a final year unit. To foster a more positive interdisciplinary learning experience, regardless of

the level of study, we recommend to include activities at the beginning of the unit to emphasise and demonstrate what students from different disciplines might bring to the team in terms of skills and knowledge, and how that relates to a ‘real world’ working environment. Further to that, we also recommend to include more practical reflective practice guidance emphasising its value for self-development and life-long learning.

References

- Alvargonzález, D (2011) Multidisciplinarity, interdisciplinarity, transdisciplinarity, and the sciences, *International Studies in the Philosophy of Science*, 25, pp. 387–403
- Gibb, A.A. (2005), Towards the entrepreneurial university entrepreneurship education as a lever for change, *Policy Paper No. 003, National Council for Graduate Entrepreneurship (NCGE)*, Birmingham.
- Jones, B., Iredale, N. (2014) Enterprise and entrepreneurship education: towards a comparative analysis, *Journal of Enterprising Communities: People and Places in the Global Economy*, 8 (1), pp.34-50.
- Jones, P.J., Forbes-Simpson, K., Maas, G., Newbery, R. (2015) Beta: An experiment in funded graduate start-up, *Industry and Higher Education*, 29 (5) , pp. 405-418
- Klapper, R. G., Farber, V. A. (2016) In Alain Gibb's footsteps: Evaluating alternative approaches to sustainable enterprise education (SEE), *The International Journal of Management Education*, 14 (3), pp.422-439
- Kolb, D. A. (1984) *Experiential learning: Experience as the source of learning and development*, Englewood Cliffs, NJ, Prentice Hall.
- MEC, Manchester Enterprise Centre website (2018). <https://mec.portals.mbs.ac.uk/>
- Phillips, R.A. (2008) The Use of Personal Journals for Assessment of an Undergraduate Enterprise Module *Journal of Asia Entrepreneurship and Sustainability* 4 (4), pp.77-89.
- Phillips, R.A. (2010) Encouraging a more enterprising researcher – the implementation of an integrated training program of enterprise for Ph.D. and postdoctoral researchers *Research in Post Compulsory Education*, 15 (3), pp. 289-299.
- Phillips, R.A. (2017) Measuring Entrepreneurial outcomes from a residential enterprise school for postgraduate researchers *Journal of Asia Entrepreneurship and Sustainability*, 13 (2), pp. 62-89.
- QAA, Quality Assurance Agency for Higher Education (2018) Enterprise and entrepreneurship education guidance for UK higher education providers, available online at: <http://www.qaa.ac.uk/en/Publications/Documents/Enterprise-and-entrepreneurship-education-2018.pdf>
- Tomkinson, B., Tomkinson, R., Dobson, H., Engel, C. (2008) Education for sustainable development – an inter-disciplinary pilot module for undergraduate engineers and scientists, *International Journal of Sustainable Engineering*, 1(1), pp. 69-76.

- Sanchez-Romaguera, V., Dobson, H. A., Tomkinson, C. B. (2016) Educating engineers for the Circular Economy, *Proceedings to the 8th International Conference on Engineering Education for Sustainable Development*, Bruges, Belgium. September 4-7, pp. 9-19.
- Volkman, C., Wilson, K.E., Rabuzzi, D., Vyakarnam, S., Sepulveda , A. (2009) Educating the next wave of entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st century. *A report of the Global Education Initiative*, available on-line at:
http://www.weforum.org/pdf/GEI/2009/Entrepreneurship_Education_Report.pdf

Using Wikipedia as a classroom tool — a translation experience

Martínez Carrasco , Robert

Department of Translation and Interpretation, Universitat Jaume I, Spain

Abstract

This paper presents a classroom experience regarding the use of Wikipedia in a teaching innovation project carried out between Jaume I University and Wikimedia Spain. Framed in the current post-postivist climate within the European Higher Education Area (EHEA), Wikipedia will be presented as an inter-disciplinary tool with a relevant number of classroom applications, reflecting how meaningful learning experiences based on collaborative work and authentic project-based tasks lead to better understanding and higher levels of motivation among the students. In the particular case of translation education, it will be argued that using Wikipedia in the course of the reverse translation modules allows the students to gain a deeper insight of its linguistic and discursive structures, as well as the critical/exegetic skills they need in order to assess the kind of texts with which they are commissioned, and the special discursive techniques associated to the translation task.

Keywords: *Wikipedia, translation pedagogy, project-based learning, higher education*

1. Framing Education on Institutional and Epistemological Terms

The situated, context-bound nature of Education (Risku, 2010, 2016) allows for few generalisations, especially in methodological and content-wise terms. Reductionist approaches to education may try to conceptualise, analyse or even dissect its particular narratives, its nature and characteristics, but, generally speaking, studying the phenomenology of such an intersectional field renders a complex picture made up of different trends, epistemological standpoints, pedagogical beliefs, and socio-cultural influences.

Yet, the European Higher Education Area (EHEA) may be said to be a true attempt to unify and strengthen the European higher education domain. The Sorbonne Declaration (1998) reflected a segmented Europe and aimed at a number of structural reforms seeking comparability, mobility, and recognition. However, the latest ministerial meeting held in Yerevan in 2015 speaks primarily of EHEA's duty towards *employability* and enhancing the *quality and relevance of learning and teaching*. This should be done through “pedagogical innovation in student-centred learning environments” that exploit “the benefits of digital technologies for learning and teaching” (Yerevan Communiqué, 2015:2).

The institutional framework in which the European third level education is embedded is adamant about the pedagogical and methodological approach EHEA expects: a post-positivist scenario where ‘education’ becomes ‘learning’ (Biesta, 2013a, 2013b), conceived almost exclusively in student-centred, constructivist terms.

The shift in the mainstream educational paradigm from a traditional empirico-rationalist model (Doll, 2002; Kiraly, 2016) towards constructivist premises does have methodological implications. Indeed, knowledge acquisition is understood as an activity that has little to do with acquisition and is regarded instead as a re-contextualisation of the existing cognitive structures of the self, a re-conceptualisation of the world taking place when the cognising agent, the student, faces a new situation that contradicts, widens, or modifies previous cognitive schemas.

Therefore, third level education is currently understood in student-controlled environments that are *scaffolded*, in Vygotskian terms, by the guiding supportive role of the lecturer. Project-based methodology (García, 2016; Kiraly, 2012; Thomas & MacGregor, 2005), collaborative work (Martín Ruano, 2014), the use of authentic materials in the classroom (Galán Mañas, 2011; Hagemann, 2016; Kiraly, 2016), the use of new technologies (Kasa & Heidrich, 2016), etc., become tools to shape that educational shift; a change, as the reflection goes, which is epistemologically grounded and, at the same time, institutionally promoted.

2. Introducing Wikipedia in the classroom

“As a ground-breaking and interdisciplinary phenomenon”, Alonso argues (2015:90), Wikipedia has attracted the attention of researchers from many fields, including Computer Science, Communication, Politics, and Language. More specifically, in the field of higher education, Biasutti and El-Deghaidy (2012:861) reflect on the use of wikis as an online didactic tool, mentioning how they can be used in collaborative activities in the construction of both ‘personal’ and ‘collective knowledge’, very much in syntony with the institutional framework above. Indeed, Wikipedia has become for many a platform to situate their teaching practices and unfold a plethora of activities that may suit the most varied fields: critical analysis of existing articles, article correction, article creation, article expansion and improvement, addition of references and multimedia content, translation of existing articles, etc. (Lerga & Aibar, 2015).

The benefits one may extract from the exploitation of Wikipedia in the classroom address a substantial number of the so-called ‘generic competences’ reflected in the Tunning Project (González & Wagenaar, 2003), aimed at adjusting third level education programmes to the common European framework: emancipation, interaction and communication abilities, writing skills, creativity, motivation, responsibility, critical and exegetic skills, research and IT-related abilities, empowerment, and autonomy, among others.

Wikimedia Foundation is well aware of the possibilities Wikipedia offers to the post-positivist classroom and thus a number of its affiliates are indeed addressing several educational projects, be it through the many specific sections within Wikipedia itself where resources and useful educational content are brought together (Lerga & Aibar, 2015:3) or through WikiProjects, that is, teams of users working for a common objective, including educational initiatives.

Besides, the Wikimedia Educational Portal, a wiki aimed at coordinating and spreading educational activities and projects, was created for anyone interested in using Wikipedia for educational purposes (*ibid*:4), linking projects from around the world as well as new initiatives, resources, etc. The portal, launched back in 2010, may serve as a coordination meeting point for educators and students with the support, resources and practical information Wikimedia offers.

2.1. Wikipedia for translators

It goes without saying that undergraduate students use Wikipedia widely in the course of their education (Brox, 2012; Knight & Pryke, 2012) however criticism and skepticism it may receive from their lecturers (Jaschick, 2007). Similarly, professional translators and translators-to-be turn to Wikipedia for a number of purposes, namely conceptual information and terminological/lexicological aspects (Alonso, 2015:100). According to

Alonso, a significant number of translators (70.6%) report regular access to Wikipedia in the course of their professional activity (*ibid*:102), acknowledging, at the same time, their ability to detect the quality of articles. In contrast to that, an overwhelming majority (over 90%) declared that they had *never* written, translated, or edited any content on Wikipedia (*ibid*:107), rendering an interesting scenario where translators claim to use a particular tool that they have little interaction with.

Thus, following the epistemological and institutional framework current third level education is embedded in, and taking into account the pedagogical possibilities that Wikipedia offers and the extensive use professional translators make of the platform, a pedagogical innovation activity was envisaged in order to enrich the educational classroom experience of translators-to-be.

3. The Project

3.1. Operational framework

The following project is the outcome of a teaching innovation programme carried out between Jaume I University and Wikimedia Spain. The project introduces a holistic methodology aimed at building a solid translation competence among translator trainees while successfully introducing them to real discursive practices, and therefore enhancing the socialisation process of the students as inter-linguistic professionals.

The project belongs to a bigger network called “Teaching Translation via Wikipedia” started by Professor María Calzada Pérez (Jaume I University –Spain-) and Professor Khaled Al-Shehari (Sultan Qaboos University –Oman-) and currently involves some thirty lecturers in countries such as Spain, the UK, Argentina, Turkey, Jordan, Algeria, etc. who are implementing similar projects sharing a common aim: the use of an authentic project-based methodology and collaborative work in the translation classroom.

At Jaume I University there are currently four languages involved, three of them in both directions (Catalan/Spanish into English and English into Catalan/Spanish) and a fourth one, French, which is only translated into the students’ mother tongue (French into Catalan/Spanish).

Translation students at Jaume I University need to undergo two reverse translation modules during their 4-year-long bachelor degree in Translation and Interpreting. These reverse translation modules are placed in the third and fourth academic years of the curriculum, so students are expected to display a number of relevant translation strategies and resources they have built during their previous training. Still, even if it shares some features with the direct translation modules (into the student’s mother tongue), directionality plays a major

role in the course and poses an added difficulty for translators-to-be, whose proficiency in their target language may not be as polished as reverse translation requires. The role of the reverse translation lecturers throughout the module is not only to scaffold their students' learning process but also to fill the linguistic voids that hinder the development of a comprehensive translation competence.

Throughout the Wikipedia project, students are encouraged to translate, in a collaborative fashion, real Wikipedia articles that, despite existing in their source language, the Wikipedia in their target language lacks. The students' work and development is carefully scaffolded by a team of external experts who have no relation with our university (Wikipedia technicians and linguistic proof-readers) whose role is to mimic a real life translation commission. The project is embedded in a constructivist scenario where the student is fully in charge of their education, and it results in an empowering learning opportunity with a real impact in life. Indeed, not only do students learn and practise throughout all the phases of the project, but at the same time their translations help expand free-of-charge collaborative knowledge, the basis of Wikipedia, which is a way to 'give back' to the community since Wikipedia is a tool they normally use but seldom support.

3.2. Theoretical assumptions

As we have put forward, the aim of the project is to create meaningful learning experiences based on collaborative work and authentic project-based tasks. We agree with Pagano (1994) when she argues that teacher-centred methodologies, following transmissionist pedagogical criteria, result in a significant loss in the students' motivation. In our opinion, in terms of professional education, authentic collaborative work leads not only to a better understanding of the particular linguistic and discursive structures translators face in the course of their careers but also both the critical/exegetic skills they need in order to assess the kind of texts with which they are commissioned, and the special discursive techniques associated to the translating task. In terms of education and personal growth, finding ways of relating education with professional practice is a key notion in empowerment-oriented pedagogy, something we fully agree with.

3.3. Project realisation

Setting up the task

During the first session, the students are introduced to Wikipedia, its aims, its working methods and how to edit and create pages in both their source and target language Wikipedia. With the assistance of a Wikipedia technician, students are invited to explore the website and become familiar with html language and other editing options Wikipedia offers to its users. After this introductory stage, students are given time to create groups and select a text to translate. In the reverse translation classrooms choosing a text may prove to

be slightly more complicated given the size of Wikipedia in English (5 million+ articles, compared to the 500 000+ articles in the Catalan Vikipèdia and 1 million+ articles in the Spanish Wikipedia). Students are not given any guidelines so as to what text to choose, except for the word limit, around 400 words per team member: it is up to the group to assess the degree of complexity of a given text compared to their learning goals and current translation expertise. After the text selection, the students present the text to their lecturer and justify the text they have chosen in terms of context, difficulty, underlying rationale, etc. When the text proposals are accepted, the role of the lecturer ceases to be prescriptive and they become a scaffolding tool, whenever needed.

Translation

Students are given four weeks to translate the text. Students need to agree on the different roles they will adopt in the project (translator, terminologist, editor, proof-reader, etc.) or even if they want to work under more collaborative premises (group translation, group editing, group proof-reading). Students are asked to translate the text and provide an identical target text including all IT-related technicalities they could come across (images, hyperlinks, formatting options, etc.).

Revision

There are two revision stages after the translation phase ends: a peer review and a double external review (translation expert and Wikipedia technician). During the former, the lecturer re-assigns the texts translated among the groups, who adopt the role of a proof-reader and check their classmates' translations, suggesting changes, if any. After that first stage, the groups decide whether to accept or reject their peers' suggestions, delivering a second draft of their target text, which is reviewed by a professional technician and an external translator. After the second revision stage students are given time to implement comments and suggestions and deliver their final translation, which is finally published in Wikipedia.

Looking back without anger

Once the project finishes, there is an individual and group feedback session where students comment on their performance and major problems they have faced in the course of their translation/revision task. Students are asked to comment on their individual performance, group performance, working methods and the impact the project has had in the development of their translation, professional, and inter-personal skills, and also to comment on their classmates' contributions and their role as proof-readers of the other groups.

4. Conclusions

The Translating Wikipedia Project has been an on-going initiative at Jaume I University since 2010. So far, more than 400 students have taken part in the project, making it a successful initiative to implement in our translation modules. At the end of the course, students consistently believe their command and knowledge about Wikipedia is better, they have grown as professional translators and they have developed a very interesting set of competences and skills to be applied in a rich multi-lingual number of contexts (Martínez-Carrasco, *in press*). Similarly, the facilitators (lecturers, Wikipedia technicians and external translators) report high levels of satisfaction and acknowledge better overall results in the education process of the students.

References

- Alonso, E. (2015). Analysing the use and perception of Wikipedia in the professional context of translation. *The Journal of Specialised Translation*, (23), 89–116. <http://doi.org/10.1016/j.sbspro.2015.02.071>
- Biasutti, M., & El-Deghaidy, H. (2012). Using Wiki in teacher education: Impact on knowledge management processes and student satisfaction. *Computers and Education*, 59(3), 861–872. <http://doi.org/10.1016/j.compedu.2012.04.009>
- Biesta, G. (2013a). Interrupting the Politics of Learning. *Power and Education*, 5(1), 4.
- Biesta, G. (2013b). Receiving the gift of teaching: From “learning from” to “being taught by.” *Studies in Philosophy and Education*, 32(5), 449–461.
- Brox, H. (2012). The Elephant in the Room: a Place for Wikipedia in Higher Education. *Nordlit*, (30), 143–155.
- Doll, W. E. (2002). Ghosts and the Curriculum. In W. E. Doll & N. Gough (Eds.), *Curriculum Visions*. New York: Peter Lang.
- EHEA Ministerial Conference, M. (2015). Yerevan Communiqué.
- Galán Mañas, A. (2011). Translating authentic technical documents in specialised translation classes. *JoSTrans*, (16), 109–125.
- García, C. (2016). Project-based Learning in Virtual Groups - Collaboration and Learning Outcomes in a Virtual Training Course for Teachers. *Procedia - Social and Behavioral Sciences*, 228 (June), 100–105.
- González, J., & Wagenaar, R. (2003). *Tuning. Final Report*. Bilbao.
- Hagemann, S. (2016). (Non-)Professional, Authentic Projects? Why Terminology Matters. In *Towards Authentic Experiential Learning in Translator Education* (pp. 33–52). Mainz: V&R Press.

- Jaschick, S. (2007). A stand against Wikipedia. *Inside Higher Education*, (26). Retrieved from <https://www.insidehighered.com/news/2007/01/26/wiki>
- Kasa, R., & Heidrich, B. (2016). Knowledge generation and utilization in wiki supported teamwork – An experiment. In *2nd International Conference on Higher Education Advances, HEAd'16* (pp. 261–268). Valencia.
- Kiraly, D. (2012). Growing a Project-Based Translation Pedagogy: A Fractal Perspective. *Meta: Journal Des Traducteurs*, 57(1), 82. <http://doi.org/10.7202/1012742ar>
- Kiraly, D. (2016). *Towards Authentic Experiential Learning in Translator Education*. Mainz: V&R Press
- Knight, C., & Pryke, S. (2012). Wikipedia and the University, a case study. *Teaching in Higher Education*, 17(6), 649–659.
- Lerga, M., & Aibar, E. (2015). Best Practice Guide to Use Wikipedia in University Education. Universitat Oberta de Catalunya UOC. Retrieved from <http://hdl.handle.net/10609/41662>
- Martín Ruano, M. del R. (2014). From Suspicion to Collaboration: Defining New Epistemologies of Reflexive Practice for Legal Translation and Interpreting. *Jostrans, The Specialised Translation Journal*, (22), 1–20.
- Martínez-Carrasco, R. (in press). Collaborative Writing 2.0 Socialising Critical, Cross-cultural Agents through Online, Project-based Methodology. Cross-Cultural Perspectives on Technology-Enhanced Language Learning. Hershey: IGI Global
- Risku, H. (2010). A cognitive scientific view on technical communication and translation: Do embodiment and situatedness really make a difference? *Target*, 22(1), 94–111. <http://doi.org/10.1075/target.22.1.06ris>
- Risku, H. (2016). Situated learning in translation research training: academic research as a reflection of practice. *The Interpreter and Translator Trainer*, 417(May), 1–17. <http://doi.org/10.1080/1750399X.2016.1154340>
- Thomas, W. R., & MacGregor, S. K. (2005). Online project-based learning: How collaborative strategies and problem solving processes impact performance. *Journal of Interactive Learning Research*, 16(1), 35–39.

University classroom interactive situation microanalysis: cognitive attunement and pedagogical interpretation

Calduch, Isaac^a; Hervás, Gabriel^a; Jarauta, Beatriz^a and Medina, José Luis.^a

^aDepartment of Teaching and Learning and Educational Organization, University of Barcelona, Spain.

Abstract

This conference paper aims to elucidate the attuning processes between teacher knowledge and the learning moment of the students, in interactive situations within the university classroom, under a situated perspective and in real-time; specifically, in relation to the process of didactical interpretation. An episode performed by an expert teacher is analyzed; it took place in the Clinical Nursing subject of the nursing degree and was about the use of the physiological serum in certain situations. The analysis focuses on the interaction between the teacher and the students, adopting a research methodology close to the ethnography of communication -in its microethnographic aspect-, adopting the sequence S-T-S' (student-teacher-student) as the unit of analysis. The results show how the teacher has the ability to evaluate the appropriateness of the students' interventions in situ, thanks to which she is able to adjust her response (dynamic coupling), generating a pedagogic resonance. Concurrently, it can also be seen how, beyond tuning in with a particular student, she manages to tune in with the rest of the class (collective attunement).

Keywords: Higher education; Attunement; Didactic interpretation; Microanalysis.

1. Introduction

By implementing the guidelines of the European Higher Education Area (EHEA), the universities reformulated their degrees, but this was not always matched with a transformation of the teaching culture, an essential process to achieve a more student-centred teaching.

If we accept that the nature of teacher's knowledge is indissoluble from professional practice (Tardif, 2004; Medina, 2013), its analysis requires considering: 1) a situated approach; 2) to focus on the articulation and deployment mechanisms, considering their procedural nature; 3) to incorporate the students' perspectives without neglecting the interaction layout.

Approaching an investigation from this position is aligned with the framework of the EHEA and is consistent with the social-constructivist learning theories. For this, it is important to focus on the situated characteristics of articulation and coupling processes between the teacher knowledge, the learning moment of their students and the specific teaching-learning situations. This makes essential to pay attention to the dynamic of these processes, especially the intersubjective component between the teacher and his/her students.

As an antecedent, it is appropriate to mention the study of Medina, Cruz and Jarauta (2016), which highlights how some well-valued teachers use different strategies to tune their action to the specific needs of their students due to a coordinated use of their disciplinary and pedagogical knowledge. In summary, the authors found that these teachers used the Pedagogical Content Knowledge (PCK) identified by Shulman (1987). But, beyond that, in their study, they identified a less studied feature of the PCK, its reflexive-dialogic dimension, which allows teachers to focus their attention floatingly on both the ideas expressed by the students and in their own understanding frameworks; thanks to that, the processes of knowledge transformation, or of didactic transposition (Chevallard, 1997), and the other teacher skills acquire a new more relational meaning.

The purpose of this paper is, precisely, to give light to a research that seeks to understand how university professors interpret, evaluate and respond to the students' contributions -into a structure of discursive interactions- and their repercussions in terms of learning. This is done taking into account the processes of cognitive tuning between both (which occur as a result of a didactic interpretation, made by the teacher) and with the ultimate aim of considering the results obtained to be used in further training and professional development processes that ensure the implementation of pedagogical innovations and teacher improvement actions.

2. Context

The research presented here has been developed in the nursing degree at the University of Barcelona, during the 2016-2017 academic year. Specifically, it is analysed a session of the compulsory subject of Clinical Nursing II, within the thematic block "General aspects of critical patient care".

3. Methodology

Interested in how the teacher interprets, evaluates and respond to the students' contributions, and its repercussions in terms of learning, we take an onto-epistemological perspective close to the Symbolic Interactionism (Blummer, 1969), considering the importance of meaning construction during interaction.

The methodological specification of the previous statement, leads us to the development of an Ethnography of Communication (Hymes, 1962) in the form of a microethnography. Through it, we intend to analyze the interaction (as a communicative event), at every instant, to comprehend the meanings that the protagonists give to their words and actions, paying attention to linguistic, sociocultural and cognitive factors, both at an intersubjective and intra-subjective level.

The unit of analysis for this study corresponds to the sequence S-T-S' (student-teacherstudent), differentiating three interrelated processes in the moment that corresponds to the teacher (T): identification, evaluation and answer.

The methodological process of the research can be summarized in the following phases:

- 1) Non-participant observation of the classroom and its recording;
- 2) Edition and analysis of the video recorded to select S-T-S' sequences;
- 3) Recorded think aloud interview (Erickson and Simon, 1993) –to teachers and students- to allow the participants explicitly state the meaning and intentionality of their actions and speeches occurred in the preselected sequences;
- 4) Parallel transcriptions (Weston and McAlpine, 2002) of the previous phases, useful to gather and analyse concurrent data about a shared experienced and its dynamicity;
- 5) Micro-analysis, focused on the thinking and the action of the teacher;
- 6) Holistic analysis (relational, contextualized and triangulated with the protagonists and specialists).

4. Results

The creation of edited videos focused on the analysis unit previously mentioned, and the subsequent interpretation of the selected micro-events, allow for evincing coupling and attuning cognitive processes occurred in real time in the classroom.

Table 1, created following the parallel transcriptions technique (Weston and McAlpine, 2002), shows one of those micro-events, chronologically sequenced and maintaining the focus of attention in the classroom situation, and the reflection of the students and the teacher.

The events developed belong to a moment of the class about the types of serum that could be used in a pressurizer. Previously, the teacher explained the use of different types of catheters and serums and, after it, she formulates a question and “Student 1” responds with a doubt that connects it with her previous understanding of the contents. That’s the event where the transcription starts. There, it can be found how both “Student 1” and the teacher reflect on the motivations to ask, the interpretation of the question and, simultaneously, how that moment is understood by “Student 2”, leading him to ask another question that, again, is assessed by the teacher.

Table 1. Microevent: Pressurizing serum (moment 1 & 2)

Teacher	Situation (Classroom event)	Students
	Teacher: What type of serum will you put in the pressurizer? Student 1: But if you said it was not a regulated, I understood a physio 0.9 [physiological saline 0.9%]. Teacher: Why? Because it's not a regulated one?	
		<i>Why are you making that comment?</i> Student 1: Yes, because in a previous class she had

		explained we have to administer a physiological saline solution. So I was surprised by the comment she made after that we can also use a dextrose one.
<p><i>What did you think when you heard her?</i></p> <p>Teacher: I love the 'because you said it'. When the students tell me 'because you said it', I know they are thinking 'this is so because you said it'. And I do not want that.</p> <p>Teacher: In addition, I thought that, like her, half of the class was thinking the same: "If you have said no before, why do you say yes now?"</p>		
		<p><i>Do other students think the same?</i></p> <p>Student 2: It was a question that I was also asking myself.</p>
	<p>Student 2: But if, for example, he is a hepatopathist ... you will not put the physio, right?</p>	
		<p><i>Why are you asking this question?</i></p> <p>Student 2: I had this doubt. I did not fully understand what a not regulated serum is.</p>

<p><i>What did you think when you heard him?</i></p> <p>Teacher: When I heard him, I thought... 'Oh, you have understood me, you have understood me...'. I mean, I realized that he was thinking... he was reasoning, and doing it well. What he says is correct. We could put a 5% dextrose... if it did not have the issue to stick. It is water with sugar and... (She makes a noise to represent something that is sticking).</p>		
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5. Discussion

The analysis of these micro-events during the class sessions, allows to reflect on the objective we set at the beginning, related with understanding the possible moments when cognitive attuning between the thinking of the teacher (and her knowledge) and the students' (and their learning) happens.

Focusing the attention in the answer of the teacher when she is asked about what she was thinking when both students asked, we can observe:

- 1) The comprehension and assessment (in situ) of the appropriateness of the intervention, connecting and recognizing the mental process of the student in respect to the disciplinary content: "I mean, I realized that he was thinking... he was reasoning, and doing it well".
- 2) The attunement with the thinking of the rest of students in the class, via the specific component of the PCK that refers to the knowledge of how a specific content is usually understood and the difficulties linked to its learning: "I thought that, like her, the half of the class was thinking the same thing".

Both, can be considered as part of the cognitive process of dynamic coupling (Medina and Jarauta, 2013); constitutive element of the dialogical-reflective dimension previously referred to. The teacher makes a diagnosis of the learning situation where the student and the class are situated, and that allows her to adopt her teaching action –in real time–

generating pedagogic resonance (Trigwell and Shale, 2004) as she adjusts her following interventions.

References

- Blumer, H. (1969). *Symbolic Interaction: Perspective and Method*. Englewood Cliffs: Prentice Hall.
- Chevallard, Y. (1997). *La transposición didáctica. Del saber sabio al saber enseñado*. Buenos Aires: Aique.
- Ericksson, K.A. & Simon, H.A. (1993). *Protocol Analysis. Verbal Reports as Data*. Cambridge: The MIT Press.
- Hymes, D. (1962). The Ethnography of Speaking. En T. Gladwin y W.C. Sturtevant (Eds.), *Anthropology and Human Behavior*, pp. 13 -53. Washington: Anthropology Society of Washington.
- Medina, J.L.; Cruz, L. & Jarauta, B. (2016). La dimensión dialógico-reflexiva del conocimiento didáctico del contenido en la docencia universitaria. *Revista de Educación*, 274, 69-93.
- Medina, J. L. (2013) Una reconceptualización de los saberes profesionales que se enseñan en la universidad: más allá de las competencias. In J.L. Medina y B. Jarauta, *Enseñanza y aprendizaje en la educación superior*, pp. 35-84. Madrid: Síntesis.
- Shulman, L. (1987). Knowledge and teaching: foundations of the New Reform. *Harvard Educational Review*, 57(1), 1-22
- Tardif, M. (2004). *Los saberes del docente y su desarrollo profesional*. Madrid: Narcea.
- Weston, C. & McAlpine, L. (2002). *Parallel transcripts: an innovative approach for capturing the impact of reflective teaching on student learning experience*. New Orleans: Annual Meeting of the American Educational Research Association.

EMI Teacher Training at the University of A Coruña

Crespo, Begoña^a and Llanos-Tojeiro, Ángela^b

^aDepartment of Letters, University of A Coruña, Spain, ^bDepartment of Letters, University of A Coruña, Spain.

Abstract

The aim of this paper is to offer an overview of how an EMI programme was designed at the University of A Coruña (Spain) to implement courses taught in English by its teaching staff. The final goals of this initiative were twofold: to attract an increasing number of foreign students through mobility or as new admissions; and to promote internationalisation at home for both students and lecturers. Some of the steps taken in this process (from coaching to EMI) are explained as well as the principles on which a particular teaching methodology for non-native speakers of English is based. Content knowledge and a B2 level of English is presupposed, but a further level of teacher professionalism is aspired to, involving commitment, reflection, responsibility. A shift in focus, from teacher- to student-centred learning is required. Instructors should show their students how to learn and guide them along their learning paths. This implies a shift in the original mindset that is strongly rooted in particular teaching traditions. Communicative competence is also a key factor: knowing how to transmit and communicate is at least as important as the material content itself, and lecturers should be good communicators.

Keywords: *EMI; coaching protocol; teacher professional development; learner-centred teaching; communicative competence.*

1. Introduction

This paper focuses on some of the elements that should be taken into account in an EMI course, mainly within the context of a Spanish-speaking country, where teaching staff are not specifically trained to become university instructors. This is the case of the EMI teacher training implemented at the University of A Coruña (UDC, henceforth). This different approach to teaching in English offers the advantage of promoting new methodological commitments, such as making interactive and participatory lectures customary, and enforcing teaching strategies that can contribute to the success of teaching programs in English.

The paper is organized in this way: following an introduction to EMI and the specific context in which it is applied, section 2 will describe the UDC context and the pre-EMI coaching activities. Section 3 will be devoted to the EMI course and the three underpinning principles: teacher professional development, learner-centered teaching and instructors' communicative competence. Finally, some conclusions will be offered regarding the experience gained from the practical application of these principles.

2. What is EMI? The UDC context

As there exists wide confusion concerning some of the terminology currently used in this field of study within applied linguistics, we consider it most convenient to begin by clarifying what EMI is and how it differs from other possible denominations.

English as a Medium of Instruction (EMI) refers to the growing global phenomenon of the teaching of academic subjects through the medium of English in countries where the first language (L1) of the majority of the population is not English (Dearden, 2015) and where explicit language learning aims are not the priority of these classes (Madhavan & McDonald, 2014).

Another acronym related to this terminological issue is CLIL (Content Language Integrated Learning). But CLIL “refers to situations where subjects, or parts of subjects, are taught through a foreign language with dual-focused aims, namely the learning of content, and the simultaneous learning of a foreign language (Marsh, 1994; 2000)”. According to Smit and Dafouz (2012), in the university context the term CLIL has been altered to Integrating Content and Language in Higher Education (ICL or ICLHE) or English as a Medium of Instruction (EMI). Unlike CLIL at lower levels of education, where both language and content are the focus of learning, ICHLE and EMI teaching is devoted to course content, with the use of language as the medium of instruction (Morell, 2014). Different focuses seem to call for different denominations.

For at least the last ten years, higher education institutions in non-English-speaking countries (Spain, Italy, Germany...) have been developing and implementing programmes for training teaching staff in what has become known as English as a Medium of Instruction (EMI).

The Universidade da Coruña (UDC) is one of the Spanish universities that decided in 2012 to launch, as part of its internationalisation policy, a training programme aimed at providing teachers with new linguistic and methodological habits, enabling them to teach courses forming part of bilingual or double degrees.

It was around this time that the CRUE (Spanish Rectors Association) decided to begin working on a document that could serve as a guide or orientation for Spanish universities wanting to implement bilingual programmes. Among many aspects, it was precisely the need to train university lecturers that was highlighted in the document (Bazo Martínez & González Álvarez, 2017).

Within this framework UDC launched a tutorials planning effort that crystallized into a coaching programme.

2.1. Pre-EMI: Coaching activities

In 2013 the Vice-Chancellorship for internationalization made an agreement with the English Department to cooperate in the training of mainly STEM (Science, Technology, Engineering and Mathematics) lecturers. The initial stages involved coaching activities for those lecturers interested in teaching their courses in English. The primary tenet behind the initiative was the belief that teachers should not be abandoned to intuition in working out the skills needed for teaching in English.

A coaching protocol was designed setting clear objectives and creating an honest and trustful relationship between coaches and coachees. In addition, this protocol was devised on the basis of the coachee's future potential, disregarding previous misconceptions of their performance. The coaches' aim was to motivate lecturers in their professional life and re-engage them with teaching, especially by focusing on solutions rather than problems and by being optimistic and supportive.

Activities were designed according to the following format:

STAGES	GOALS
1. First contact	Organise the calendar with input from the parties involved. The teacher may provide materials for revision.
2. Review of teaching materials	Didactic materials, powerpoints and Moodle pages are reviewed. Comments from the coach.
3. Rehearsal and observation	The coachee rehearses with the coach, who observes, guides and supports. The coach identifies strengths and weaknesses and provides appropriate strategies for minimizing the latter.
4. Classroom Observation	The coach attends a class and later relays observations to the coachee.
5. Orientation and linguistic support	The coachee has at his/her disposal the orientation and linguistic support of the coach throughout the semester, up to a maximum of 7 hours.
6. Clarifying doubts	The coachee has at his/her disposal the orientation and linguistic support of the coach throughout the semester, up to a maximum of 7 hours.

To help structuralise this support program we designed file cards featuring the above-mentioned activities for the coaches to maintain updated throughout the semester. The information collected would be used to prepare a guide for frequently asked questions, strategies, and helpful tips for the bilingual teacher. This card was filled in by all the coaches and the information they provided was commented on in regular meetings between coaches and coordinators throughout the semester.

In this coaching programme the idea was that the coach, linguistically speaking, acted as “a language teaching mentor”, “an individual with recognized expertise comprising language

teaching experience, knowledge, and skill. In a mentoring relationship with a language teacher, a mentor has more expertise than the teacher.” (Sherris, 2010:1).

The classroom observation element was not well received by all lecturers. Successful teaching observations primarily form a part of the training process in order to create reflective and self-directed teacher-learners. While observations can be effective when undertaken as a collaborative and collegial exercise among peers, (Coe et al., 2014), as coaches we found, however, that they were not as effective as expected since coachees were reluctant to be observed.

3. English as a Medium of Instruction course

This programme was carried out according to the design and implementation of an EMI course made specifically for UDC instructors with a B2 level of English as described in the Common European Framework of Reference for Languages (CEFR). The EMI course was modelled on three fundamental pillars: teacher professional development, learner-centred teaching and lecturers’ communicative competence.

3.1 Teacher professional development

The four dimensions of teacher professional development – knowledge, practice, reflection and engagement (Altrichter and Krainer, 1996) – take on a new meaning in the EMI course. University lecturers and instructors are now expected to master their content knowledge and teaching practice in English. Reflecting on their performance and engaging with their EMI peers will also help EMI instructors to keep improving.

Implementing and practicing learner-centred teaching, being familiar with different teaching techniques and strategies, and interacting with the learners help develop an effective teaching practice in English. EMI instructors must provide clear information about course objectives, learning outcomes, and evaluation, and give the students appropriate feedback. Active student participation should also be encouraged by asking different types of questions.

Last but not least are reflection and engagement. Thoughtful reflection on how to improve their teaching in English can help lecturers identify the most common weaknesses and the effective practices to overcome them. To reach this point, EMI lecturers can certainly benefit from a particular attitude: ‘open-mindedness’ concerning new ideas and thoughts, ‘whole heartedness’ and ‘responsibility’. Among these, it is responsibility that clearly engenders engagement and participation with the professional community in pursuit of a life-long learning process with dedication to university education.

Achieving effective teaching through reflection and engagement and putting an emphasis on feedback, support, challenge, and professional learning may lead to improvement in

student learning (Robert Coe, Cesare Aloisi, Steve Higgins and Lee Elliot Major October 2014: 10). This should be the obvious goal of a teaching professional.

3.2. *Learner-centred teaching*

The second pillar of EMI is the development of an attitude towards learner-centred teaching. Instilling this new attitude in the instructor is difficult for the trainer because it requires a change of mindset. The traditional teacher-centred lecture that figures so profoundly in the Spanish teaching culture has to be replaced by student-oriented teaching. This entails a transformation that becomes the greatest obstacle for EMI trainers.

Weimer (2002) identifies five areas in which teacher-centeredness in the classroom is clearly seen: the balance of power, the function of content, the role of the teacher, the responsibility of learning, and the purpose and processes of evaluation.

Weimer's thesis – that learner-centered teaching will lead to greater success for students and increased job satisfaction for teachers – has been supported in the pedagogical literature. Additionally, it has been recognized that the affective and cognitive domains interact to determine and favour classroom effectiveness.

Without a doubt, learner-centered teaching engages students in the process of learning more adequately. Learner-centered teachers provide students with essential skills to effectively master material in the discipline by showing them how to think, solve problems, evaluate evidence, analyse arguments, generate hypotheses. Allowing student participation in the process also encourages them as it promotes collaboration using the expertise of individual learners. All this active learning yields positive effects on motivation and engagement.

For UDC instructors, accustomed to a concept of educating in a teacher-centered scenario, this principle was the most controversial and difficult to assume. In fact, some widespread misconceptions surfaced about why a course taught in English might or might not be different from the same course taught in Spanish, with no regard to the added communicative difficulties of teaching in a language that is not one's native tongue. The resistance to modifying and adapting materials as a way to facilitate learning, focusing on the student as the main actor, is a challenge that remains to be met.

3.3 *Communicative Competence in EMI*

Communicative competence refers to the lecturer's ability to conduct a class in English and to convey information successfully. This does not refer to only what may be considered basic linguistic competence, but also embraces a sociocultural dimension that requires what is known as strategic competence, or "compensatory strategies in case of grammatical or sociolinguistic or discourse difficulties, such as the use of reference sources, grammatical and lexical paraphrase, requests for repetition, clarification, slower speech, or problems in

addressing strangers when unsure of their social status or in finding the right cohesion devices.” (Nordquist, 2018).

Consequently, communicative competence in EMI involves both verbal and nonverbal communication. Both have a lot to do with teacher performance.

Verbal communication encompasses the use of expressions to manage the classroom setting, that is, the use of specific classroom language: many different phrases can be used to organize presentations and to identify for the student what type of information is being presented. Some such phrases do the following: introduce a topic; give examples; emphasize main points; invite questions and support participation; and conclude a teaching session (“What we are going to cover today is . . .”, “Now pay attention to this next part . . .”, “So far (up until now), we have been discussing . . ., in the next class we will . . .”). Other aspects, such as control of the lecturer’s speaking volume and pace are also taken into account here. A loud voice (not too loud) shows confidence and implies authority. Speaking too softly may result in the student’s failure to hearing important points. In addition, it is important in any learning environment to emphasize and repeat key concepts, which naturally involves slowing down the rate of speech in class, which is an especially sensitive issue faced by Spanish speakers of English.

Nonverbal communication conveys information about the lecturer’s attitude toward the class and students, and it is a relevant component of the strategic dimension of communication. Making eye contact with the students to keep them engaged in the subject and attentive to what the lecturer has to say, the ability to monitor students’ comprehension by observing their facial expressions, facing the students when talking to them, using gestures and facial expressions to clarify language and emphasize key ideas are complementary actions that improve communicative teaching performance.

In general, UDC lecturers that fail to apply interactivity in the classroom often neglect the communicative aspect of teaching. They may be responsible for conflating basic linguistic competence in an everyday English-speaking environment with the highly-specialized linguistic context of teaching. Being able to make oneself understood does not necessarily imply being able to help students learn.

4. Final remarks

Support for the linguistic and methodological development of lecturers teaching in English is part of the internationalization strategy of UDC (2014-2020). The model designed to this end evolved through different stages: from linguistic coaching and mentoring to structured courses devoted to the specific training of professionals. Teacher professional development is a key aspect for successful EMI, as in Spanish regulations research seems to take priority

over teaching. In the particular case of UDC, difficulties were faced in attempting to convince lecturers of the benefits of learner-centred activities and interactive lectures. Equally challenging was the endeavor to change the traditional mindset of a decades-old learning environment, one that affected their own experiences as students.

All in all, both the coaching protocol and the EMI courses have helped many of the participants discover that enthusiasm and commitment open new possibilities for engaging students, which in the long run may translate into professional satisfaction.

References

- Altrichter, H., & Krainer, K. (1996). Wandel von Lehrerarbeit und Lehrerfortbildung. *Lehrerfortbildung zwischen prozessen und produkten*, 33-52.
- Bazo Martínez, P. et al. (2017). *Linguistic Policy for the Internationalisation of the Spanish University System: A framework document*. http://www.crue.org/Documentos%20compartidos/Sectoriales/Internacionalización%20y%20Cooperación/Politica_Executive%20summary_Version%20Final%20Reducido.pdf
- Brown, G. (2011). Student-Centered Learning in Higher Education. *International Journal of Teaching and Learning in Higher Education*, 23(3), 92-97.
- Coe, R. et al. (2014). *What makes great teaching? Review of the underpinning research*. Durham University. <https://www.suttontrust.com/wp-content/uploads/2014/10/What-makes-great-teaching-FINAL-4.11.14.pdf>
- Dearden, J. (2015). *English as a medium of instruction: A growing global phenomenon*. London: British Council.
- Madhavan, D., & McDonald, J. (2014). *Food for thought. Webinar English as Medium of Instruction (EMI): Philosophies and Policies*. Paris: OECD Higher Education Programme, 2014.
- Marsh, D. (1994). *Bilingual Education & Content and Language Integrated Learning. International Association for Cross-cultural Communication, Language Teaching in the Member States of the European Union (Lingua)*. Paris: University of Sorbonne.
- Marsh, D. (2000). An introduction to CLIL for parents and young people. In In D. Marsh & G. Lange (Eds.), *Using languages to learn and learning to use languages*. Finland: University of Jyväskylä.
- Morell, T. et al. (2014). *English as the medium of instruction: a response to internationalization*. Alicante: Universidad de Alicante.

- Nordquist, R. (2018). Communicative Competence Definition and Examples. ThoughtCo, Jan. 8, 2018, [thoughtco.com/what-is-communicative-competence-1689768](https://www.thoughtco.com/what-is-communicative-competence-1689768).
- Smit, U., & Dafouz, E. (eds.) (2012) Integrating Content and Language in Higher Education. *AILA Review*, 25. Amsterdam: John Benjamins.
- Shaeiwitz, J.A., & Turton, R. (2003). Educating chemical engineers in product design. *International Journal of Engineering Education*, 19, 153-157.
- Sherris, A. (2010). Coaching Language Teachers. CALdigest, 1-4. <http://www.cal.org/siop/pdfs/digests/coaching-language-teachers.pdf>
- Weimer, M. (2002). *Learner-centered teaching: Five key changes to practice*. San Francisco: CA: Jossey-Bass.

Grading *versus* Reliability: how Academia perspectives evaluation on MOOCs

Moura, Ana S.^a, and Natália D.S. Cordeiro, M.^a

^aREQUIMTE, Department of Chemistry and Biochemistry, University of Porto, Portugal

Abstract

Massive Open Online Courses (MOOCs) have experienced in recent years a significant growth in courses'offer and the number of enrolled students. Nevertheless, the controversy regarding if its quality is reliable, namely in student evaluation and assessment, has not found closure. In this study, we aim at establishing an initial prospection of the academic teaching professionals' perspective regarding the quality of the most common/usual evaluation methods and tools used in MOOCs. After the elaboration of a questionnaire and its implementation to an international sample of academic professors, the analysis of the answers allows perceiving which MOOC grading methods are acceptable in presential Higher Education courses and its eventual acceptable weight in the final grade. Further, within certain constraints, a large percentage of the inquired academics presented no problem with the inclusion of MOOC grading methods on their non-online courses. Overall, within those constraints, the academics felt the quality of the academic orthodox courses was maintained, a perspective that can contribute to change eventual suspicious attitudes regarding MOOCs evaluation methodologies and their student assessment.

Keywords: MOOC; Grading; Peer-review; Evaluation

1. Introduction

Massification of educational systems made its debut in the 19th century as education methodologies become the object of academic study, while the pedagogical goals and constraints were subject to political debate (Stray, 2001). Education, as an absolute value, became an increasingly perennial foundation of contemporary society and the desire to have such value reach every citizen, at any age and any time and any location, led to several attempts for its universal diffusion, as the 1922 decision of Higher Education institutions to broadcast lectures through radio exemplifies and media duly noted (Bliven, 1924). As stated by Marquez-Ramos *et al.* “Current and future learning environments involve both physical and virtual scenarios; [...] A remarkable growth in technology-based educational practices is accompanying the traditional educational model.” (Marquez-Ramos, 2017).

However, apart from the controversy and discussion regarding the evolution of Higher Education pedagogics practice in new contexts, since its primordial attempts, the question of assessment quality of such massive educational approaches *versus* those methods of more orthodox academic courses was raised, and at present, under the rise of Massive Open Online Courses (MOOCs), where massification reaches the domestic embedded nature of intimacy only Internet can offer, the question has increased its prominence.

Assessment and grading are always in question and under analysis, whether in orthodox and non-orthodox courses, but as Pessoa *et al.* wrote: “There is yet to be presented a grading or evaluation method that is pristine in principle and flawless in execution.” (Pessoa, 2015). Nevertheless, one can perceive some methods as less vulnerable to fraud and/or more trustworthy in evaluating specific skills. The questions that can be asked in such a reality are: (a) does this perception is sound or skewed?, and (b) to whom does this perception belongs? Regarding question (a), there have been several studies regarding grading methods and its dependability. Moreover, grading methodologies, namely orthodox grading methodologies, such as written tests, can be used as a pedagogical tool for learning in formative evaluation (Nicol and Macfarlane-Dick, 2005). But this study is focused on some ramified aspects of the question (b).

Perception and personal perspective are the basis of any given person’s reality and if, in particular, such person has education as leitmotif for a profession, then they not only are the person’s paradigms for reality but will also affect how the established education shapes the reality of others. The persons traditionally bestowed with the trust of society regarding Higher Education quality are the orthodox academic professors. As such, how they view MOOCs grading methods certainly affects how MOOC assessment is perceived, either as reliable or not. The results presented in this study consist in a preliminary stage for a future and deeper search in order to understand how orthodox educational professors perceive MOOC grading systems and how that perception affects not only their grading methods

(and those of Academia) but the perception of society, students, and employers from Academia and MOOC evaluation.

This work presents the results of a first stage, where an inquiry regarding the opinion of the academics on MOOCs most usual grading methods was performed and its results are presented. The following stage will be the construction and implementation of a new questionnaire, more detailed, in order to scrutinize even further their academic perception on this subject. The specifics of method and sample are presented in Section 2, while the results and their analysis are presented in Section 3. A final section of concluding remarks not only sums up the overall relevant aspects of the study but also indicates future perspectives regarding the following stages of research.

2. Method and sample details

The survey entitled *MOOCs and Evaluation: the POV of Professors*, was developed/written by the authors of this study and conducted using Google Surveys (2018), being delivered directly to the institutional emails of Higher Education teaching professionals from two countries, Portugal and Spain, which represent the authors's geographical and cultural context. The applied survey consisted of two parts, *Personal Details* and *MOOCs grading and evaluation*, with a total of seventeen questions. The questions ranged from multiple choice (10), short text (4), and selecting boxes (3). In *Personal Details*, the questions aimed at defining the sample and could be divided in individual absolute characteristics (e.g. gender, age, etc) and professional experience (e.g. years of teaching practice, etc). The specifics of the sample are indicated in the following subsections 2.1 and 2.2. In *MOOCs grading and evaluation*, the questions explore the opinions and perspective of the surveyed individuals regarding MOOCs grading methodologies. The results of this part will be presented and discussed in Section 3.

2.1. Sample: Personal Details

The total number of surveyees in this study is 32, an accepted value for minimal statistical significance, especially considering this is a prospection stage for developing a more detailed questionnaire and performing it in a wider community of academics. The sample presents a gender distribution of 65.6% male and 34.4% female, and 77.8% having as field of expertise *Natural Sciences* (e.g. Physics, Chemistry, Biology, Astronomy, Earth Sciences, Space Sciences), or *Formal Sciences* (eg, Mathematics, Logic, Computer Sciences). On the remaining options, apart from the field of expertise *Psychology and Education* represented by two surveyees, the remaining academic fields of expertise have just one individual. The details displayed in Table 1 and Table 2 present the specifics regarding age and nationality of the surveyees. In the latter, both the current professional nationality and the country of origin were considered.

Table 1. Personal Details of Surveyees: Age

Age/years	%
20-29	6
30-39	3.1
40-49	43.8
50-59	40.6
60-69	6

Table 2. Personal Details of Surveyees: nationality

Countries	Country of origin	Current citizenship
Portugal	78.1%	81.3%
Spain	15.6%	18.7%
Senegal	3.1%	0%
Venezuela	3.1%	0%

2.2. Sample: Professional Details

With exception of one case, all surveyees are active teacher/professor in higher education institutions, with 90.6% affiliated to a public University and two in a private Higher Education institution. Regarding professional experience, 50% have more than twenty years of teaching experience in academic institutions, and an equal percentage of 18.8% have between 6 to 10 or 11 to 20 years of teaching experience on the same context. During those teaching years, 56.2% taught/lecture in only one city in the same country, while the remaining 40.6% indicated the option of having taught on two to four different cities in the same country. Still regarding teaching cultural environment, 78.1% have taught/lecture in only one country, 12.5% in at least two countries and 9.4% in more than two countries. Currently, 6 of the surveyees teach in Spain while the remaining exert the profession in Portugal.

3. Results and Discussion

In this section, the results of the second part of the survey, *MOOCs grading and evaluation*, are presented and discussed. The survey's questions of this part could be divided into three groups. The first group consisted in two questions (*Suppose one of your courses or*

seminars would be transformed in a MOOC. Choose what means of evaluation you consider suitable and If you answer that none of the methods listed in the previous question are reliable, please indicate ONE method you think it is reliable for grading a MOOC) intending to examine which, of an array of usual MOOC grading methodologies, were preferred by the surveyees. The answer admitted more than an option. From the 32 answers, 56.2% chose *Peer-review tasks and multiple choice quizzes*, while 34.4% elected *Peer-review essays and peer-review tasks*. No surveyee chose the option 'none of the listed methods' and therefore the second question was locked for the surveyees.

The second group comprised three questions aiming to determine the 'comfort zone' of the surveyees regarding the inclusion of some MOOC grading methods in orthodox evaluation. The first question, *Inclusion of MOOC grading I: If you had to include online peer-review essays as part of the grading on your formal course, indicate the option with the prospective maximum percentage of the final grade*, 40.6% chose the option corresponding to 30% of the final grade and almost a third of surveyees chose the option corresponding to 25% of the final grade. Only 9.4% would opt for a maximum of 10% of the final grade while the remaining surveyees were comfortable with the inclusion of this grading methodology up to 20% of the final grade.

The second question, *Inclusion of MOOC grading II: If you had to include online multiple option quizzes with limited time as part of the grading on your formal course, indicate the option with the prospective maximum percentage of the final grade*, saw yet again a scenario where the options corresponding respectively to 30% and 25% of the final grade not only have the higher percentage of answers but that value is equal, 31.3%. From the remaining answers, 21.9% chose up to 20% of the final grade and just five would only accept up to 10% of this grading method in the final grade.

The third and final question of this group, *Inclusion of MOOC grading III: If you had to include online peer-review tasks as part of the grading on your formal course, indicate the option with the prospective maximum percentage of the final grade*, had half of the surveyees choosing the option corresponding to 30% of the final grade, and the second choice, corresponding to option of up to 25% of the final grade, had 31.3% of positive answers. Only two would just include up to 10%, with the remaining choosing the option of up to 20%.

The third group consisted of two questions, *Inclusion of MOOC grading IV: Choose the reason(s) for choosing the percentages from the list below* and *Inclusion of MOOC grading V: Would you include MOOC grading methods on your non online courses?*, and aimed at a first understanding the reasons for the choices of the previous groups and if those choices were acceptable in orthodox academic courses. An overwhelming percentage of 68.8% considered that their choices made on the former maximum percentages of inclusion of

MOOC grading methods maintained the overall quality of the final grade and/or minimized eventual fraud from the students. The minimization of fraud as solo reason for choice was chosen by 15.7% of the surveyees, while four of the professors considered these methods did not evaluated adequately the intended academic skills. Finally, 81.3% of the surveyees would include MOOCs grading methods on their non-online courses. From these results and taking in consideration also the data of Section 2, it is clear that for a large percentage of experienced academics the inclusion of some MOOC grading methods in non online courses presents a reasonable possibility, as long as its influence in the final grade is between 20 to 30%. As such, that implies those methods are seen as effective evaluation tools within certain constraints.

One cannot escape comparing these results with those discussed by Pessoa *et al.* on the case of computer programming MOOCs assessment, as almost 80% of the surveyees have as field of expertise Natural and Formal Sciences (Pessoa, 2015). In this study, after analyzing twenty three grading rubrics gathered from several academic institutions around the world (which included countries as culturally diverse as Brasil, China, Canada, or Australia), the three most relevant criteria not only were the most frequent and rated criteria but were also used in peer-assessment as reliable on grading programming skills. It was inferred that online assessment could be perceived as trustworthy when the correcting rubrics were appropriately developed.

In fact, peer assessment, viewed as a quality mark by some authors (Mora, 2012; Kulkarni, 2013), was present in the majority of choices as a well founded grading method for the sample discussed in this work. Further, from the five academics that chose all the options for grading, four considered that their choices maintaining the overall quality of grading without also choosing the option regarding the minimization of fraud. More interestingly, however, is that though only six of the surveyees would not include these methods in their non online courses, just one consistently choose the option of up to 10% of final grade in the several questions of the second group. Four of them had evidence to be comfortable with a percentage equal or higher than 25% of the final grade on at least two of the MOOC grading methods. There would seem to be a contradiction between the confidence of the reliability of the grading methods in theory and when the personal professional practice is applied. This certainly would be of interest to explore in a future stage of research.

Finally, we considered to be pertinent, given the large percentage of surveyees with Natural or Formal Sciences as field of expertise, to compare the perspective solely of these academics per country, *i.e.*, contrasting Portuguese *versus* Spanish academic point of view regarding the inclusion and maximum percentages of MOOCs methodologies on the final grade. This would also allow to cross-reference with the conclusions of Pessoa *et al.*, on the MOOC assessment of programming courses (Pessoa, 2015).

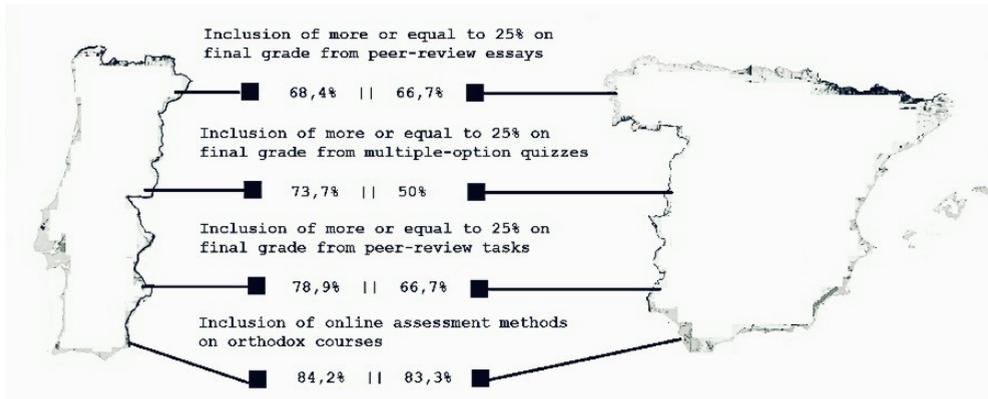


Figure 1. Results regarding only surveyees with Formal or Natural Sciences as field of expertise, for the second and third group of questions. Portugal is represented left, and Spain on the right.

Considering Figure 1, which displays the results of this analysis, it is evident that for the survey sample that is convergence in most of the two nations' perspectives. Considering the inclusion of online peer-review essays assessment equal or higher than 25% of the final grade and expressing favorability to inclusion of online assessment methods on their courses, the percentages are almost the same and expressively represent the opinion of majority of the academic professors. Though the majority is still case for the other two situations (inclusion of more or equal to 25% on the final grade from online assessment through multiple-option quizzes with limited time/peer-review tasks) there is a clear gap between the percentages. On both cases, Portuguese academics present percentages higher than 70% while such mark is never reached in the analogous Spanish sample. There would seem to be certain methodologies perceived as less reliable for the latter, though on the overall the inclusion of MOOCs assessment methods would present no disruption of grading confidence, within the given constraints. This agrees with the conclusions of Pessoa *et al.*, which also noted that the objective nature of the field of expertise could affect the perception of online assessment (Pessoa, 2015).

4. Conclusions

The Internet brought new avenues to the human experience spectra and Education is no exception. Studies, such a quantum-based approach model for the dynamics of higher education/societal transformation interface, are concerned, and rightly so, with the expectations of the professionals, students and general individuals regarding the novel and prospective educational paradigms (Marquez-Ramos, 2017). However, approaches to mass education, such as the ones through television or radio broadcasting, have risen and fall on

the 20th Century. One key factor lies on the reliability of assessment of such courses. Academia stands as the corner-stone for the social confidence on grading and its perspective on the reliability of such assessment methods will affect the success or downfall of online courses. This work aimed at being a preliminary study for understanding the perspective academics have on MOOC grading methods, and from the results it is evidenced that the methods used in MOOC grading are generally seen as acceptable and possible to be included on orthodox courses, as long as they do not represent more than a quarter of the final grade. Future research will aim at exploring the reasons for this constraint and which other online grading methodologies would be acceptable.

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References

- Bliven, B. (1924). *The Century Illustrated Monthly Magazine*, 108, pp. 148.
- Kulkarni C., Wei, K. P., Le, H. (2013) Peer and self-assessment in massive online classes [J]. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 20 (6), 33
- Márquez-Ramos, L., Mourelle, E. (2018). On the relationship between society and higher education: what path should we take? *Distance Education*, 39 (1) 19-36
- Mora, M. C., Sancho-Bru, J. L. , Iserte, J. L., Sánchez, F. T. (2012) An e-assessment approach for evaluation in engineering overcrowded groups. *Computers & Education*, 59 (2), 732-740
- Pessoa, A. M., Coelho, L., & Fernandes, R. (2015). Massive Open Online Course Management: Learning Science and Engineering through Peer-Reviewed Projects. In R. Queirós (Ed.), *Innovative Teaching Strategies and New Learning Paradigms in Computer Programming* (pp. 89-105). IGI Global
- Stray, C. (2001). The Shift from Oral to Written Examination: Cambridge and Oxford, *Assessment in Education: Principles, Policy & Practices*, 8, (1) 33-50.

Flipped classroom and ICTs as the tools to reach key competences

Sanchez Peñaranda , David; Naturil Alfonso , Carmen; Marco Jiménez, José Salvador, Francisco, and Antón, Vicente

Animal Science Department, Universidad Politècnica de València, Spain.

Abstract

The contemporary society demands professionals with competences directly connected to information and communication technology (ICT). In fact, the ICTs have registered a relevant advance through last decades, making possible the implantation of new educational strategies like: the inverted or flipped model. Nevertheless, ICT have been used in a superficial manner at educational system, even at higher education system.

The aim of the present work will be the description of an innovative teaching programme which proposes the implantation of flipped classroom using ICTs to reach the key competences in two environments: students using English as foreign/second-language and students using Spanish as first language.

The key competences will be developed through 5 e-learning activities. The students, outside of the classroom, will perform the tasks using ICTs and afterwards delivering the competence evidence. Once in classroom, the students should make a presentation of their work and open discussion will be performed.

The teacher based on the indicators of achievement and competence evidence will be able to assess the grade of fulfillment of the key competence. Finally, the effectiveness of the teaching project will be evaluated making the comparison between the competence achievement before and after teaching programme implantation.

Keywords: *flipped classroom, ICTs, key competences,*

1. Introduction

The contemporary society demands new competences to both teachers and students, and these competences are related to e-learning activities. High education is required to use information and communication technology (ICT), thus teachers should be prepared to stimulate students through integration of ICT (Røkenes & Krumsvik, 2016). Nevertheless, the presence of digital tools and digital competence development in the university is limited. ICT tools have been used in a superficial manner, such as lesson planning, personal communication or word processing (Drent & Meelissen, 2008), and digital competence is limited to basic skills including office tools and social media (Valtonen et al., 2013).

On the other hand, recently, a different model of teaching have been proposed: the inverted or flipped model. Flipped Classroom is known as is an instructional strategy that combines online digital media with traditional classroom methods, but reversing the traditional learning environment by delivering instructional content, often online, outside of the classroom. Therefore, using this methodology, the students are able to acquire the learning outcomes outside of the classroom, usually using ICTs (Khan, 2012). In fact, the huge advance of ITCs have allowed that flipped classroom methodology had become a reality. Thanks to ICTs is possible to create stimulating learning environments that allow students to solve realistic problems and develop higher-order cognitive skills (Lajoie & Azevedo, 2000).

A relevant advantage of inverted classroom methodology is the fact that can be combined with ICTs to achieve the key competences. European Parliament and the Council, in December 2006, defines the recommendation on European Key Competences, in order to make teaching and learning more oriented towards competence development (Halász & Michel, 2011). European recommendation did not make any reference to behaviour and to learning environments, but the need to think the learning outcomes in terms of competences, is not possible without modifying educational methodologies.

In conclusion, the flipped classroom is an innovative educational methodology, flexible enough to be combined with ICTs in order to make mores feisable the evaluation and so on the achievement of the key and transversal competences.

2. Objectives

The aim of the currentstudy is the description of an innovative teaching programme which proposes the implantation of flipped classroom using ICTs to reach the key competences in two environments: students included in *Content and language integrated learning* (CLIL) programmes (using English as foreign/second-language) and students included in groups using Spanish as first language.

3. Methodology

3.1 Context and Participants

The innovative teaching project will be applied at *Universitat Politècnica de València* (UPV), particularly in the Degree in Biotechnology (<http://www.upv.es/titulaciones/GB/index-en.html>), which includes a new programme called: *Grupos de Alto Rendimiento Académico: Grupos ARA* (<https://www.upv.es/contenidos/ARA/>). This programme was designed by the local government (<http://www.ceice.gva.es/web/universidad/grupos-de-alto-rendimiento>; *Generalitat Valenciana*) to reinforce the potential of the outstanding students in order to help them to achieve the highest academic performance.

The teaching project will be applied in the annual subject: “Animal and Human Physiology”. The subject is considered as a basic training course, being divided into two teaching groups: Standard group, using Spanish as working language and ARA group, using English as working-language. The English group, in order to ensure the achievement of the learning outcomes, the students must certify having a minimum of B2 English level, based on the Common European Framework.

The teaching activities will be carried out by 2 assistant professors, 1 lecturer and 1 professor. The programme has been designed to be applied in 5 lessons of 1 hour, corresponding to 5 seminars. The maximum number of students by seminar is 25. Thus, the Spanish group (~100 students) will be divided in 4 sub-groups of ~25 students. Taking into account that the ARA group is limited to 25 students, only one seminar group will be established.

3.2 Key and Transversal Competences

The subject has been designed to achieve a set of key competences:

- Ability to search and use information
- Competence for continuous learning
- Ability to solve complex problems
- Critical evaluation capacity
- Work in multidisciplinary groups

With the aim to develop these competences, it has been defined the following learning outcomes (Table 1). On the other hand, all the activities have been designed to be carry out in groups, developing the competence “Work in multidisciplinary groups”.

Table 1. Competences and learning outcomes developed

	Competences	Learning Outcomes
1	Ability to search and use information	Apply the regulation of Royal Decree for a practical case of animal experimentation
2	Competence for continuous learning	Be able to perform an experimental design
3	Competence for continuous learning	Be able to summarise and present to peers a research article
4	Critical evaluation capacity	Be able to contrast the information using ITCs.
5	Ability to solve complex problems	Be able to solve complex problems by applying the knowledge acquired

3.3 Teaching activities

The teaching activities have been designed in order to reach the competences through the learning outcomes. All of them have been organised to be accomplished in groups, with 5 members as maximum.

3.3.1 Task 1 - Animal experimentation in research

Thanks a virtual platform (*Poliforma T*, Sakai system), an on-line server provided to both student and teacher by UPV, the students will have accessible all the guidelines and material necessary in relation to a real research project which includes animal experimentation. Using a form, which will have to be filled, the students should describe the protocol applied in the project and confirm if they followed the animal healthcare rules.

Knowledge to learn: The European regulation on animal experimentation

Skills to develop: Autonomy and personal initiative.

3.3.2 Task 2 – Carry out your own experimental design

Once the rules to design a proper animal experimentation have been provided in the previous activity. The students will design an experiment, including an animal model, following the guidelines of the activity using as a reference a set of material (scientific articles, blogs, web of sciences..).

Knowledge to learn: Learn the basic principles of designing an experiment including living beings.

Skills to develop: Oral communication, teamwork, creativity.

3.3.3 Task 3 – Show me what you know

With the aim to work on the progressive learning, in the current activity will work on the learning of presenting the results in attractive format to draw attention to the other scientific or general public.

Knowledge to learn: Learn how to obtain the most relevant information from a scientific article

Skills to develop: Synthesis, creativity and oral communication.

3.3.4 Task 4 – Learn to discuss

Taking as basis the guidelines provided at *Poliforma T* platform, the students should make their own discussion about the results presented in the task 3. Accordingly, the students should search information to contrast the veracity of these results, supporting their comments in scientific bibliography. The students will have the scientific database provided by UPV to perform the activity.

Knowledge to learn: Learn to contrast the information.

Skills to develop: Critical thinking, ability to seek information.

3.3.5 Task 5 – Find out who is to blame

One of the most difficult tasks is to apply the theory to solve a real problem. In the current activity, the teacher will develop a learning module at *Lesson* section of the *Poliforma T* platform. This learning module will include a screencast, further additional information, in relation to the effects of drugs or medicines. Afterwards, the students will have a final activity with the description of a disease. The task will consist in finding out which are the causes of the diseases and which organs are involved.

Knowledge to learn: Learn how drugs/medicines affect the nervous system.

Skills to develop: Logical and deductive thinking.

3.4 Assessment

The five teaching activities will have a weight of 15% respect to full subject score. The individual score will depend on the indicators of achievement for each learning activity which are as follows:

3.4.1 Task 1 - Animal experimentation in research

Description of the indicators of achievements:

- Knows how to apply the regulations on animal experimentation.
- Is able to identify the most relevant regulation of the Royal Decree.
- Has been demonstrated autonomy to develop the activity

The competence evidence will be the filled form delivered by the student at Poliforma T platform.

3.4.2 Task 2 – Carry out your own experimental design

Description of the indicators of achievements:

- Know how to design a feasible experiment.
- Know the procedure of designing an experiment including living beings.
- Show creativity.
- Develop oral skills.

The competence evidence will be the experimental design document delivered by the student at *Poliforma T* platform.

3.4.3 Task 3 – Show me what you know

Description of the indicators of achievements:

- Ability to synthesise.
- Improve the reading comprehension of scientific literature.
- Show creativity.
- Develop oral skills.

The competence evidence will be the results presentation in a poster format delivered by the student at *Poliforma T* platform.

3.4.4 Task 4 – Learn to discuss

Description of the indicators of achievements:

- Ability to find information.
- Critical thinking.
- Ability to transfer theoretical knowledge to resolve practical cases.

The competence evidence will be the document including the discussion of the results presented in the task 3, and delivered by the student at *Poliforma T* platform.

3.4.5 Task 5 – Find out who is to blame

Description of the indicators of achievements:

- Ability to solve complex problems.
- Ability to transfer theoretical knowledge to resolve practical cases
- Develop logical thinking.
- Improve deductive skills.

The competence evidence will be the document which includes the resolution of the challenged posed, justifying the response.

The assessment of the different competences in each activity will be carry out using a new tool called *iRubric*, available at *Poliforma T* platform. Thanks to this tool, *iRubric*, it will be possible to assess the developed competences in each task using a specific rubric, predesigned to classified the learning outcomes in each activity.

4. Conclusion

The objective of this innovative teaching project is to help students to acquire the competences corresponding to the subject “*Fisiología Animal y humana*” through ICTs. With the aim to reach these goals, an educational methodology known as flipped classroom has been proposed to be applied in two environments: students belong to ARA teaching programme, using English as second-language, and the students belong to Standard group, using Spanish as first language.

In order to evaluate the effectiveness of the teaching project, we will compare the competence assessment reported in previous academic courses, when the teaching programme was not implemented, and after the teaching programme implantation. Finally, motivation will be evaluated through an anonymous questionnaire, in which the students will be asked about the level of satisfaction of the teaching programme, which activities they considered more attractive and which aspects they would change in the future.

The results obtained will be presented to be disseminated in several educational conferences, such as:

- INRED 2018, IV Congreso Nacional de Innovación Educativa y Docencia en Red.
- 4th International Conference on Higher Education Advances (HEAd’18).

Acknowledgements

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References

- Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education*, *51*(1), 187–199. <https://doi.org/https://doi.org/10.1016/j.compedu.2007.05.001>
- Halász, G., & Michel, A. (2011). Key Competences in Europe: interpretation, policy formulation and implementation. *European Journal of Education*, *46*(3), 289–306. <https://doi.org/10.1111/j.1465-3435.2011.01491.x>
- Khan, S. (2012). *The one world schoolhouse: Education reimaged*. London: Hodder and Stoughton.
- Lajoie, S. P., & Azevedo, R. (2000). Cognitive tools for medical informatics. *Computers as Cognitive Tools II: No More Walls: Theory Change, Paradigm Shifts and Their Influence on the Use of Computers for Instructional Purposes*, 247–271.
- Røkenes, F. M., & Krumsvik, R. J. (2016). Prepared to teach ESL with ICT? A study of digital competence in Norwegian teacher education. *Computers & Education*, *97*, 1–20. <https://doi.org/https://doi.org/10.1016/j.compedu.2016.02.014>
- Valtonen, T., Hacklin, S., Kontkanen, S., Hartikainen-Ahia, A., Kärkkäinen, S., & Kukkonen, J. (2013). Pre-service teachers' experiences of using social software applications for collaborative inquiry. *Computers & Education*, *69*, 85–95. <https://doi.org/https://doi.org/10.1016/j.compedu.2013.07.001>

Duet Lectorials: An Engaging Approach to Interdisciplinary Teaching

Slattery, Robin Marie^a; Taylor, Renea .Anne.^b and Doerig, Christian Daniel^c

^aDepartment of Immunology, Central Clinical School, Monash University, Australia.

^bDepartment of Physiology, Monash University, Australia. ^cDepartment of Microbiology, School of Biomedical Science, Faculty of Medicine, Nursing and Health Sciences, Monash University, Australia.

Abstract

Duet Lectorials were delivered to third-year students undertaking their final 'cap-stone' unit by two experts straddling two inter-related but distinct biomedical disciplines. This interdisciplinary teaching approach was introduced for two reasons: firstly, to address a gap in integrated learning at the interface between biomedical disciplines; and secondly, to support non-teaching focused, research experts, in the engaging delivery of lectures. Compared with traditional lecture delivery, students who had received Duet Lectorials reported an increase in their enjoyment of learning, a greater interest and engagement with the subject content, and, most importantly, improved in-depth understanding of the topic through an integrated perspective of the two disciplines. This positive outcome in student learning was further validated by improved performance in objective assessment tasks. Lecturers delivering Duet Lectorials reported a deepening of their own interdisciplinary knowledge that stimulated their enjoyment of teaching. Thus, interdisciplinary teaching using interactive Duet Lectorials emerges as a powerful approach to improve both student and teacher engagement and learning in the classroom, and brings a strong contribution to breaking the discipline-specific "silo" mentality in the teaching of complex aspects of biomedical sciences.

Keywords: *Interdisciplinary Teaching; Duet Lectorial; Active Learning*

1. Introduction

In tertiary institutions, the biomedical disciplines have traditionally been taught from departments housing discipline-specific research activities. As research has progressed, the boundaries between disciplines have blurred, leading to an integrated approach to biomedical sciences, and ultimately making ‘Personalized Medicine’ a clear possibility (Salari, 2009). This development in integrated biomedical knowledge based on disciplines such as Genetics, Biochemistry, Pharmacology, Immunology, and Microbiology (to name a few) must now be included in tertiary education. Despite the need for interdisciplinary education, most tertiary institutions continue to educate students with discipline-specific knowledge delivered from within the rigid structures of departments (Salari, 2009).

Several significant challenges limit the ability of academics from discipline-specific departments to effectively teach in an interdisciplinary way. The first is cultural: the traditional resources available for teaching, including discipline-specific course ‘ownership’ driven by departmental funding structures and classic discipline-specific text-books as source material (Frodeman et al, 2017), do not facilitate inter-disciplinary teaching. Perhaps the most significant challenge, however, is the discipline-related language barrier that exists between disciplines after centuries of largely independent development, and the ensuing paucity of knowledge of academics in disciplines that are interconnected, but distinct, from that in which they have specialized during their research career.

To overcome the language barriers that have evolved within the silos of biomedical disciplines, and teach in an interdisciplinary way, we introduced Duet Lectorials.

2. Methods

2.1. Format of Duet Lectorials

Duet Lectorials utilized the discipline-specific knowledge and language proficiency of two experts straddling two related disciplines. The format was between that of a classic lecture and a tutorial, in which a three way discussion was initiated, firstly between each of the expert facilitators, and extended to the student cohort to participate in the sharing of ideas at the interface of the two disciplines. Three Duet Lectorials were assessed: *The Immune System versus Malaria*, *The Immune System versus Herpesvirus*, and *The Immune System versus Cancer*. In each case the discussion between the two discipline experts took the form of a ‘battle’, reflecting the real physiological battle that occurs at the interface between the two systems being studied. Students were thrown a ‘catch box’ carrying a microphone, through which they were encouraged to communicate their ideas on the ‘weapons’ each biological system may have evolved to be ‘most fit’ to survive the battle.

2.2.1 Assessment of the impact of Duet Lectorials on student experience

Anonymous feedback was sought from 198 students who attended Malaria and Herpesvirus Duet Lectorials (136 and 126 respondents, respectively), and from 109 students who attended Cancer Duet Lectorials (70 respondents) over two academic years. Attendance at individual Duet Lectorials was awarded marks, but not compulsory. Students were classified into three groups according to whether they attended the duet lectorial (Attend), listened online to the recording but did not attend (Listen), or neither attended nor listened online, but read the lectorial notes provided only (Read). All students were asked to give a discrete response to statements as either Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly Disagree (SD). For simplicity, the analyses collated student responses into whether they agreed (SA/A) or did not agree (N/D/SD) with the statements provided. Statistical analyses were performed using GraphPad Prism Fisher's exact test.

2.2.2 Assessment of the impact of Duet Lectorials on student performance

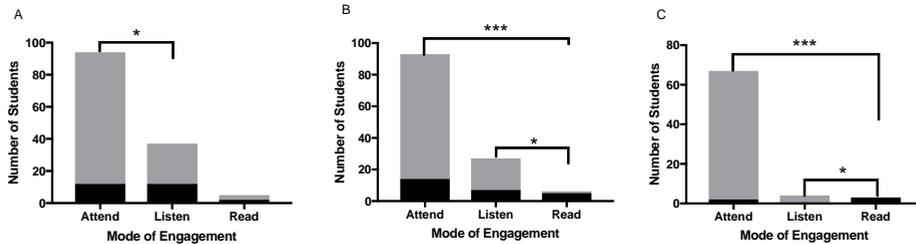
Performance was evaluated through objective assessment tasks based on Extended Matching Questions (EMQs) (Slattery, 2017). For the single lecturer cohort, the immunology expert taught all three lectures, and for the Duet Lectorials the same immunology expert was joined by experts in microbiology (Malaria and Herpesvirus Duet Lectorials) and cancer (Cancer Duet Lectorial). The EMQs were created by the immunologist; recording and notes were available for both traditional lectures and Duet Lectorials.

3. Results

3.1 The Duet Lectorials were well structured

Students were asked whether they preferred the structure of the Duet Lectorial, or that of standard lecture, for each Duet Lectorial they attended, listened to online, or read the notes only (Fig. 1). For each of the three Duet Lectorials, the vast majority of students preferred the Duet style of delivery. In the case of the Malaria Duet Lectorial, there was a significantly higher preference for the Duet structure of delivery by students who attended, compared with those who listened online only (Fig 1A, * $P < 0.05$). This was the first of the Duet Lectorials delivered, and we propose that actual attendance (rather than listening to a recorded session online) may have facilitated understanding because of additional visual and kinesthetic educational cues (Murphy et al, 2004). In the subsequent two Duet Lectorials, the lecturers were asked to slow the pace of the discussions to give students time to 'change gears' between the two discipline areas. There was no significant difference in the responses of students who attended versus those who listened online to the later Herpesvirus (Fig 1B) or Cancer (Fig1C) Duet Lectorials. In both of the latter cases, there

was a significantly higher preference for the Duet structure of delivery by students who either attended or listened online to the material compared with the preference of students who read the notes only (** $P < 0.001$). These data suggest that Duet Lectorials are most valuable in providing a setting in which students are actively participating in the learning environment.



*Figure 1. Students who attended or listened online preferred Duet Lectorials. Data representing (A) The Immune System versus Malaria Duet Lectorial (n=136), (B) The Immune System versus Herpesvirus Duet Lectorial (n=126), and (C) The Immune System versus Cancer Duet Lectorial (n=70). Students were asked if they preferred the structure of the Duet Lectorial (grey), or that of standard single lecturer delivery style (black), for each Duet Lectorial they attended. Statistical differences denoted as * $P < 0.05$, *** $P < 0.001$.*

3.2 The Duet Lectorial style was more enjoyable for students

Students were asked whether they agreed or disagreed that Duet Lectorials were more fun than standard lectures (Fig. 2). For each of the three Duet Lectorials the vast majority of students agreed the Duet style of delivery was more enjoyable compared with the standard, single lecturer, delivery style. Here again the Malaria Duet Lectorial was enjoyed by students who attended the lectorial, compared with those who listened online only, consistent with the results in Section 3.1 (Fig 2A, * $P < 0.05$). Whereas, again, there was no significant difference in the number of students who enjoyed the Duet Lectorials between those who attended and listened online in the Herpes Duet Lectorial; the difference in enjoyment was seen only between those who did versus those who did not attend or listen to the lectorial (Fig 2B, ** $P < 0.01$, * $P < 0.05$ respectively). Since the majority of students attended the Cancer Duet Lectorial, the number of non-attending students was too small for meaningful comparison (Fig 2C).

3.3 The Duet Lectorial style was more interesting and engaging for students

Students were asked whether they agreed or disagreed that the Duet Lectorials were more interesting (Fig 3) and more engaging (Fig 4) than standard delivery, for each Duet Lectorial they attended, listened to online, or read the notes only. For each of the three Duet Lectorials the vast majority of students who attended or listened online agreed the Duet style of delivery was more interesting and engaging compared with the standard, single lecturer, delivery style. In contrast, students who read the notes only reported being

significantly less interested (Fig 3A, $**P<0.01$; Fig 3B, $***P<0.001$, $**P<0.01$) and engaged (Fig 4A, $*P<0.05$; Fig 4B, $***P<0.001$, $**P<0.01$) with the Duet style of delivery.

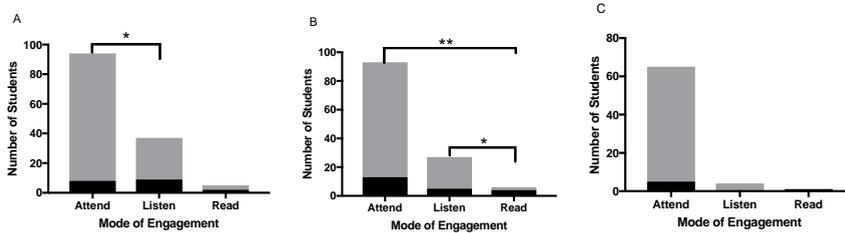


Figure 2. Duet Lectorials were more enjoyable for students who attended or listened online. Data representing (A) The Immune System versus Malaria Duet Lectorial (n=136), (B) The Immune System versus Herpesvirus Duet Lectorial (n=126), and (C) The Immune System versus Cancer Duet Lectorial (n=70). Students were asked whether they agreed (grey) or not (black) that Duet Lectorials were more fun than traditional lectures. Statistical differences denoted as $*P<0.05$, $**P<0.01$, $***P<0.001$.

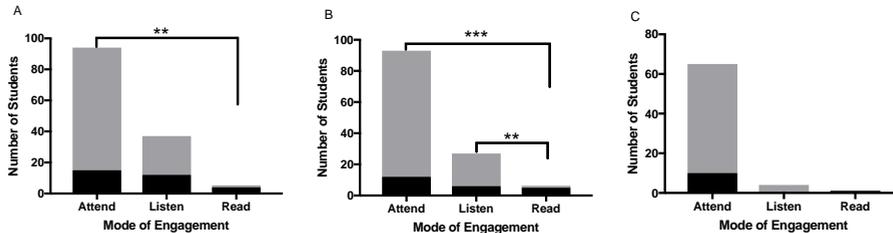


Figure 3. Duet Lectorials were more interesting for students who attended or listened. Data representing (A) The Immune System versus Malaria Duet Lectorial (n=136), (B) The Immune System versus Herpesvirus Duet Lectorial (n=126), and (C) The Immune System versus Cancer Duet Lectorial (n=70). Students were asked whether they agreed (grey) or not (black) that Duet Lectorials were more interesting than traditional lectures. Statistical differences denoted as $**P<0.01$, $***P<0.001$.

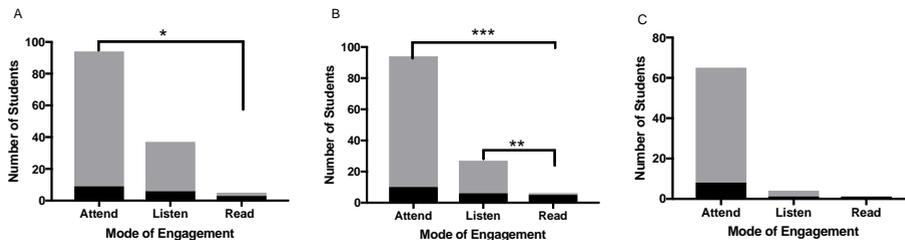


Figure 4. Duet Lectorials were more engaging for students who attended or listened. Data representing (A) The Immune System versus Malaria Duet Lectorial (n=136), (B) The Immune System versus Herpesvirus Duet Lectorial (n=126), and (C) The Immune System versus Cancer Duet Lectorial (n=70). Students were asked whether they agreed (grey) or not (black) that Duet Lectorials were more engaging than traditional lectures. Statistical differences denoted as $*P<0.05$, $***P<0.001$.

3.4 The Duet Lectorial style assisted students to learn in an integrated way

Students were asked whether they agreed (or not) that the Duet Lectorials assisted their integrated learning (Fig 5). For each of the three Duet Lectorials the vast majority of students who attended or listened online agreed the Duet style of delivery assisted their integrated learning compared with the standard, single lecturer, delivery style. However, again, the subset of students who only read the notes significantly less often reported improvement in their integrated learning (Fig 5A, * $P < 0.05$; Fig 5B, ** $P < 0.01$, * $P < 0.05$) with the Duet style.

The impact on learning was further assessed by comparing performance of students who were given interdisciplinary material, either using the standard lectures ($n=74$), or using the Duet Lectorial ($n=96$). The same objective assessment sheet (10 EMQs) (Slattery, 2017) was completed under examination conditions by both cohorts of students to assess their interdisciplinary knowledge of the interface between the immune system and malaria parasite biology. The students who received the Duet Lectorial significantly out-performed those who had received the standard lecture (mean mark of $65 \pm 22.2\%$ versus $87 \pm 16.7\%$).

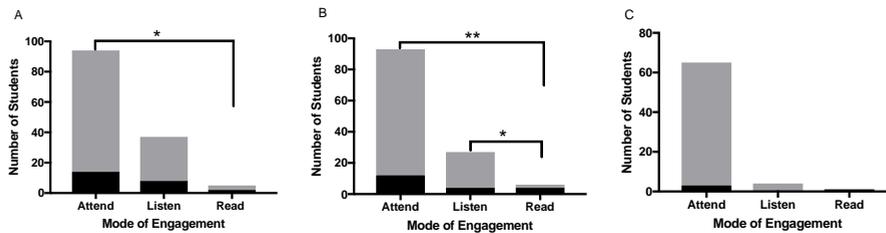


Figure 5. Duet Lectorials assisted students to learn in an integrated way. Data representing (A) The Immune System versus Malaria Duet Lectorial ($n=136$), (B) The Immune System versus Herpesvirus Duet Lectorial ($n=126$), and (C) The Immune System versus Cancer Duet Lectorial ($n=70$). Students were asked whether they agreed (grey) or not (black) that Duet Lectorials assisted their integrated learning more than traditional lectures. Statistical differences denoted as * $P < 0.05$, ** $P < 0.01$.

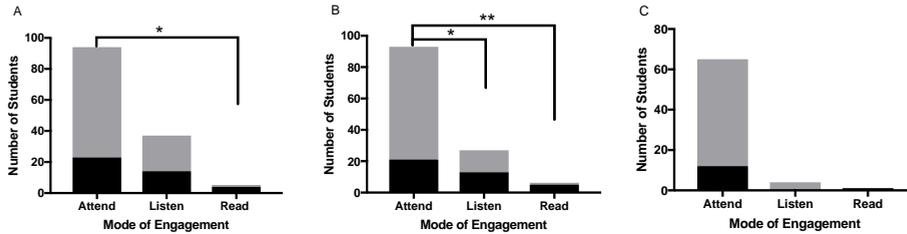


Figure 6. Students prefer to have more Duet Lectorials. Data representing (A) The Immune System versus Malaria Duet Lectorial (n=136), (B) The Immune System versus Herpesvirus Duet Lectorial (n=126), and (C) The Immune System versus Cancer Duet Lectorial (n=70). Students were asked whether they would like to have more content delivered by the Duet Lectorial style (grey) or not (black) to replace traditional single lectures. Statistical differences denoted as * $P < 0.05$, ** $P < 0.01$.

3.5 Students prefer to have more Duet Lectorial style delivery of material

After each of three Duet Lectorials, students were asked whether they would like to have more of the course content delivered in the Duet Lectorial style, or have more standard lectures. Again the responses were stratified according to whether students attended, listened online, or read the notes only. The majority of students who attended or listened online preferred to have more Duet Lectorials, whereas, consistent with other parameters measured, significantly fewer students who neither attended nor listened online preferred to have more Duet Lectorial style delivery of material (Fig 6A, * $P < 0.05$; Fig 6B, ** $P < 0.01$, * $P < 0.05$).

3.6 Benefits for the discipline-specific academics delivering the Duet Lectorials

While the small number (3) of teachers involved in the study precludes meaningful statistical analyses of lecturer experience, anecdotal feedback was exclusively positive. Comments include: *'The Duet Lectorial offered me the opportunity to go in-depth in an area that is central to the infection process, but of which I had only largely superficial knowledge. This will certainly improve my own teaching on the subject'*. *'The Duet Lectorial strengthened my ability to teach in an interactive way, not only with the other teacher, but also with the students, as the format is conducive to engaging the students to be 'on the side' of the pathogen. Altogether a very valuable and enjoyable experience.'*

4. Conclusions

Duet Lectorials addressed the gap in interdisciplinary learning, and enhanced the communication style of non-teaching focused, research experts. This required a shift in pedagogical philosophy, from the traditional approach where a single lecturer is the discipline expert, to a synergistic approach, resembling research endeavors in which

collaborative expertise is harnessed in an integrated way. It also required substantial extra-disciplinary reading by both academics, to inform a script focussing on the interface between disciplines. The conversational style was experienced by both lecturers and students as a more natural mode of communication than is the case in a classical lecture (Mayer et al, 2004).

The impact of Duet Lectorials was overwhelmingly positive in all parameters measured. The vast majority of students who attended the event or listened to the content online preferred Duet Lectorials over traditional lectures, finding the approach to be more fun, interesting and engaging. These students reported an improvement in their integrated learning, which was substantiated by objective assessment through interdisciplinary EMQs under examination conditions. Finally, they expressed a strong preference for more Duet Lectorials to be included in their course; students who did not attend the Duet Lectorials were significantly less positive about the merits of the approach in all of the parameters tested. This suggests the benefits of this approach do not translate well to learning by reading notes, in isolation from active listening to the Duet Lectorial. It should be noted that the number of students who neither attended nor listened was small and may represent a self-selected sub-group that was disengaged from the subject material prior to its delivery (Massingham & Herrington, 2006).

Teachers who delivered Duet Lectorials have requested further involvement in the program, which has enhanced their confidence in interdisciplinary teaching, and in turn had benefits in cross-fertilization of their research and in interdisciplinary grantsmanship. The successful uptake by students has prompted implementation of this approach in international post-graduate courses (Doerig & Slattery, 2016, 2017), and for interdisciplinary research presentations at to the National Institute of Health (USA) (Cox & Bainbridge, 2017).

The introduction of Duet Lectorials addressed a gap in interdisciplinary learning. The Duet Lectorials have enhanced the performance, enjoyment, interest and engagement of students and teachers alike. Overcoming the discipline language barriers and educating our students in an interdisciplinary way will not only prepare our graduates for the world of integrated medicine that awaits them, but also ultimately lead to changes in the culture of education within our universities, as these students become tomorrow's educators.

References

Salari K (2009) The Dawning Era of Personalized Medicine Exposes a Gap in Medical Education. *PLoS Med* 6(8): e1000138.

- Robert Frodeman, Julie Thompson Klein and Roberto Carlos Dos Santos Pacheco (2017) Administering Interdisciplinary Programs. *The Oxford Handbook of Interdisciplinarity* 2nd Edition p538, Oxford University Press.
- Slattery, R.M., (2017) Objective versus subjective methods to assess discipline-specific knowledge: a case for Extended Matching Questions (EMQs). *3rd International Conference on Higher Education Advances, HEAd'17*
- Murphy, R.J., Gray, S.A., Straja, S.R., and Bogert M.C. (2004) Student Learning Preferences and Teaching Implications *Journal of Dental Education* 68(8) 859-866
- Mayer, R. E., Fennell, S., Farmer, L., & Campbell, J. (2004). A Personalization Effect in Multimedia Learning: Students Learn Better When Words Are in Conversational Style Rather Than Formal Style. *Journal of Educational Psychology*, 96(2), 389-395.
- Massingham, P. & Herrington, T., (2006) Does Attendance Matter? An Examination of Student Attitudes, Participation, Performance and Attendance. *Journal of University Teaching and Learning Practice* 3(2)
- Doerig, C.D., & Slattery, R.M., (2016 & 2017) The Immune System versus Malaria. Concepts in Parasitology Course, Kioloa, Australia. *Australian Society for Parasitology*.
- Cox, B and Bainbridge, S (2017) The Human Placenta Project, National Institute of Child Health and Human Development (NICHD), National institute of Health (NIH) *Natcher Conference Center*.

Training and developing soft skills in higher education

Cornalli, Federica

University of Turin, Italy

Abstract

In recent decades, there has been a growing awareness of the importance of higher education to the development of a knowledge-based economy. Therefore, universities are committed to the challenge of providing students with all the skills that enable them to respond to the ever-changing needs of contemporary society and the workplace. In particular, increasing emphasis is being put on the so-called 'soft skills', viz., personal attributes and interpersonal qualities such as communication, responsiveness and the ability to work in a team. A series of studies agree in assigning soft skills a major role in employability, as well as in achieving well-being and personal goals.

Starting from a brief review of the main definitions of the notion of soft skills and how they have been classified, this paper will highlight the plurality of approaches and the critical points that characterize studies on this topic. We will then examine the role that tertiary education plays and could play in building soft skills.

Keywords: *Soft skills; higher education; academic teaching.*

1. Introduction

The profound changes in the production system that have taken place in the last decades — mostly due to pervasive technological innovation, the incessant processes of globalization and institutional transformations — call for competent and highly qualified professionals. Likewise, the transition from routine task-centered work activities to multiform and process-centered activities, as well as the growing number of people working in commerce and the service industry, creates a need for managers, supervisors and workers who are capable of positive interaction with others and can solve problems for which there is no set approach.

The need for an increasingly competent population has placed education at the center of the employability skills agenda, and in particular higher education, as it is the level where advanced professional skills are developed. Scholars, the business community, commentators and various organizations — including the Organisation for Economic Co-operation and Development (OECD), the International Labour Office (ILO) and the World Bank — place great emphasis on this level of education, recommending that countries increase the proportion of their population with tertiary level qualifications.

In Europe, higher education has expanded rapidly following the Bologna Process — an initiative to harmonize educational programs by creating a common degree structure and introducing a common credit system and quality assurance mechanism.. However, the goal of increasing the number of graduates has yet to be reached. In fact, one of the five headline targets indicated in the Europe 2020 strategy for developing a “smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion”, is that “40 % of people aged 30-34 in the EU should have a higher education qualification”. In addition to the need to increase the number of graduates, it is also necessary to improve the quality of their training to ensure that they are highly skilled and able to respond to the ever changing and complex needs of the contemporary workplace.

Numerous studies (King, 2003; Yunus and Li, 2005; Mourshed et al. 2012) have raised serious concerns about the widening gap between graduates’ skills and capabilities, and the demands of the work environment in an increasingly mobile and globalized society. Recently, the European Centre for the Development of Vocational Training reported the opinions of many employers and policy-makers, who argue that these difficulties arise because of the inadequate preparation of graduates and other workers. They claim that the endemic skills mismatch in European economies results in high unemployment (CEDEFOP, 2014). Graduates often lack the ability to organize, adapt and strategically apply their specific skills to new situations and circumstances (Bridgstock 2009). The skills that are crucial to employability are not only the hard skills, i.e., cognitive and technical, job-specific and discipline-specific abilities, but also the so-called soft skills, or in other

words transferable skills that are common to almost all complex endeavours and apply across all fields, such as communicating, problem-solving, flexibility, persistence, resilience and creativity.

This paper will discuss the notion of soft skills, starting from a review of the different definitions that have been assigned to them and a presentation of their main classifications, highlighting in particular the critical elements and the plurality of approaches involved. The role of the university in forming and developing soft skills will then be discussed.

2. Soft skills: definitions and categorizations

Though it is widespread in political, journalistic and popular scientific discourses, the notion of soft skills is not without problems. Nor is the terminology used for the notion uniform, as it can differ significantly from country to country. In the United Kingdom, the terms ‘life skills’, ‘core skills’ and ‘key skills’ are frequently used in addition, or in preference to, the term ‘soft skills’. In Australia and New Zealand, expressions such as ‘employability skills’ or ‘generic skills’ are used. In the United States they prefer to talk about ‘basic skills’ and ‘necessary skills’, and in France about ‘compétences transposable’ and ‘compétences transversales’. There is no greater convergence as regards how the concept should be defined, and in fact there are numerous definitions that take different semantic slants. Some identify soft skills mainly on the basis of what they make it possible to do, the results they make it possible to achieve. The Nobel laureate in economics James J. Heckman, in an article co-authored with Tim Kautz, states that soft skills are “personality traits, goals, motivations, and preferences that are valued in the labor market, in school, and in many other domains. [...] Soft skills predict success in life, [...] they produce that success, and [...] programs that enhance soft skills have an important place in an effective portfolio of public policies” (Heckman and Kautz, 2012, 451). Robles also focuses on the effects: “Soft skills are the intangible, non-technical, personality-specific skills that determine one’s strengths as a leader, facilitator, mediator, and negotiator” (Robles, 2012, 457).

Some scholars characterize soft skills by identifying them with other attributes. In Verma’s opinion (2013), soft skills correspond to the Emotional Intelligence Quotient (EQ), as opposed to the Intelligence Quotient (IQ) which concerns the hard skills. Carneiro et al. (2007) seem to equate soft skills with social skills. Lastly, other scholars believe that they represent “a dynamic combination of cognitive and metacognitive skills, interpersonal, intellectual and practical skills” (Haselberger et al. 2012, 67).

Although many critics have opined that soft skills are not clearly distinguishable because they are strongly connected to each other and interrelated to individual traits, numerous

studies have attempted to make analytical distinctions between them and propose classifications. Among the pioneering studies in the field, mention should be made of one conducted at the beginning of the Nineties by the World Health Organization which identified the following life skills: decision-making; problem-solving, creative thinking; critical thinking; communication skills; interpersonal skills; self-awareness; empathy; coping with emotions; coping with stress (WHO 1993). A few years later, a program launched by the Swiss Federal Statistical Office, with OECD support, entitled Definition and Selection of Competencies: Theoretical and Conceptual Foundations (De.Se.Co) provided a conceptual framework to inform the identification of competencies needed to lead a personally and socially worthwhile life in a contemporary democratic state. This study, which was grounded in a holistic model of competence and drew on contributions from experts in disciplines such as sociology, anthropology, philosophy, psychology and economics, identified three categories of key competencies: interacting in socially heterogeneous groups (which includes the ability to relate well to others, cooperate, and manage and resolve conflicts); acting autonomously (which includes competencies that empower individuals to manage their lives in meaningful and responsible ways by exercising control over their living and working conditions, e.g., the ability to form and conduct life plans and personal projects, and to defend and assert rights, interests, limits and needs) and using tools interactively (which includes the ability to use language, symbols, text, knowledge, information and technology interactively) (Rychen and Salganik 2001).

Other classifications were subsequently proposed by the European Union (Key Competences for Lifelong Learning, EU 2006), by the OECD (21st century skills, 2009) and by internationally renowned scholars (Goleman and Boyatzis, 2008; Ciappei and Cinque, 2014).

The wide variety of classifications stems from the fact that they were formulated using multiple reference criteria. For example, some soft skills have been identified by grouping them into two clusters: interaction skills and motivation skills (Moss and Tilly 2001), others have been identified with reference to a matrix whose rows are the different areas of competences (cognitive, realization, social, emotional) and whose columns are the different organizational roles (operational, manager, executive) (Manpower Group 2014), and many other criteria could also be mentioned. There are also various ways of constructing these classifications. For example, some were drafted from an ‘employers’ perspective’ by surveying business executives or human resource managers regarding the needs of the labor market —as, for example, Robles (2012) and Career Builder (2014) — while others derive from an ‘institution perspective’ or ‘expert perspective’ because they report the orientations of national, international or supranational institutions and the opinions of scholars from different disciplines (as for example in the De.Se.Co project mentioned above). This results in dissimilar outcomes. While the first perspective identifies characteristics and capacities

that are directly related to individual productivity, which leads to mainly economic benefits, the latter also identifies skills that promote sustainable development and facilitate the creation of social cohesion. Despite their number and variety, these classifications are undoubtedly valuable. They provide a systematic and rationally ordered list of attributes that would otherwise be a formless mass. However, these classifications should not be reified. Although useful as simple work tools, they require continuous maintenance: there are countless soft skills and classifications must be revised and expanded to reflect constant changes in technology.

3. Soft skills in higher education

The education system's persistent misalignment with the needs of the labor market raises doubts about the university and its role in forming the skills needed to lead a successful and responsible life and for society to face present and future challenges.

Accordingly, as part of the Qualifications Framework of the European Higher Education Area, the European Union member states have adopted a set of "cycle or level descriptors" in order to establish typical expectations of achievements the end of each of the three Bologna cycles. These descriptors, the so-called Dublin Descriptors, are generic statements that describe the expected results not in terms of knowledge learned, but in terms of levels of competence achieved. They include the following five components: knowledge and understanding, applying knowledge and understanding, making judgements, communication, and lifelong learning skills. In an attempt to identify the nature of the whole qualification, the descriptors are not subject-specific or limited to academic, professional or vocational areas, but focus on the acquisition of transferable skills, effectively incorporating the most recent research guidelines that emphasize the importance of soft skills in achieving expected performance levels. Academic teaching is thus faced with a complex challenge. On the one hand, it seems easier to transmit attributes that involve personal characteristics in the family or in the early levels of education, when growing children are most receptive. On the other hand, university teaching practice is often still pervaded by the lecturing method and traditional approaches. In recent times, the growing interest in this topic — coupled with the multiplication of recommendations by various institutions (e.g. EU, OECD) in favor of training and developing soft skills as well as the need for competitive educational provision that meets the requirements of the job market — has meant that most universities are introducing soft skills initiatives. The catalog of proposals is very wide and varies considerably in terms of student involvement and personalization. It ranges from simply posting written materials or videos on the university website, up to the preparation of coaching and tutoring programs. Over and above the different possible approaches, the question that arises is whether soft skills

should be taught in a specific separate module, or if they should be developed in each of the disciplines making up the regular curriculum. In the latter case, faculty should encourage the use of different teaching methods to develop graduate attributes in their students. In particular, teaching should take a holistic, learner-centered and problem-based approach and should include educational activities such as work teams, case studies, simulations, project works and presentations from the students. The teacher should also assume multiple roles, such as mentor, facilitator and evaluator, thus demonstrating and modelling the utility of possessing generic skills (B-HERT 2002).

4. Conclusions

Recent changes in the production system and labor market have placed higher education under increasing pressure to train employable graduates. In order to achieve this purpose, universities must not only transmit knowledge and abilities that are specific to each discipline or occupation, but must also develop so-called soft skills, meaning dispositions and attributes that are transferable to many occupational situations and areas.

Faced with this need, now considered essential, efforts to build soft skills and implement them effectively must be redoubled. In this connection, it seems necessary to establish a robust framework of soft skills based on theoretical and empirical research. Though there are numerous studies on this subject, soft skills are constantly changing properties and require constant redefinition. Moreover, a further issue deserves attention: while a distinctive feature of soft skills is the fact that they cut across many fields of application, it is known that they can take on different characteristics across cultures and settings. Investigating the various contexts of use and methods of application could provide useful insights.

Lastly, continuing research on soft skills can avert the risk of reductionism, or in other words, considering only the labor market outcomes while neglecting the important positive effects on health, family life, social cohesion, civic engagement and life satisfaction.

References

- B-HERT Business-Higher Education Roundtable (2002). Enhancing the learning and employability of graduates: the role of generic skills. *B-HERT Position Paper*, No. 9.
- Bridgstock, R. (2009) The graduate attributes we've overlooked: enhancing graduate employability through career management skills. *Higher Education Research & Development*, 28, 1, 31-44.

- Bologna Working Group (2005). *A Framework for qualifications of the European higher education area*. Bologna Working Group Report on Qualifications Frameworks, Copenhagen, Danish Ministry of Science, Technology and Innovation.
- Career Builder (2014). *Overwhelming majority of companies say soft skills are just as important as hard skills*. Url: www.careerbuilder.com/share/aboutus/pressreleasesdetail.aspx?sd=4/10/2014&id=pr817&ed=12/31/2014.
- Carneiro, P., Crawford, C., Goodman, A. (2007). *The impact of early cognitive and non-cognitive skills on later outcomes*. London: Centre for the Economics of Education, London School of Economics.
- CEDEFOP (2014). *Skill mismatch: More than meets the eye*. Briefing Note, March 2014. Thessaloniki: European Centre for the Development of Vocational Training. Url: www.cedefop.europa.eu/en/publications-and-resources/publications/9087.
- Ciappei C., Cinque M. (2014). *Soft skills per il governo dell'agire*. Milano: FrancoAngeli.
- European Union (2006). *Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning*. Url: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006H0962>.
- Goleman D., Boyatzis R. (2008). Social intelligence and the biology of leadership. *Harvard Business Review*, September, 74-81.
- Haselberger, D., Oberhuemer, P., Pèrez, E., Cinque, M., Capasso D. (2012). *Mediating soft skills at higher education institutions, handbook of the ModES project: Lifelong learning programme*, <http://www.euca.eu/en/prs/modes-handbook.aspx>.
- Heckman, J.J., Kautz, T. (2012). Hard evidence on soft skills. *Labour Economics*, 19(4), 451-464.
- King, Z. (2003). New or traditional careers? A study of UK graduates' preferences. *Human Resource Management* 13(1), 5-27.
- Manpower Group (2014). *Soft skills for talent, internal report*. Url: www.manpowergroup.it/indagine-soft-skills-manpowegroup
- Moss, P., Tilly, C. (2001). *Stories employers tell: Race, skill and hiring in America*. New York: Russell Sage.
- Mourshed, M., Farrell, D., Barton, D. (2012). *Education to employment: Designing a system that works*. Washington, DC: McKinsey Center for Government.
- OECD (2009). *21st Century skills and competences for new millennium learners in OECD countries*. EDU Working paper no. 41 by Ananiadou K., Claro, M.
- Robles, M.M. (2012). Executive perceptions of the top 10 soft skills needed in today's workplace. *Business Communication Quarterly*, 75(4), 453-465.
- Rychen, D.S., Salganik, L.H. (eds) (2001). *Definition and selection of key competencies*. Gottingen: Hogrefe & Huber Publishers.
- Verma, S. (2013). *Enhancing employability @ soft skills*. Chandigarth-Delhi-Chennai: Pearson.
- WHO (1993). *Life skills education in schools*. Genève: WHO.
- Yunus, K., Li, S. (2005). Matching job skills with needs. *Business Times* (1 October).

Explanatory factors of student performance in online tests for the continuous assessment: Is attendance really important?

Merello, Paloma^a and Zorio-Grima, Ana^a

^aDepartment of Accounting, University of Valencia, Spain.

Abstract

In the European Higher Education Area, the educational model focuses on the student and the role of Information and Communication Technologies is crucial for the learning and teaching process. This study identifies the characteristics of the students according to their performance in the online tests carried out in a subject of Financial Accounting in the groups taught in English of the Degrees of Business Administration and Economics in a University from XXX. The objectives of this study are to explore the determining factors for student performance in online tests. Several analyses are carried out for all the marks and for a separated sample considering only the tests where the mark is at least good- i.e. the best or the second best grade in the national grading system. Among other interesting findings, our study evidences that attendance is a determining factor for the performance in each test if we take the whole group of students, but it is not significant for the students achieving better grades. This evidence has important implications as regards making attendance compulsory to benefit from the continuous assessment system.

Keywords: *ICT; online tests, performance, Moodle.*

1. Introduction

Information and Communication Technologies (ICTs) are crucial for the learning and teaching process (UNESCO, 2008). In the European Higher Education Area (EHEA), the educational model focuses on the student (European Ministers of Education, 1999, Gonzalez, Arquero & Hassall, 2009) so the changes implied by the EHEA promoted new teaching and assesment methodologies, taking advantage of ICT benefits in order to consider students' daily effort with different activities along the course (Segers and Doch, 2006). Rivero et al. (2017) find evidence that students achieve higher marks in coursework than in the final exam and that they perceive they gain deeper learning.

In the business field, a growing number of studies look into the introduction of ICT to promote new learning methodologies (see for instance Escobar-Rodriguez & Monge-Lozano, 2012, on the acceptance of the Moodle platform). In the accounting field, Beltrá et al. (2011) and García-Benau & Zorio-Grima (2012) propose the use of a mix of teaching methodologies including ICT's possibilities. Among these ICT activities, online questionnaires seem to be attractive both for the professor and the students, as it allows for easy self-correction for the former and formative assessment for the latter (Einig, 2013), increasing learning, motivation, and engagement (Marriott & Lau, 2008, Marriott, 2009). However, some research shows that online questionnaires may lead to overconfidence, amongst certain type of students (Merello- Gimenez & Zorio-Grima, 2017, Smolin & Butakov, 2014).

As far we know, there is little research on the impact of determining factors on online questionnaires performance for the continuous assessment sytem, especially on attendance (Marriott & Lau, 2008). Sometimes, class attendance is a component or even a requirement to benefit from the continuous assement system. Hence, the objective of this paper is to identify the factors leading to online test performance, in order to find valuable insights for the class attendance requirement debate in the continuous assessment system. The methodology employed in this study to obtain students performance is based on a set of Moodle online tests (Merello- Gimenez & Zorio-Grima, 2017, Smolin & Butakov, 2014, Marriott & Lau, 2008, Marriott, 2009).

In fact, this paper makes a valuable contribution as evidence is found that attendance significantly improves online test performance for the whole group of students (which is consistent with Paisey & Paisey, 2004), but it is not significant if we concentrate only on the best performing students in the online tests- which implies that the better students are able to catch up with the other students even if they missed the class. This suggests that considering class attendance as a requirement to benefit from the continuous assessment system favours the not so good students (because it promotes attendance), and may penalise the best students (who are able to catch up anyway). Our findings can be useful to justify

that the continuous assessment system should require a specific level of attendance component if the online test performance drops below a certain grade (for instance the second best grade). That way, the not so good students are pushed to attend classes but the better students who are keeping a good online test performance do not get penalised if they miss a certain number of classes.

The rest of the paper unfolds as follows. After this introduction, we present the materials and methods, followed by the discussion of results. The paper closes with the conclusions section.

2. Materials and Method

2.1. Teaching experience

This teaching experience has been undertaken in two groups of Financial Accounting taught in English (which are expected to be “high performance groups”) of the Business Administration Degree and the Economics Degree from University of Valencia with 29 and 62 students, respectively, taught in the summer semester. The data corresponds to year 2016/17 and to the continuous assessment system.

In the teaching process, the master class has been combined with different innovative teaching techniques, such as puzzle, role playing, videos, tasks, exercises, practical cases and online tests. However, in this study, we focus on students’ performance just on the online tests (i.e., 5 tests in total, 1 test per chapter in the syllabus). These tests have been solved in the Moodle platform, combining true and false questions with multiple choice questions.

2.2. Sample and Statistical analysis

Different explanatory variables are used to explain students’ performance in the online tests, including, attendance to class sessions (percentage), the difficulty of the contents analysed (as perceived by the student), the student's degree (Business Administration vs. Economics), the access mark to the university (from 0 to 14 points, being 14 the highest mark possible), the time of personal study before the online test, the studies of the parents, the gender and the age.

The complete sample has 455 observations (91 students x 5 tests). Only 364 cases are complete because some students do not follow the continuous assessment or do not take some of the tests. The descriptive characteristics of that sample are as follows: 55.5 % are man (202 observations) and 44.5% are woman (162); 91.5% are less than 20 years old and 7.4% are between 20-23 years old; regarding the access mark, 35.7% obtained a mark between 8.5-10, 51.1% a mark between 10 and 12 and 11% and access mark between 12 to

14. Furthermore, 75.3% of the students' parents have University studies and only 3.8% have secondary studies or less.

In order to evaluate the differences between the students with the best results, a subsample is selected with those students with a mark which is at least good- i.e. the best or the second best grade in the national grading system. This subsample has 293 complete cases.

We use nonparametric techniques since the variables under study do not follow a normal distribution. Therefore, U-Mann Whitney analyses are performed for variables with two categories and Kruskal-Wallis for those variables with more than two categories. A significant Kruskal-Wallis test indicates that at least one sample stochastically dominates one other sample. This test allows us to decide if the hypothesis that the independent samples (categories of the categorical variables) come from the same population (or from identical populations with the same median) can be accepted. The necessary assumptions that the underlying distributions of the variables are continuous and that they have been measured at least on an ordinal scale, are satisfied by our variables.

3. Results and discussion

3.1. Full sample of students

Different tests are carried out to characterize the influence of determining factors on the mark obtained in the tests for the complete sample. It is controlled by the variable degree, since it could imply both differences in the students' groups and in the performance of the lecturer, although no significant differences are detected between both groups (Table 1).

Table 1. Results of the U-Mann Whitney and Kruskal-Wallis test for the complete sample.

Variable	z /chi-square	p-value	Test
gender	-0.375	0,7070	U-Mann Whitney
age	6.364	0,0415	Kruskal-Wallis
degree	-0.860	0,3899	U-Mann Whitney
study time	10.831	0,0285	Kruskal-Wallis
test difficulty	11.345	0,0229	Kruskal-Wallis
Access mark	14.691	0,0054	Kruskal-Wallis
Parents' studies	7.769	0.1004	Kruskal-Wallis

The student's degree, gender and parents' studies are not significant according to the non-parametric contrasts performed. There are significant differences by age, where younger students (Figure 1.a) show greater variability in the marks.

The study time and the difficulty of the contents have a significant influence on the test mark. Thus, if the study time for the contents covered in a specific test is more than 5 hours

(12 cases) a higher number of students achieve high marks in the tests (ranging from 8 to 10 points, Figure 1.b). There is no defined pattern for the remaining hours of study.

Regarding the difficulty of the chapter as perceived by the student, in those cases in which the perceived difficulty was very low marks are very high (Figure 1.c). Also, in the cases in which the perceived difficulty was very high the students always passed the test, probably due to an extra effort by the student.

In addition, the correlation between the attendance and the test scores with the nonparametric Spearman coefficient is checked. The correlation is significant ($p\text{-value} = 0.029$) and positive, although of low value (Spearman-rho = 0.114).

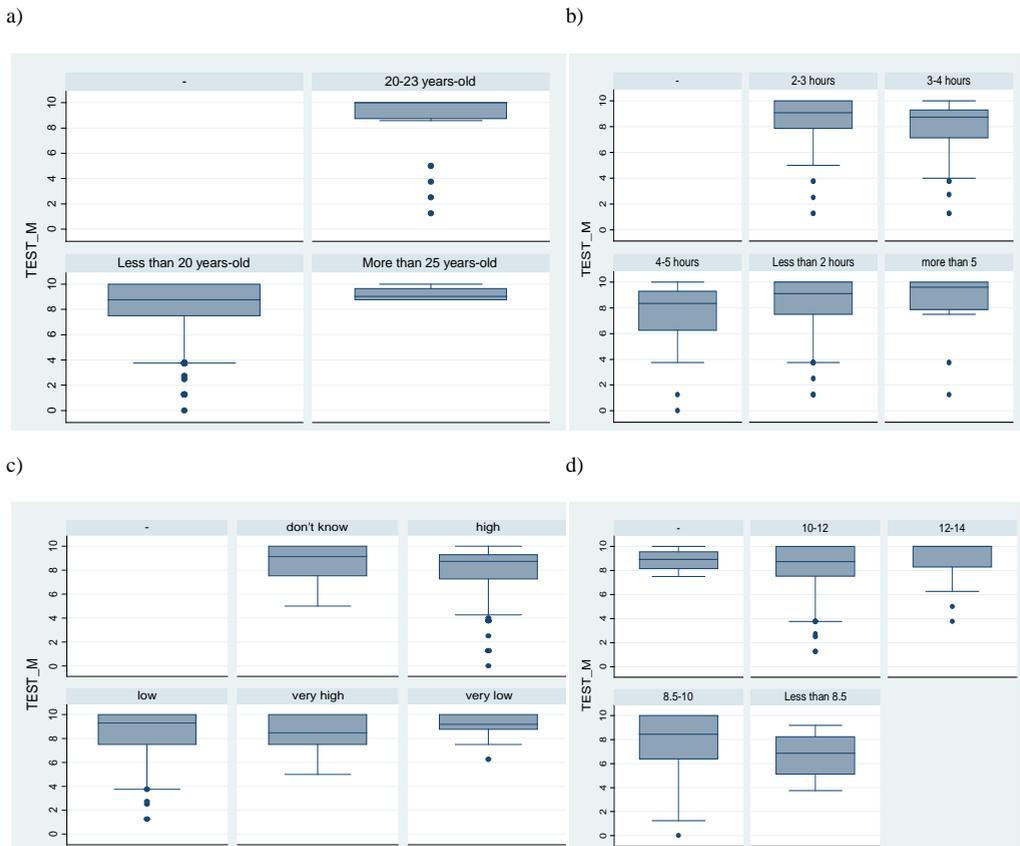


Figure 1. Box and whisker plots of the test mark variable for the categories of the significant variables: a) age, b) study time, c) difficulty and d) access mark.

3.2. Best performance students

Bearing in mind the fact that the best students could be expected to catch up with the other students even if they missed the class, we now concentrate on the sample of the students

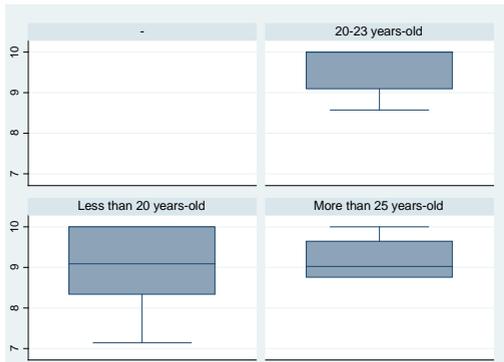
getting the best and second best grade in the online tests (a mark ranging from 7 to 10 points). If we find differences regarding attendance as compared to the analysis above, conclusions might be drawn as regards considering the attendance requirement or component dependent on the test mark in order to benefit from the continuous assessment.

For the best performance students, there are no significant differences in terms of degree, access mark or gender (Table 2). Age follows a similar pattern as for the complete sample (Figure 2.a), where students over 20 years have less variability in the test marks.

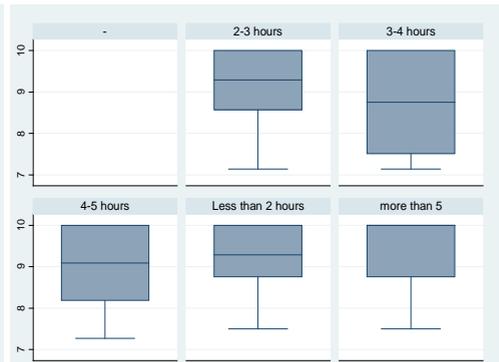
Table 2. Results of the U-Mann Whitney and Kruskal-Wallis test for the best students.

Variable	z /chi-square	p-value	Test
gender	0.468	0.6396	U-Mann Whitney
age	7.997	0.0183	Kruskal–Wallis
degree	-0.843	0.3991	U-Mann Whitney
study time	12.669	0.0130	Kruskal–Wallis
test difficulty	13.736	0.0082	Kruskal–Wallis
Access mark	7.128	0.1293	Kruskal–Wallis
Parents’ studies	9.843	0.0431	Kruskal–Wallis

a)



b)



c)

d)

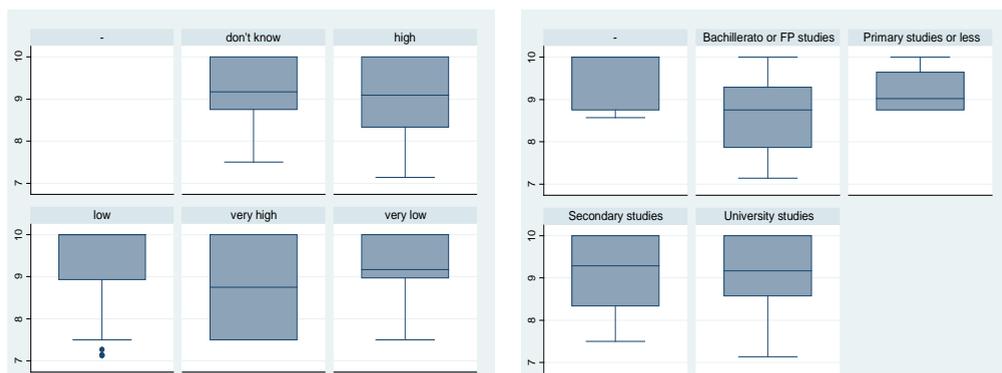


Figure 2. Box and whisker plots of the test mark variable for the categories of the significant variables: a) age, b) study time, c) difficulty and d) parents' studies.

In addition, the correlation between the attendance and the test scores is tested with the nonparametric Spearman coefficient resulting non-significant (p -value = 0.37). This means that the attendance is decisive to pass the tests but that does not entail differences between the high marks.

4. Conclusions

The difficulty of the contents, the time of study, the access mark, age and attendance are determining factors of the mark in the online test for the whole group of students. However, in the case of students whose marks are the best and second grade, only the difficulty of the contents, the time of study, the studies of the parents and the age are significant. This makes us think about the different profile of the students in the classroom, although there are no differences between the degrees, nor the gender that is usually one of the determining variables in this type of studies (Merello- Gimenez & Zorio-Grima, 2016).

Our study is specially valuable as regards the attendance factor. The evidence obtained suggests that considering class attendance as a requirement to benefit from the continuous assessment system favours the not so good students (because it promotes attendance), and may penalise the best students (who are able to catch up anyway). Our findings can be useful to justify that the continuous assessment system should require a specific level of attendance component if the online test performance drops below a certain grade (for instance the second best grade). That way, the not so good students are pushed to attend classes but the better students who are keeping a good online test performance do not get penalised if they miss a certain number of classes.

Future research might try to understand the better or worse performance of students if our recommendation above is implemented in a course. This type of studies can help planning

better continuous assessment design and follow up of the students progress as the subject is being taught in the classroom.

References

- Beltrá, J. L., Pereira, J. M., & Sáez, J. L. (2011). Practical application of alternative teaching methods in Accounting. *EDUCADE, The Spanish Journal of Accounting, Finance and Management Education*, 2, 3-34.
- Einig, S. (2013). Supporting Students' Learning: The Use of Formative Online Assessments. *Accounting Education*, 22(5), 425-444.
- Escobar-Rodriguez, T., & Monge-Lozano, P. (2012). The acceptance of Moodle technology by business administration students. *Computers & Education*, 58(4), 1085-1093.
- European Ministers of Education (1999). The Bologna Declaration of 19 June 1999 Joint declaration of the European Ministers of Education. Available at: http://media.ehea.info/file/Ministerial_conferences/02/8/1999_Bologna_Declaration_English_553028.pdf Accessed on 28/01/2018.
- García-Benau, M. A., & Zorio-Grima, A. (2012). Experience on the Use of a Mix of Teaching Methods in Higher Education of Accounting. *Cuadernos de Contabilidad*, 13(33), 613-657.
- Marriott, P. (2009). Students' evaluation of the use of online summative assessment on an undergraduate financial accounting module. *British Journal of Educational Technology*, 40(2), 237-254.
- Marriott, P., & Lau, A. (2008). The use of on-line summative assessment in an undergraduate financial accounting course. *Journal of Accounting Education*, 26(2), 73-90.
- Merello-Giménez, P., & Zorio-Grima, A. (2016). Moderating role of gender in the performance of Moodle questionnaires in an introductory Accounting course. *Procedia - Social and Behavioral Sciences*, 228, 407-412.
- Merello-Giménez, P., & Zorio-Grima, A. (2017). Impact of students' performance in the continuous assessment methodology through Moodle on the final exam. *EDUCADE, The Spanish Journal of Accounting, Finance and Management Education*, 8, 57-68.
- Paisey, C., & Paisey, N. J. (2004). Student attendance in an accounting module—reasons for non-attendance and the effect on academic performance at a Scottish University. *Accounting education*, 13(sup1), 39-53.
- Rivero, C. del Campo, C., Urquia-Grande, E., Camacho-Miñano, M.M., & Pascual-Ezama, D. (2017) Analysing students' academic performance in Higher Education in Spain. *EDUCADE, The Spanish Journal of Accounting, Finance and Management Education*, 8, 3-19
- Segers, M. & Dochy, F. (2006). Enhancing student learning through assessment: Alignment between levels of assessment and different effects on learning. *Studies in Educational Evaluation*, 32(3), 171-179.

- Smolin, D., & Butakov, S. (2014). Resolving the Paradox of Overconfident Students with Intelligent Methods. In U. Kose, and D. Koc. (Eds.), *Artificial Intelligence Applications in Distance Education* (pp. 161-174). Hershey, USA: IGI Global.
- UNESCO (2008). Estándares de competencias en TIC para docentes. Available at: <http://www.oei.es/tic/UNESCOEstandaresDocentes.pdf>. Accessed on the 27/01/2016

A proposal to analyse the progress and difficulties of Higher Education teacher training¹

Hamed Al-Lal, Soraya; Pineda Alfonso, José Antonio.; Pérez Rodríguez, Noelia; Navarro-Medina, Elisa; Duarte Piña, Olga

Department of Experimental and Social Sciences Pedagogy. Faculty of Educational Sciences. University of Seville, Spain

Abstract

This article presents an ongoing research study whose purpose is to describe and analyse the progress and difficulties participants face in a university teacher training programme offered by the University of Seville. The training programme and the different parts of the research strategy are described.

Keywords: *Teacher education; Higher education; Training programme.*

¹ This study is part of a larger research project entitled *Pedagogical training of university teachers. Progress and obstacles in a training programme focusing on improving teaching practice* (EDU2016-75604-P), financed by the Ministry of Economy and Competitiveness 2016 R&D fund.

1. Introduction: Pedagogical training of teachers working in the faculty of Higher Education at the University of Seville

International organisations have been insisting on the need for university teaching training (UNESCO, 1998) and the standardisation of teaching and research processes (European Commission, 2014) for decades. This concern is supported by a review of the studies that have been conducted over the last 30 years whose results indicate that teachers do not have the necessary skills to adequately carry out their teaching tasks and have very little knowledge about effective teaching practices (Amundsen & Wilson, 2012).

On this basis, several international research projects have reported results of the progress and obstacles encountered by the participants of different university teacher training programmes (Gibbs & Coffey, 2004). Several successful strategies for teaching practices have been put forward: peer review, self-analysis, video-analysis, portfolios, improvement courses, but it is Ken Bain's (2004) study that has undoubtedly had the most international influence.

The situation in Spain is similar, a high percentage of teachers continue to use traditional methodologies, even though studies indicate that a more student-centred teaching is necessary (Zabalza, 2007). Studies also show that the figure of university teacher trainer needs to be professionalised (Cruz Tome, 2003) and that there is a need to create pedagogical work-teams (Gómez, Escofet & Freixa, 2014) and use training strategies based on 'improvement courses' (IC) in the teaching practice itself, which should favour not only methodological change but foster the construction of a new identity for teaching professionals (Arancibia & Badia, 2015; Conde-Jiménez & Martín-Gutiérrez, 2016; Porlán (Coord.), 2017).

Considering these aforementioned approaches, and inspired by advances made in successful international experiences (De Alba, Duarte, Hamed, Navarro & Porlán, 2017; Porlán (Coord.), 2017), for the past four years the University of Seville has been developing the Pedagogical Training and Innovation Programme for Teachers (FIDOP for its acronym in Spanish). This programme has three stages: during its first year, participants attend a 100-hour Initiation Course, during which they reflect on their usual teaching practice, design and experiment with two Improvement Courses (ICs)², and carry out a thorough follow-up of their results, incorporating gradual and sustained changes into their classroom practice.

²These Improvement Courses are inspired by the idea of reflection *on* and *about* teaching practice (Schön, 1992), and by the classic format of action research (Stenhouse, 1985). Likewise, they are supported by the long research history of the IRES Project (Research and Renewal of the School), based on an interaction between innovation and curricular experimentation and professional teacher development (García-Pérez & Porlán, 2000; Porlán & Rivero, 1998).

The ICs comprise a conscious and studied reflection and reformulation process on the teaching methods used in class, the content and purpose of the teaching materials used and the evaluation model that follows in order to build a Personal Pedagogical Model that guides the teaching action. During the second year, participants join a Pedagogical Training and Innovation Network (REFID for its acronym in Spanish) comprising teams of teachers from related areas, led by an experienced person from within the network. During this period, participants continue to design and experiment with their ICs. In the third year their objective is to put their IC results into practice during an entire semester class. At the end of each academic year the participants of the programme present the results of their completed ICs at Educational and Pedagogical Innovation Conferences. For a review of the FIDOP programme and completed ICs, see Porlán (Coord.), (2017).

2. Research Purpose and Objective

The research question that this study, which is in its second year, seeks to answer is the following:

*How does university teachers' **pedagogical** knowledge **evolve** when they participate in a training programme focused on improving **classroom teaching** practice?*

The following objectives have been established to address this question:

1. *Describe and analyse changes in participants' understanding and practices due to the FIDOP programme, as well as the obstacles and difficulties they face.*
2. *Characterise and define reference guidelines that may develop during the changes that take place in participants' understanding and practices.*
3. *Identify the training programme's strengths and weaknesses.*
4. *Establish conclusions that allow it to be reconstructed and improved.*
5. *Generate training materials that can be transferred to other universities.*

3. Methods

3.1. Methodological approach

The research study has a multi-methodological focus, and its second stage takes a case-study approach, as recommended by various authors (Collier & Elman, 2008; Denzin & Lincoln, 2005; Erickson, 2012). The reasons justifying this choice are the study's use of a variety of procedures and sources for the collection and analysis of qualitative and

quantitative information, the interconnections between them and the interpretative and constructivist approaches taken. The purpose of this complementary and plural strategy (Cohen, Manion & Morrison, 2011; Creswell, 2012) is not simply to juxtapose approaches, but to ensure that reductionist tensions between qualitative and quantitative, subjective and objective and empirical and interpretative are minimised.

As a consequence, this study uses a combination of techniques and instruments such as: Likert questionnaires and open-ended question surveys, semi-structured interviews, and analyses of the written records generated by participants of the training programme during the course, etc.

3.2. Studies, stages, participants and instruments

The study analyses two general areas within the project. It first analyses the curriculum: the participants' understanding and practices of the curriculum considered relevant and pertinent to the teaching profession (see table 1) and secondly, the professional, an understanding of the following categories: the Personal Pedagogical Model, the students' learning, the discipline itself, the identity of teaching professionals and the difficulties of improving teaching.

Table 1. Categories and subcategories of the first area, the 'curriculum'

CATEGORY	SUBCATEGORY
Content	1.1. Content type
	1.2.a. Organisation of contents: Hierarchical
	1.2.b. Organisation of contents: By interaction
	1.3. Sources for the construction of the contents: problems, students' ideas, Disciplines and subjects
	1.4. Stated Obstacles/Difficulties for the ideal preparation of content
	1.5. Ideal model of stated content
Method	1.6. Content prepared as problems
	2.1. Actual methodological model
	2.2. Methodological sequence (includes the meaning of the activities)
	2.3. Adjustment of sequence of activities to student ideas
	2.4. Stated Obstacles/Difficulties of methodological difficulties
	2.5. Stated Ideal Methodological Model
Evaluation	2.6. Stated Possible Methodological Model
	3.1. Classification of student ideas (types, progression and obstacles)
	3.2. Evolution and comparison of students' initial and final ideas
	3.3. Evaluation and analysis of the practice itself and reformulation and improvement of the design
	3.4. Evaluation criteria and what to evaluate
	3.5. How to evaluate (instruments)
	3.6. Grading
	3.7. Evaluation obstacles/difficulties
3.8. Stated Ideal Evaluation Model	

Source: Authors Own (2016).

Both areas of analysis are addressed through the two studies presented in Figure 1.

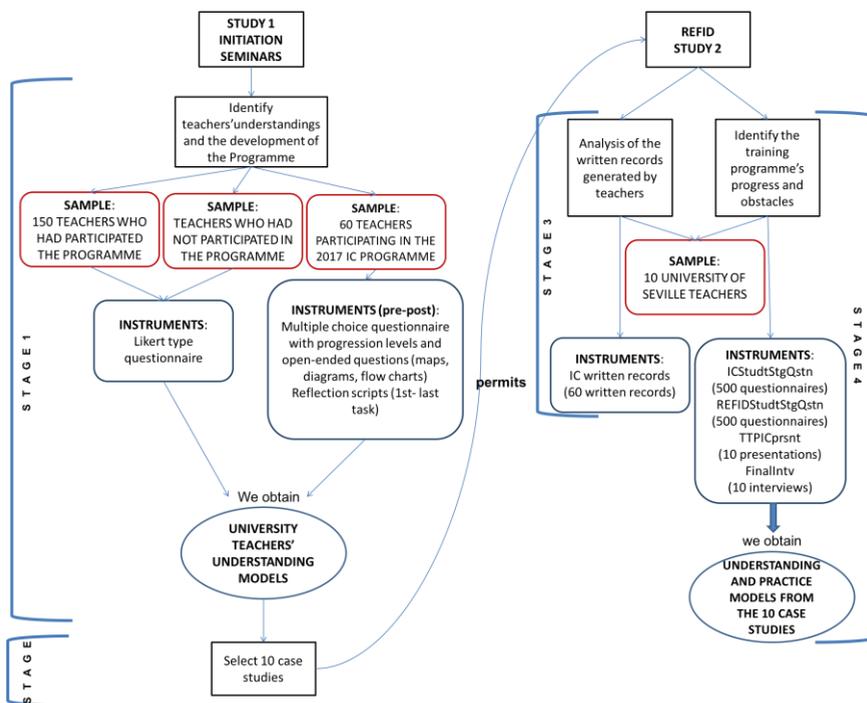


Figure 1. Studies, stages, participants and research instruments. Source: Authors Own (2016).

Two questionnaires have been designed for Study 1: a yes/no question, a Likert type questionnaire and an open-ended question survey. The purpose of the yes/no questionnaire (*University Teacher Pedagogical Understanding Questionnaire*) is to gather information from two groups regarding their understanding of the categories under analysis: those teachers who had participated in the programme during the academic years prior to 2017 (approximately 150), and from a similar sample who had not participated in the programme so that the differences emerging from the results of each group could be analysed. The following structure was proposed for this: a) Introduce the study; b) Collect participants' personal information; c) Provide instructions on how to answer the questionnaire, indicating the different values represented on a scale from 1 (completely disagree) to 6 (completely agree) and how they apply to the importance of the possible difficulties hindering teacher improvement (1 being of no importance and 6 very important) and the ability to influence whether they can be overcome or not (1 being not possible and 6 very possible) and d) Explain the items to answer. In total, the questionnaire comprises 68 items.

To confirm that the questionnaire clearly and appropriately addresses the categories and subcategories of the areas under analysis, we asked nine experts in a variety of relevant fields such as Educational Research, Research Methodology, General Pedagogy, Experimental Sciences Pedagogy, and Pedagogy in the Social Sciences, to validate the process while considering two criteria: *Relevance* or degree to which the item is appropriate to the model, category and subcategory in which it is included, and *Clarity* or degree to which the item can be easily understood by the participants. Additionally, the experts were asked to provide observations and suggestions to reformulate those items when they did not meet the aforementioned criteria.

The purpose of the open-ended question survey is also to gather information on the understanding of the categories and subcategories under analysis, but from only those teachers who had begun the programme in 2017, just before starting the Initiation Course, and is based on questions regarding the specific context in which they teach. At the end of the courses the final synthesis task produced by the participants will be analysed (task 10) and the results compared with the initial results of the aforementioned open-ended question survey. This pre-post comparison will be presented at the aforementioned Conference.

One result emerging from this first study is a selection of 10 teachers who represent the diversity of models and understandings present in the samples used. These cases are the research sample for Study 2, which focuses on analysing the progress and obstacles they faced during the training programme. The instruments that will be used are: 60 written records and tasks carried out by those 10 teachers during the 2017 Initiation Course and 1,000 yes/no questionnaires which those teachers' students will take. The results from these questionnaires will provide data regarding the changes and improvements which the 10 teachers have introduced into their practice, in addition to serving as a contrast to the information provided by the teachers themselves; the 10 presentations given by teachers at the Teaching and Educational and Pedagogical Innovation Conferences, which include the design and development of the IC applied to teaching strategies during the programme's second year, as members of REFID; 10 semi-structured interviews given at the end of the process in order to triangulate the information between the initial and final statements of the 10 chosen teachers carried out in Study 1, the written records generated during the training programme's two years and the results emerging from the questionnaires answered by the teachers' students.

SPSS v.24 will be used to analyse the data obtained from the first study's yes/no questionnaires, which will include data on: frequencies, percentages, means, medians, standard deviations, factor analysis by principal components, contrast tests and effect size, etc. And a *content analysis* methodology recommended by various authors (Bardin, 1986, Downe-Wamboldt, 1992; Krippendorff, 2004; Polit & Beck, 2006) will be followed when

handling qualitative information, in order to prepare and categorise units of meaning based on valid and replicable inferences. ATLAS.ti version 8 will be used for this task.

A triangulation process among the researches will maximise the validity of the analysis. Each researcher will carry out a separate analysis and they will subsequently meet to discuss the results and establish a possible consensus. A multiple triangulation approach to the study is justified by using different sources and techniques for collecting and analysing data (Patton, 2002).

This article has outlined the training programme under study and the problem, objectives and research strategy underway. We hope to be able to present results at the next International Conference on Higher Education Advances.

References

- Amundsen, Ch. & Wilson, M. (2012). Are We Asking the Right Questions? A Conceptual Review of the Educational Development Literature in Higher Education. *Review of Educational Research*, 82(1), 90-126. DOI: 10.3102/0034654312438409.
- Arancibia, M. M. & Badia, A. (2015). Concepciones de profesores de secundaria sobre enseñar y aprender Historia con TIC. *Revista Electrónica de Investigación Educativa*, 17(2), 62-76. Recuperado de <http://redie.uabc.mx/redie/article/view/608>.
- Bain, K. (2004). *Lo que hacen los mejores profesores universitarios*. Valencia: Universidad de Valencia.
- Bardin, L. (1986). *El análisis del contenido*. Madrid: Akal.
- Cohen, L., Manion, L. & Morrison, K. (2011). *Research methods in Education*. New York (NY), Estados Unidos: Routledge.
- Conde-Jiménez, J. & Martín-Gutiérrez, A. (2016). Potencialidades y necesidades de mejora en la formación de profesores noveles universitarios. *Revista Electrónica de Investigación Educativa*, 18(1), 140-152. Recuperado de <http://redie.uabc.mx/redie/article/view/767>.
- Creswell, J. W. (2012). *Qualitative inquiry & research design: Choosing among five approaches (4th ed.)*. Thousand Oaks, CA: Sage.
- Cruz Tome, M.A. (2003). Necesidad y objetivos de la formación pedagógica del profesor universitario. *Revista de Educación*, 331, 35-66.
- De Alba, N., Duarte, O., Hamed, S., Navarro, E. & Porlán, R. (2017). Una propuesta para la innovación docente y la formación del profesorado universitario. En *V Congreso Internacional de Docencia Universitaria (CINDU)*. Vigo, España.
- Denzin, N.K. & Lincoln, Y.S. (2005). Introduction: The discipline and practice of qualitative research. In N.K. Denzin & Y.S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research (2 nd)*. Thousand Oaks, CA: Sage.
- Downe-Wamboldt, B. (1992). *Content Analysis: Method, Applications, and Issues*. Health Care for Woman International, 13, 313-321.

- Erickson, F. (2012). Qualitative Research Methods for Science Education. In: B. Fraser, K. Tobin & C. McRobbie (Eds.), *Second International Handbook of Science Education. Springer International Handbooks of Education*, vol 24. Dordrecht: Springer.
- European Commission (2014). *Report to the European Commission on New modes of learning and teaching in higher education*. Luxembourg: Publications Office of the European Union.
- García Pérez, F. F. & Porlán Ariza, R. (2000). El proyecto IRES (investigación y renovación escolar). Biblio 3W, Revista Bibliográfica de Geografía y Ciencias Sociales, (Revista electrónica de la Universidad de Barcelona, 205, Consultado el 5 de septiembre de 2011: <http://www.ub.es/geocrit/b3w-205htm>).
- Gómez Serra, M., Escofet Roig, A. & Freixa Niella, M. (2014). Los equipos docentes en la educación superior ¿utopía o realidad? *Revista Española de Pedagogía*, 259, 509-523.
- Krippendorff, K. (2004). *Content analysis: an introduction to its methodology*. Thousand Oaks, California: Sage Publications Inc.
- Porlán, R. & Rivero, A. (1998). *El conocimiento de los profesores*. Sevilla: Díada.
- Porlán, R. (Coord.) (2017). *Enseñanza universitaria. Cómo mejorarla*. Madrid: Morata.
- Schön, D. (1992). *La formación de profesionales reflexivos. Hacia un nuevo diseño de la enseñanza y el aprendizaje en las profesiones*. Barcelona: Editorial Paidós.
- Stenhouse, L. (1985). *Investigación y desarrollo del curriculum*. Madrid: Morata.
- Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods*. 3. ed. Thousand Oaks, CA: Sage Publications.
- Polit, D. F. & Beck, C. (2006). *Essentials of nursing research methods, appraisal, and utilization*. Philadelphia: Lippincott Williams & Wilkins.
- Zabalza, M.A. (2007). *Competencias docentes del profesorado universitario. Calidad y desarrollo profesional*. Madrid: Narcea.

Information from Automated Evaluation in an Engineering School

Serrano, Nicolas^a; Blanco, Carmen^b; Carias, Francisco^a and Reina, Enrique^c

^aDepartment of Industrial Management, TECNUN Escuela de Ingenieros, University of Navarra, Spain, ^bDepartment of Biomedical Engineering and Science, TECNUN Escuela de Ingenieros, University of Navarra, Spain, ^cInformation Systems, TECNUN Escuela de Ingenieros, University of Navarra, Spain.

Abstract

The paper introduces the need for automated evaluation and presents the experience of automating all the evaluations of a course in Computer Science in the sophomore year of an engineering degree.

First, the paper describes the features needed and developed for that course and the positive results for both professors and students. The main advantage of automated evaluation is that it allows real continuous grading for all types of activities: short answers and exercises during the class, homework, short exercises evaluated every 10 days in class, medium term evaluations and the final grade for the course.

A significant benefit of this practice is that it allows the professor, from the very beginning of the course, to monitor how the students perform each task. The professor can see in real time the marks of an exercise or evaluation, the global evolution of the class or the status of a specific student. The students also have immediate feedback from their exercises and the total points obtained at any given time providing greater involvement in the course.

Keywords: *automated evaluation, computer science, grading, self-assessment*

1. Introduction

An important element of the education process is the assessment of the students. This is because assessment is not only the end result for the student, but an indicator of the efficiency of the learning process (Williamson et al. 2006, Greiff et al. 2017). So, the sooner, and more frequently, the professor and the students know the value of this indicator, the quicker and more effectively they can act on the process.

In addition, in Europe, the European Higher Education Area and the Bologna Process promote a continuous assessment system. This continuous assessment produces an increase in the professor's workload and, as a result, requires more resources or a decrease in the number of evaluations done.

To solve this problem, a significant amount of tools have been developed for automated evaluation of students (Mittal & Devi 2012) (Alta-Mutka 2015). These tools can solve this problem and provide other benefits, such as immediate feedback for both the student and the professor.

However, the types of questions provided by such tools are not adequate for the complete assessment of the students in engineering subjects. For example, few of them allow introducing and evaluating mathematical expressions or the evaluation of algorithms written by the students, and there are not tools that include all these elements.

There are also other issues, like the lack or difficulty of connection with the academic management system and the not simple process to start writing and editing questions and tests.

The teachers of Computer Science and Mathematics of the School of Engineering of the University of Navarra wanted to essay a continuous evaluation program of nearly all the activities of a university course. With the experience of previous academic and teaching applications (Kaushal and Singh, 2012) (Manev et al. 2009), a system called "Iquest" was developed for this automated evaluation process by the professor of the course in Tecnun, the School of Engineering of University of Navarra. This paper studies the use of this application in a Computer Science course during the sophomore year of an engineering degree.

2. A tool for automated evaluation

The main goal of the tool was that it must be able to evaluate all the students activities in the subject. These activities include answering optional questions, programming a simulated microprocessor, programming in JavaScript and Java, and writing code HTML and Java programs that create HTML pages.

With this purpose in mind the Iquest application was developed with a simple interface that allowed a quick professor interaction to define new questions or activate and deactivate the questions for the students.

Figure 1 shows the main window of the application for the professor with a list of the defined questions. From this list the professor can activate or deactivate a question for the students (column Active), define if the question must be graded at the time (column Grade), if the grade must be shown at the time (column Show grade), go to the edition of a specific question (column Edit), execute of the grade (or regrade a specific question for all the students) (column Grade), show a preliminary view of the question (column Show) or show the summary of marks or the answer for a specific question (columns Results).

Level	Active	Grade	Show grade	Edit	Grade	Show	Results
Level 2							
2.1.1	N	Y	Y	c5i Suma	Grade	Show [20]	Mark1 MarkN
2.1.2	N	Y	Y	c5i Suma de tres numeros	Grade	Show [22]	Mark1 MarkN
2.2.1	N	Y	Y	Numero de instrucciones	Grade	Show [21]	Mark1 MarkN Opt1 OptN
2.2.2	N	Y	Y	c5i Resta	Grade	Show [23]	Mark1 MarkN
2.2.3	N	Y	Y	c5i Operación con paréntesis	Grade	Show [24]	Mark1 MarkN
2.2.4	N	Y	Y	c5i Suma condicionada de 3 numeros	Grade	Show [26]	Mark1 MarkN
2.2.5	N	Y	Y	c5i Suma condicionada de 5 numeros	Grade	Show [25]	Mark1 MarkN
2.2.6	N	Y	Y	c5i Suma condicionada de N numeros	Grade	Show [27]	Mark1 MarkN
2.2.7	N	Y	Y	c5i Multiplicación (ejercicio adicional)	Grade	Show [28]	Mark1 MarkN
2.3.1	N	Y	Y	c5i Suma de tres numeros	Grade	Show [29]	Mark1 MarkN
2.3.2	N	Y	Y	c5i Sumas y restas	Grade	Show [31]	Mark1 MarkN
2.3.3	N	Y	Y	c5i Suma condicionada	Grade	Show [30]	Mark1 MarkN
2.3.4	N	Y	Y	c5i Suma condicionada de 4 numeros	Grade	Show [32]	Mark1 MarkN
Level 3							
3.0.1	N	Y	Y	JavaScript Funcion multiplicación	Grade	Show [43]	Mark1 MarkN
3.0.2	N	Y	Y	JavaScript Funcion raiz2	Grade	Show [36]	Mark1 MarkN
3.1.1	N	N	Y	JavaScript Funcion suma	Grade	Show [42]	Mark1 MarkN
3.1.2	N	N	Y	JavaScript Función par	Grade	Show [35]	Mark1 MarkN
3.1.3	N	N	Y	JavaScript Funcion max	Grade	Show [33]	Mark1 MarkN
3.1.4	N	N	Y	JavaScript Funcion nombre con espacios	Grade	Show [37]	Mark1 MarkN
3.1.5	N	N	Y	JavaScript Funcion letras	Grade	Show [39]	Mark1 MarkN
3.1.7	N	N	Y	JavaScript Factorial	Grade	Show [16]	Mark1 MarkN
3.1.8	N	N	Y	JavaScript Derivada	Grade	Show [38]	Mark1 MarkN
3.2.1	N	N	Y	JavaScript Funcion max3	Grade	Show [44]	Mark1 MarkN
3.2.2	N	N	Y	JavaScript nombre alternado	Grade	Show [45]	Mark1 MarkN
3.2.3	N	N	Y	JavaScript Fibonacci	Grade	Show [46]	Mark1 MarkN
3.2.4	N	N	Y	JavaScript Funcion letras2	Grade	Show [47]	Mark1 MarkN
3.3.1	N	Y	N	Encuesta Seminario 1	Grade	Show [48]	Mark1 MarkN Opt1 OptN
3.3.2	N	Y	N	Prueba 2 de JavaScript	Grade	Show [49]	Mark1 MarkN Opt1 OptN
3.4.0	N	Y	N	Prueba evaluada	Grade	Show [66]	Mark1 MarkN Opt1 OptN
3.4.1	N	Y	Y	JavaScript Funcion mayor	Grade	Show [51]	Mark1 MarkN
3.4.2	N	Y	Y	JavaScript cambiar mayusculas	Grade	Show [52]	Mark1 MarkN
3.4.3	N	Y	Y	JavaScript Funcion suma array impares	Grade	Show [53]	Mark1 MarkN
3.4.4	N	Y	Y	JavaScript Funcion palabras	Grade	Show [54]	Mark1 MarkN
Level 4							
4.1.0	N	Y	Y	Java Hello	Grade	Show [55]	Mark1 MarkN
4.1.1	N	Y	Y	Java Hello name	Grade	Show [56]	Mark1 MarkN
4.1.2	N	Y	Y	Java two numbers	Grade	Show [57]	Mark1 MarkN
4.1.3	N	Y	Y	Java Numbers	Grade	Show [58]	Mark1 MarkN
4.1.4	N	Y	Y	Java Series2	Grade	Show [59]	Mark1 MarkN

Figure 1. Management of the course questions.

This is the usual process: the professor creates the questions based on previous available exercises in the course and enables them for automatic evaluation. In the class the professor activates the desired questions and can subsequently monitor the results during the test.

The edition of a question is done with the editor shown in figure 2

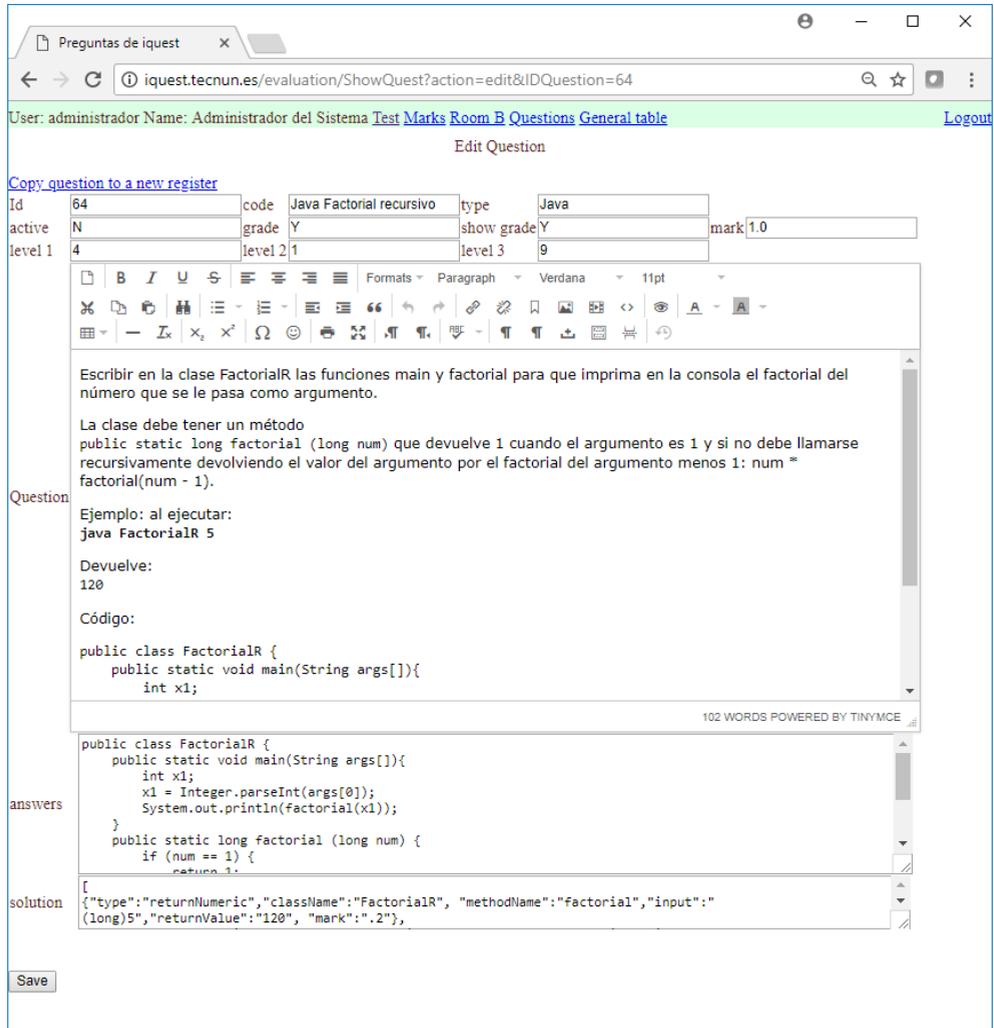


Figure 2. Edition of a question.

The editor has fields for question management, a rich web editor to type them and fields to define the answers and the question assessment method.

The student view is simpler. When the student logs in, the application shows the available activated questions for the course and can introduce the answer and check the results.

Figure 3 shows a view with an active question where the student must introduce a program written in a pseudo assembly language. When the student saves the answer, the system evaluates the program by running a specific script for this type of question and comparing the expected solution with the result of executing the student's code, and then shows the mark to the student. The student can test it again, clicking the edit button and introducing a new answer while the question is still active.

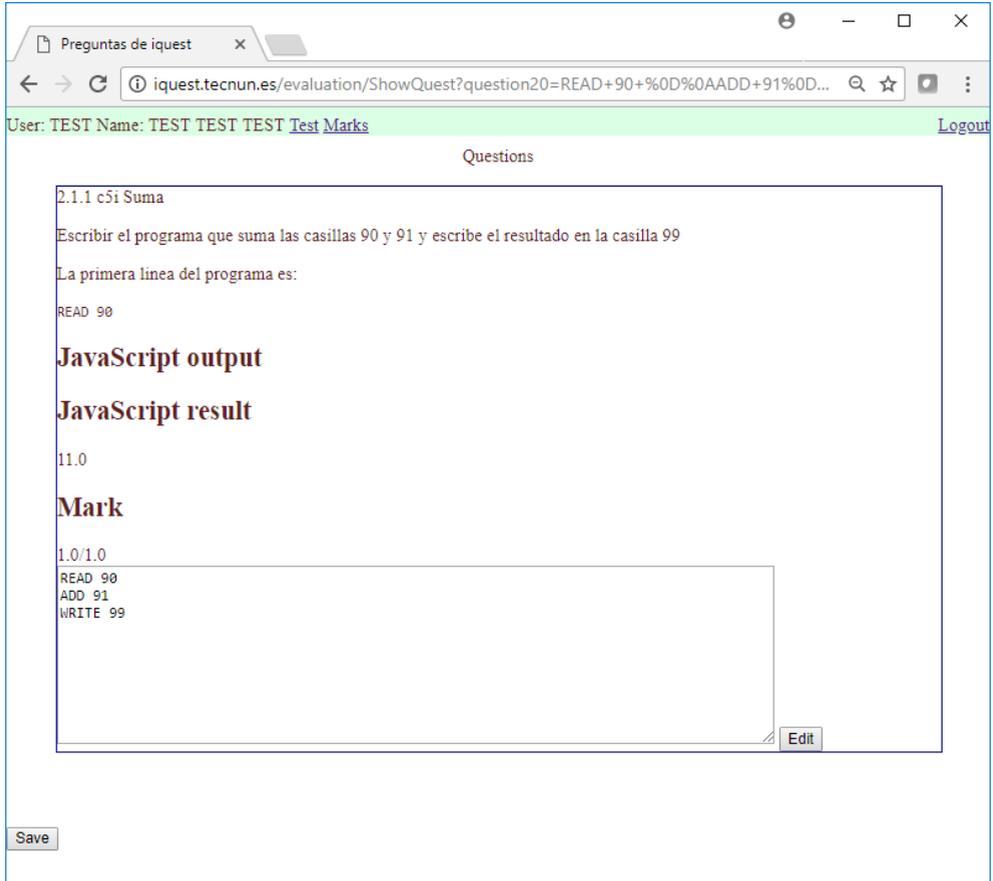


Figure 3. Student view and evaluation of a question.

The student also has another view to see previous questions and their marks.

The platform can also evaluate Mathematical expressions, JavaScript programs, HTML pages, and Java applications. A typical problem with evaluating programming applications is the presence of syntax errors and runtime errors of infinite loops. This application can solve these problems with an architecture based on threads. The thread can be stopped if it doesn't respond after some tenths of a second.

3. Information output from the tool

The use of the platform generates many data. The information is provided to the professors and students through several graphs.

Figure 4 shows partial information of the complete status of the class. Each row corresponds to a student and each column to a question. The different sizes and colors represent the different values and marks.

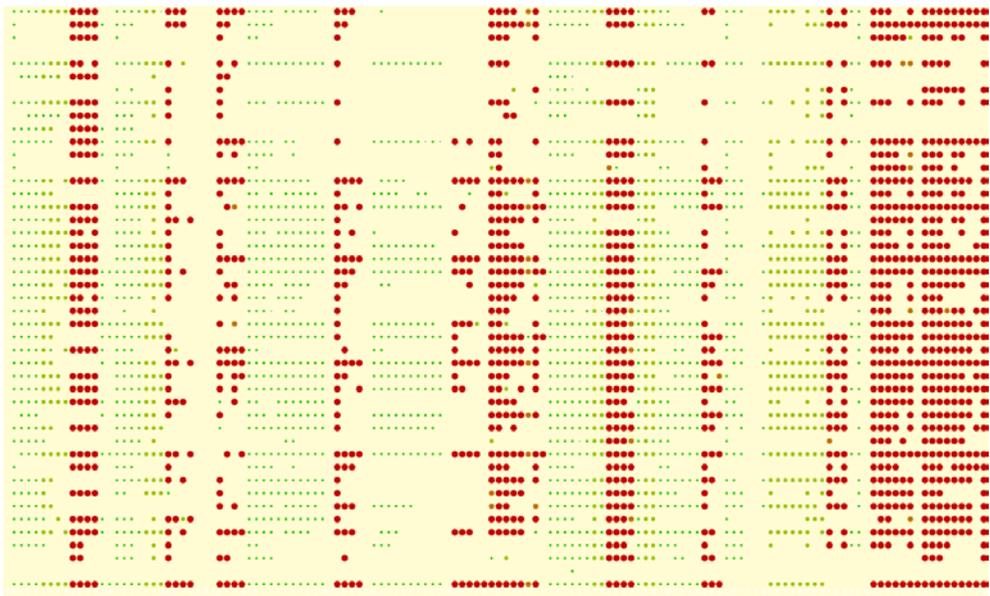


Figure 4. Global information of all students and all evaluated items

With this image, the professor can read in a row the status of a specific student (references have been deleted in the image), in one column appears the difficulty of a specific question and in a group of columns the difficulty and performance of a set of activities or a test.

The tool provides information about the evolution of an exam while the students are doing it. Figure 5 shows the evolution of a three question exam until the minute 52 (horizontal axis shows minutes from the beginning of the test). Each graph corresponds to a question and each blue block to the student's answer. The height of the block represents the mark obtained. When the mouse hovers over one block, the system shows in green all the blocks corresponding to the same student. The figure shows a student who answered the first question at minute 12, the second at minute 30 and the third at minute 32. This graph can also be used to see the performance of the students with their homework or to see all the activities done during the course, as the horizontal axis can be scaled to adequate units (minutes, hours or days).

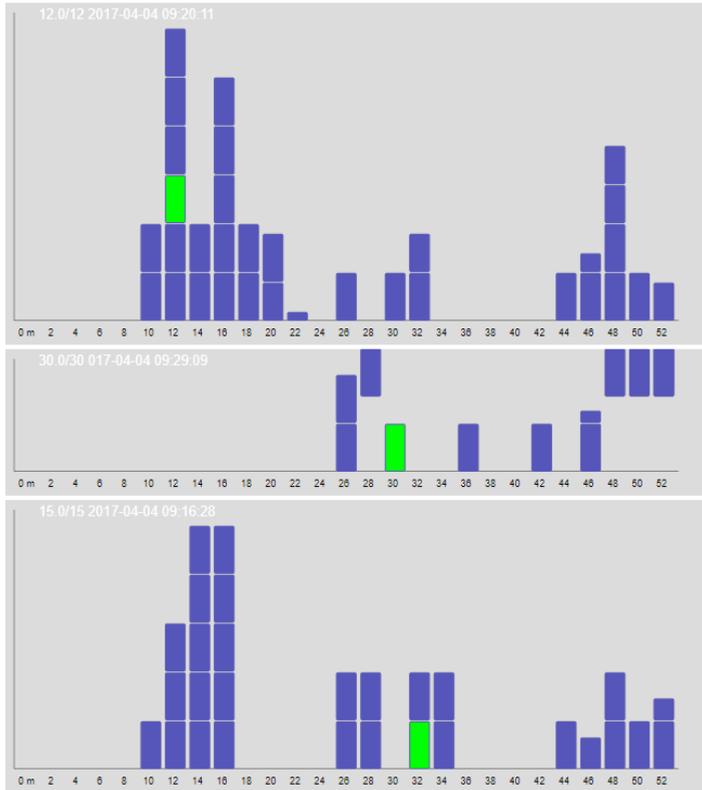


Figure 5. Information during tests.

Additional information of interest is the graph status for a specific student. Professors can see the overall performance with the graph in figure 6. Each block corresponds to a question presented to the student. Blue shows the points obtained by the student in this question and grey the points the student missed.

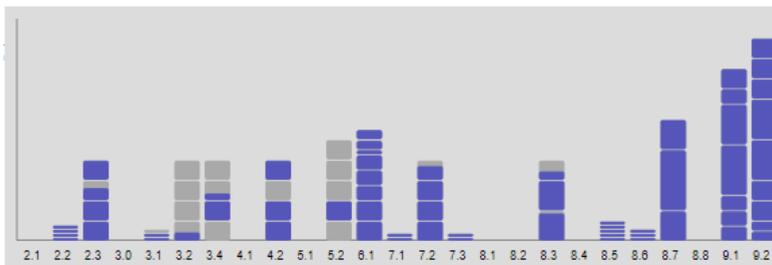


Figure 6. Overall performance of a student.

4. Conclusion

The tool has been used for a complete semester evaluating all the activities of the Computer Science course. These include short answers and exercises during the class, homework exercises and self-assessment, short exercises evaluated every 10 days in class (typically in the first 30 minutes of class), medium term exam and the final exam of the course.

The initial goal of the project was to automate the evaluation to have a continuous evaluation system without an overload of work. The use of the system has proved to be feasible for some courses of engineering, but the main advantage of the system is the information that it provides to both the professor and the student. The professor can see from the first days of the course if the students follow the subject seeing their homework results and evaluations in class. The professor can modify the time invested in each area, reinforcing some points or providing more exercises. The students have an objective measure of their development which works as a kind of gamification in which all activities, when possible, receive a number of points. The result has been quite satisfactory for professors and students alike and it is currently being applied to additional courses.

References

- Alta-Mutka, K.M., (2015) A Survey of Automated Assessment Approaches for Programming Assignments. *Computer science education*, 15(2), 83-102.
- Greiffa, S., Schererb, R., & Kirschner, P.A. (2017) Some critical reflections on the special issue: Current innovations in computer-based assessments, *Computers in Human Behavior*, 76 715-718
- Mittal, H., & Devi, M.S. (2012) Review of Computerized Evaluation Tools in Education. *International Journal of Artificial Intelligence and Computational Research*, 4(2), 111–117
- Kaushal, R., & Singh, A. (2012) Automated evaluation of programming assignments. *Conference: Engineering Education: Innovative Practices and Future Trends (AICERA)*, IEEE
- Manev, K. N., Sredkov, M., & Bogdanov, T. (2009) Grading Systems for Competitions in Programming, *Proceedings of the Thirty Eighth Spring Conference of the Union of Bulgarian Mathematicians, Borovetz, April 1- 5, 2009*
- Williamson, D. M., Mislevy, R. J., & Bejar, I. I. (2006). *Automated scoring of complex tasks in computer-based testing*. Mahwah: Erlbaum

Active methodologies and teaching performance: a necessary relationship in the field of education

Luis, M. Isabel^a; de la Torre, Tamara^b; Huelmo, Jonathan^c; Llamazares, M. Camino^d; Ruiz, Esther^e; Prieto, Carlos^f; Palmero, Carmen^g; Jiménez, Alfredo^h

^aDepartment of education sciences, University of Burgos Spain, ^bDepartment of education sciences, University of Burgos Spain, ^cDepartment of education sciences, University of Burgos Spain, ^d Department of Health Sciences , University of Burgos Spain, ^eDepartment of Specific Didactics , University of Burgos Spain, ^fDevelopment area, Suara Coop, Spain, ^gDepartment of Health Sciences, University of Burgos Spain. ^hDepartment of Health Sciences , University of Burgos, Spain.

Abstract

In the present communication, we present the project developed within the Teaching Innovation Group (APAC) of the Faculty of Education at the University of Burgos: "Active Methodologies and Teacher Performance: a road towards inclusion in the classroom". The principal objective of this project is to contribute empirical evidence on the impact that the use of active methodologies has on teaching performance in the classroom. Its results are the basis for the transformation of initial teacher training, because Universities are responsible for training the teachers who will be at the forefront of schools in the 21st c. They have therefore to be offered access to the resources in their initial and lifelong education that permit change, allowing them to construct the paradigm of inclusive, sustainable, and quality education.

Keywords: *active methodologies; teaching performance; education.*

1. Introduction

From the international perspective, organizations such as UNESCO, OECD, and EU, among others, urge universities to instigate profound change in both the initial and the lifelong education of future teachers. They do so because the educational paradigm is evolving rapidly, and the teacher as the promotor of those changes acquires a special and very relevant leading role in the quality of teacher training (Communication from the European Commission, 2010; COTEC, 2016; OECD, 2015; Porte & Stern, 2017; UNESCO, 2016). Thus, aspects related to initial teacher training are underlined, within the configuration of national educational policies, along with the need to develop and to introduce changes in their training, so that teachers can take the lead in the schools of the 21st c. (Furlong, Cochran-Smith & Brennan, 2013; Monarca & Manso, 2015; Manso & Monarca, 2016).

Universities, as the institution that offers the highest level of training, are responsible for initiating the process of change in the initial training of teachers. The competences that are at present required from teachers therefore have to be included in their teaching/learning processes. The Dirección General de Calidad, Innovación y Formación del Profesorado de la Junta de Castilla y León [General Directorate of Quality, Innovation, and Training of Teaching Staff of the Regional Government of Castile and Leon] has developed the Model of Professional Teaching Competences, based on current regulations as well as on guidelines and specifications from the European context and from Universities with responsibility for teacher training (Dirección General de Calidad, Innovación y Formación del Profesorado, 2011). Ten competences are specified in this model for teaching performance: A. Scientific competence; B. Intra- and inter-personal competences; C. Didactic competence and attention to diversity; D. Organizational competence and management of the educational centre; E. Competence in classroom behaviour management; F. Competence in team work; G. Competence in innovation and improvement; H. Linguistic-communicative competence; I. Digital competence (ITCs); J. Socio-relational competence.

Training for Teaching Innovation Groups (Grupos de Innovación Docente) (GID) is promoted within the University of Burgos in the form of refresher courses for teaching in the university context. The GID Act to Learn, Learn to Act (Actuar para aprender, aprender para actuar) (APAC) was launched at the Faculty of Education in 2016. It is formed of teachers from the University of Burgos and teachers active in non-university contexts, with the objective of investigating teaching innovation in the field of active methodologies and to transmit progress in those fields to future teachers. Thus, in October 2017, the project “Active Methodologies and Teaching Performance: a road towards inclusion in the classroom” was presented to the Provincial Directorate of Education of Burgos and approved in November 2017. Understanding as an active methodology a methodological

principle that considers as its main objective the participation of the student in their learning (García, Y., Herrea, García, M.A., & Guevara, 2015; Jiménez, 2009; Llinares, 2013; Rodríguez & Grilli, 2016).

The objective of the present Communication is to present the project as an example of research in the non-university educational context that can lead to innovation in the processes and the contents of initial teacher training developed at university.

2. Work objectives

The project on Active Methodologies is centred on analysing the correlation that exists between the use of approaches that strengthen the development of inclusive practices through active methodologies, the improvement of teaching performance, and the degree of motivation among students, encapsulated in the following work objectives:

- 1.To evaluate the degree of impact of the training actions in the context of methodologies that favour interaction, improving professional teaching competences.
- 2.To establish the correlation between the development of aspects of teaching competences linked to the inclusive paradigm of education and the improvement of social relations in the classroom.
- 3.To determine the causal relation between teacher training in cooperative methodologies and the levels of student success, taking into account the personal conditions of students at the outset.

The proposed objectives are dependent on the following working hypotheses:

- 1.Teacher knowledge of methodologies related with the inclusive paradigm of education, which encourages student participation and involvement, promoting higher levels of teaching competencies. (Hp 1)
- 2.Teacher training on methodological approaches that favour interaction between students, that reduce the frequency and/or intensity of inappropriate behaviour within the group-class, and that allow a change in the general culture of the centre that will assist the development of inclusive practices. (Hp 2)
- 3.The success of students in Infant, Primary, and Secondary School Education correlates in a positive way with lifelong training of teachers. (Hp3)

3. Methodology

This investigation uses an interpretative paradigm and a mixed, quantitative, and qualitative methodology with which to corroborate the hypotheses proposed in the study.

Working hypotheses and Evaluation Instruments

Hp1: The knowledge of teachers on methodologies related to the inclusive educational paradigm, which encourages student participation and involvement, promotes higher levels of teaching competences.

Instrument: TPT, TEA Test of Personality. Authors: S. Corral, A. Pamos, J. Pereña and N. Seisdedos. Year: 2001. Editorial: TEA Editions. Application: Individual and collective

Scope of application: Adolescents and adults specifically in the field of working life. In particular, the working practice of the educational professional is considered. Its variables can impact on adaptation and on the success of educational activity, above all the specific features of responsibility and mental openness.

Duration: Variable, around 30 minutes, or less in accordance with the reading skills of the participant.

End purpose: Evaluate 15 personality features and competences grouped into 4 general factors and dimensions. It also has an index of success in professional life and a scale of sincerity.

Rating: General adult population, in centile and standard S scores, among men and woman and a normative balanced sample of both sexes.

Bearing in mind that according to the European model the competences of teachers are ten (scientific competence, intra and interpersonal competence, didactic competence, organizational and management competence, competence in managing coexistence, communicative and linguistic competence, digital competence, social competence - relational, competence in teamwork, competition in innovation and improvement), with the TPT instrument we can measure a large part of them, in particular:

- B. Intra- and inter-personal competences (way of being and treating others well).
- C. Didactic competence (Process of teaching-learning and its management)
- D. Organizational competence and management of the Centre
- E. Behaviour management competence
- F. Team work competence
- G. Innovation and improvement competence
- J. Socio-relational competence

Hp 2: The training of teachers in methodological approaches that favour interaction between students will reduce the frequency and/or intensity of inappropriate behaviours within the group-class and permit a change in the general culture of the centre that will favour the development of inclusive practices.

- Sociogram designed ad hoc, with the objective of detecting the different relational dynamics present in the classroom, placing special emphasis on identifying those students that are in marginalized situations.
- Frequency and seriousness of misbehaviour reports that have been registered at the centre over the 2015/16 and 2016/17 academic years.
- Frequency and type of misbehaviour that infringes the disciplinary code of the educational centre registered on the software application of the Education Board CONV over the academic years 2015/16 and 2016/17.
- Self-organized discussion and interview group with a sample of different educational agents involved in the lifelong training process that is evaluated.
- Index for inclusion: developing learning and participation in schools (INDEX) by Tony Booth and Mel Ainscow.

Hp 3: The success of students at Infant, Primary, and Secondary School levels correlates in a positive way with the lifelong training of teachers.

- Evaluation sessions of Primary Education, Mandatory Secondary Education and Sixth Form (Pre-University) Education of the different groups of students whose teachers participate in the experiment. The evaluations are conducted under the framework of the model that is specified in Annex IV of Decree 26/2016, of 21st July, which establishes the curriculum and regulates the implantation, evaluation, and development of Primary Education; Annex VIII of Order EDU/362/2015, of 4th May, which establishes the curriculum and regulates the implantation, evaluation, and development of Secondary Education; and Order EDU/363/2015, of 4th May, which establishes the curriculum and regulates the implantation, evaluation, and development of sixth-form studies.
- Minutes and follow-up report of the training activity that teachers implement, according to the model facilitated by the CFIE of Burgos.
- Final Report of the training activity that the teachers implement taking into account the questionnaire on projects of educational innovation contained in the Study on educational innovation in Spain [Estudio sobre la innovación educativa en España] edited by the Ministry of Education.

3.1. Analysis of Information

With a view to analysing the quantitative data, the statistical analysis was done with the SPSS software package v. 22 under Windows XP.

Those analyses will, on the one hand, be descriptive:

a) where the results will be presented through tables and figures that relate to the description of the sample and the average scores obtained by each section of the questionnaire or report.

And, on the other hand, inferential:

b) in which the statistical significance of the differences found in the various items in relation to teaching performance and the degree of student motivation will be analysed. Specifically, the technique of Variance Analysis will be applied for the analysis of the global significance of the differences, followed by an analysis of the coefficients of correlation between the valuation given to all the questionnaire statements.

4. Expected results

The present study sets out to determine whether there is a positive correlation in the development of aspects of competence covered in the Model of Professional Competences and the degree of student motivation. In addition, an evaluation procedure is prepared to determine the degree of development in the classrooms of training processes that began in the provincial CFIE of Castile and Leon. Thus, the aim is to find scientific evidence that permits the correlation of successful situations with quality training processes.

Besides, the qualitative analysis is oriented towards demarcating both personal indicators and indicators belonging to the educational community in which the individual is integrated, which makes it possible for certain methodological strategies to be successfully implemented. The overall aim is to encourage the creation of that same situation in other contexts, fostering a generalized implementation of methodological strategies which strengthen the development of inclusive practices, because they favour interaction, creation, metacognition and the commitment of the student.

Finally, this study will start to define the aspects of teacher competences that are primordial to achieve a quality system that fits in with the demands behind the changes that are taking place at a social and economic level; a fundamental aspect in the initial teacher training developed within Universities.

References

- Communication from the Commission (2010). Europe 2020. A strategy for smart, sustainable and inclusive growth. COM (2010) 2020 final.
- COTEC (2016). Informe COTEC 2016: Innovación en España. Madrid, Fundación COTEC para la innovación.
- Dirección General de Calidad, Innovación y Formación del Profesorado (2011). Modelo de Competencias profesionales del Profesorado. Junta de Castilla y León
- Furlong, J., Cochran-Smith, M., & Brennan, M. (2013). *Policy and politics in teacher education: International perspectives*. United Kingdom: Routledge.
- García, Y., Herrera, J. I., García, M. Á. & Guevara, G. E. (2015). Collaborative work and its influence on the development of teaching professional culture. *Gaceta Médica Espirituana*, 17(1), 60-67.
- Jiménez, L. A. (2009). Cuba: the psychopedagogical and methodological Capacitation program: An alternative To stimulate cognoscitive competence. *Educere*, 13(44), 205-214.
- Llinares, S. (2013). The development of the "professional noticing" skill in teaching-learning mathematics. *Educar em Revista*, 0(50), 117-133. doi:10.1590/s0104-40602013000400009
- Manso, J. & Monarca, H. (2016). Concepciones de la OCDE y la Unión Europea sobre el desarrollo profesional docente. *Journal of supranational policies of education*, nº 5 pp. 137-155
- Monarca, H. & Manso, J. (2015). Desarrollo Profesional Docente en el Discurso de los Organismos Internacionales. *Revista Española de Educación Comparada*, 26, 171-189.
- OECD (2015). *Skills Strategy Diagnostic Report: Spain*. OECD
- Porte, M. E. & Stern, S. (2017). *Social Progress Index 2017*. Washington, Deloitte.
- Rodríguez, E., & Grilli, J. (2016). Challenges of the collaborative resonance practice model in early teacher training. *Educar em Revista*, 0(62), 199-227. doi:10.1590/0104-4060.46406
- UNESCO (2016). *Education 2030. Incheon Declaration and Framework of Action for the implementation of Sustainable Development Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*. París, UNESCO.

Developing career management skills within a flipped course in Managerial Communication

Johnstone, Bruce Alexander

Bachelor of International Business Program, Monash University, Australia.

Abstract

This paper reports on research in progress to evaluate the effectiveness of strategies for developing career management skills (the processes involved in obtaining and maintaining work) in undergraduate university business students in Melbourne, Australia. These strategies are incorporated into a course in Managerial Communication - taught using blended-learning and a flipped-classroom approach. The course's active learning workshops provide opportunities to rehearse the process of undertaking a job search, creating application documents and being interviewed. Students are also prepared for modern recruiting processes by going through an online video interview simulation and preparing an online LinkedIn profile. Finally, the design of the workshops and the terminology and approach to project-based learning prepares students for workplaces that employ Agile methodology.

Keywords: *career skills, career management, employability, resumes, video interviews, LinkedIn profiles, Agile workplaces*

Introduction

University educators in Australia (in common with the United Kingdom and Canada) are increasingly challenged to improve the career outcomes of their graduates. This has brought a greater emphasis on developing skills that employers value (Ravenscroft & Luhanga 2014).

While workplace skills are important for graduates who have moved into employment, it has become increasingly recognised that we cannot take for granted that graduates possess the skills necessary to secure the employment in which to demonstrate these skills (McKeown & Lindorff, 2011). The group of skills referred to as *career management skills* can be defined as the processes involved in obtaining and maintaining work (Bridgstock, 2009). These job securing skills are clearly important in improving graduate outcomes (Jackson & Wilton, 2016) and encompass the ability to self-assess and engage in personal development for opportunities in the job market, to carry out a job search and undergo a recruitment selection process.

This paper reports on research in progress to assess the effectiveness of strategies for developing career management skills in undergraduate university students in Melbourne Australia. These strategies are incorporated into a course in Managerial Communication - taught using blended-learning and a flipped-classroom approach. The course's active learning workshops provide opportunities to rehearse the process of undertaking a job search, creating application documents and being interviewed. Students are also prepared for modern recruiting processes by going through an online video interview simulation and preparing an online profile on the professional networking platform LinkedIn.com. Finally, the design of the workshops and the terminology and Agile approach to project-based learning (Lang, 2017) prepares students for workplaces that employ Agile methodology (Denning, 2016).

Background

The Monash University Bachelor of International Business (BIB) program was launched in 2015 in newly refurbished and equipped premises in the Central Business District of Melbourne, Australia. From its inception the program incorporated new approaches to undergraduate teaching, including a flipped-classroom and blended learning approach to all courses. After working through online material, students participate in active learning workshops that use problem-based and team-based learning. The BIB also operates a trimester system that allows students to complete their undergraduate degree in two years and offers opportunities for international study and work experience placements. The BIB also sets out to include contact with employer organisations and professional practitioners with a program of industry guest speakers.

The design of the BIB program creates two challenges for graduate employment. While the BIB operates on a trimester system, the opportunities for graduate recruitment and internships established by the university are naturally aligned with the semester timetable used by the large Monash campus at Caulfield and Clayton. The career services provided by the university are also located for the much larger student populations at Caulfield and Clayton. Hence, strategies to develop employability and career management skills that are woven into a course are of particular importance to the BIB program.

The course in Managerial Communication is taught at Monash Business School under the leadership of Nathan Eva. The author worked with Dr Eva to adapt the material for blended learning and flipped classroom delivery in 2015 and has coordinated and facilitated the course within the BIB, with the support of Dr Eva as Chief Examiner. This work included creating online lessons for all topics and teaching innovations to develop skills in creating online profiles and undertaking online video interviews.

The Managerial Communication course includes coverage of communication theory, personality testing, self assessment, writing letters and resumes, interview skills, providing feedback, decision-making, public speaking and presentation skills, group problem-solving and proposal writing and digital communications. The following is a summary of how strategies for developing career management skills are incorporated into the course.

Personality testing, self assessment and creating a development plan

Early in the trimester students undertake a range of personality tests including Myers Briggs Type Indicator (MBTI), the Big Five, Social Styles and Emotional Intelligence (EI). Readings and online lessons provide insights into understanding the results of these tests and the implications of different personality types in the workplace. Students are then challenged to research further and write a self-assessment essay in which they describe their personality and explain the implications for their careers. The essay must include strategies to build on their strengths and develop themselves in ways that will strengthen perceived weaknesses. The self-assessment essay is an assessment weighted at 30 percent of the course grade. Formative feedback is delivered after the marking process through an individual conversation with the facilitator.

Job searching and creating application documents

Each week of the course a new topic and its associated online package is released in the Moodle Virtual Learning Environment (VLE). The online packages include interactive audio-video lessons, readings, videos and an online quiz that can be answered after completing the lessons and readings. The quiz has a closing date and time set to ensure it is completed prior to the first workshop for that week.

Resumes and Cover Letters is one such week topic. Students complete online lessons in preparing resumes and cover letters (prepared with input from the Monash Careers Service), a selection of readings on the subject and a quiz. The assessment for this topic is to locate a job opportunity, and create a cover letter and resume to suit that opportunity.

Students are provided required to conduct an online search and find a real listing for a job they would personally be interested in on graduation (a model job description is provided as an alternative). Students must then create a resume and cover letter for themselves as if they wished to apply for the job opportunity selected. This work is then assessed by a moderated peer-marking process. All resumes and cover letters are marked by at least two other students who complete marking and feedback forms that measure the extent to which the documents match the best practice guidelines set out in the online lessons.

Students who are reluctant to expose their resumes to others, are permitted to use a pseudonym, only known to the facilitator. The facilitator moderates the results of the peer marking process and awards a mark. The resume and cover letter assessment is weighed at 8% of the course and it is explained to students that similar documents will have to be produced when they come to apply for graduate jobs, and this assessment has prepared them to be able to create high quality application documents.

Students are encouraged to think critically about weaknesses in their resume and how these could be strengthened. For example, students with no work experience of any kind can consider undertaking volunteering or work experience activities that can be added to their resumes. Others might join professional organisations that match their employment aspirations.

Obtaining professional portraits for online use

Students are advised not to include a photograph in their resume, unless they are applying for work as a model or actor. Employers are conscious that a photograph attached to a resume may give rise to discrimination based on conscious or unconscious prejudices based on age, gender or race. Some employers automatically rule out applicants who provide a photograph to avoid any suggestion of discrimination. Students are advised that their resumes should focus on skills and experience with the aim of securing an interview.

However, students still need a professional portrait of themselves to use on their online profile, as employers will often search online to review a candidate's profiles on professional networking sites such as LinkedIn.com.

For this reason, having a professional portrait photograph taken is a workshop activity in Managerial Communication. Students are asked to arrive in professional attire and their photograph is taken by a photographer who is a member of the Monash eLearning team.

Creating online profiles for networking

Creating an online profile on the professional networking site LinkedIn.com is a workshop activity with a low stakes (two percent) assessment. The profile is required to match the student's resume and include education, experience and a personal statement. Students are also encouraged to consider using the LinkedIn.com platform to begin professional networking, although there is no requirement for the profile to actually be posted publicly and they can have whatever privacy settings they wish. Students export a pdf copy of their LinkedIn profile and submit that document for assessment.

Discussing an online profile is an opportunity to remind students that potential employers may search for information about them online, and they should manage their online image accordingly.

Role playing panel interviews to rehearse skills

Developing interview skills follows on from the process of searching and applying for a job and is a topic that occupies a week within the Managerial Communication course. The online package takes the standard approach of providing online lessons (for this topic based on material from the Monash Careers Service), readings and an online quiz that must be completed before the workshops.

The workshops for Interview Skills use structured role playing of panel interviews to provide students with experience in both interviewing and being interviewed. Students pose appropriate behavioral questions and practice answering them. They are also given the opportunity to practice providing answers to different types of aptitude tests employers may use to screen applicants.

Online interview simulations using Vieple.com

Online interviewing has been widely adopted by Australian corporations seeking to streamline their processes for selecting the most suitable job applicants, and BIB students will almost certainly find themselves taking online interviews when they begin to apply for graduate jobs. By developing the skills and confidence of our students to take these online interviews, we are providing them with a valuable edge in the highly competitive graduate job market and improving their career outcomes.

Monash College (a wholly-owned subsidiary of Monash University) opened an account on the Vieple.com platform in August 2016 and makes use of it in recruiting for its student internship programs. Since then the author has also been able to use this account to provide an online interview simulation as a workshop activity for the Managerial Communication course.

The simulation initially allows students to take a quick test question to familiarise themselves with the process, this is a standard feature in Vieple. The simulation interview then asks four questions as follows:

- 1. What are your three greatest strengths?*
- 2. Describe a team project you have been involved in. Who were the team members? What role did you take? What were the results?*
- 3. Tell me about a situation in which you have had to adjust and adapt to change.*
- 4. Describe a recent work or study-related problem. Tell me about the action you took to solve the problem. What was the outcome?*

Students are given two minutes to answer each question, chosen because they are typical of online interviews in the real world. The first question provides applicants the opportunity to sell themselves and questions two; three and four are behavioural questions that seek to understand how applicants would behave in a new role, based on how they report that they have behaved in the past.

To implement the simulation in a workshop, students are asked to attend with a laptop or tablet. Each student receives a unique login name. Students are encouraged to leave the room and find a well-lit and quiet location with a plain background. When interviews have been recorded, students are issued with a second login name that allows them to login in as an Assessor with access to only their own interview. Students then critically appraise their own interview performance and share and compare with another student. When all students have had the opportunity to participate, we arrange for the logins to be reset and the simulation interviews deleted for privacy and data security reasons.

We have found that students participate well in this activity, although some need to overcome an initial reluctance. They generally report that they feel much more confident about a real world online interview after doing the simulation and believe that they will “... *be much better at it next time*”.

Some students require minor technical support to use Vieple.com. Usually this involves helping them switch on their camera or microphone or enabling popups in their browser. Anyone using a simulation like this in a workshop would be wise to have a technical support person available to students.

The online interview is not an assessment, however it contributes to a mark given for participation in workshop activities, weighed at 20% and spread over 20 workshops. Assessing workshop participation is important to incentivise attendance and participation, so that career management skills are rehearsed and developed by all students.

Agile methodology

Agile Methodology is widely used in managing digital technology projects (Denning, 2016) and its techniques have been adopted to organise work at a number of Australian banks, corporates and professional service firms (Boyd, 2018). The Managerial Communication course uses an Agile approach that aims to accelerate learning of the material while also giving students an advantage when they apply for roles in contemporary Agile workplaces (Lang, 2017).

Students applying for roles within Agile workplaces will have the benefit of being already familiar with much of the terminology and the way in which people and their work is organised. For example the cohort studying the course is referred to as the *Managerial Communication Tribe*. The *tribe* is divide up to contains *squads* of four to five people with a diverse range of backgrounds and skills.

Squads are required to *self-organise* to accomplish learning tasks and projects, and to build and maintain trust and respect between members. Each squad becomes a *Knowledge Centre* for one of the topics covered by the course. This means they will not only study the online material along with the rest of the tribe, but they will also develop and deliver a learning activity that the tribe will undertake during a workshop. Each squad will have one week to complete its activity development project and will undertake a *sprint* to *rapidly develop* the activity as a *minimum viable product*.

Squads also use a series of weekly *scrums* and *huddles* to complete their final project. The first workshop each week includes a *scrum* meeting in which the course facilitator acts as a *customer* for learning projects assigned to the squads. Customers state their requirements and work closely with the squad. They must be provided with continual increments of progress about which they must provide feedback. However, customers may also introduce new requirements at the last minute, which squads must accept and complete.

Each squad appoints a *scrum master* who will assign tasks and monitor progress of task completion by individuals and the squad. Additional weekly workshops are termed *huddles* in which squads meet to co-work and complete tasks assigned in scrums. Students understand that the Agile approach requires determined work until the task is complete.

Research in progress

Students at Monash University are surveyed on their experience using the Student Evaluation of Teaching and Units (SETU) and the results show high levels of satisfaction for the teaching of Managerial Communication. Students also provide the facilitator with unsolicited feedback and comments, for example that the course "... was likely to be the one which has the most positive impact on my future career".

The author is currently developing, and seeking ethics approval for, a survey that will follow a 2018 cohort of Managerial Communication course students as they attempt to enter the workforce. Students, who agree to participate, will be e-mailed links to an online survey at the completion of the course and a series of further questionnaires over the post-graduation period.

This research will cover the employment outcomes achieved by the cohort, which can be compared to graduate outcomes for other students. The survey will also establish the type of employment the students have, and the extent to which the students' employment aspirations were met. Finally the survey will ask students to rate the value and usefulness of the career management activities included in Managerial Communication.

The results of the proposed survey will assess the value of the course and guide the development of future approaches to developing career management skills.

References

- Boyd, Tony (2018, 3 January) Business gets the agile bug - AFR Digital Editions. www.afr.com
- Bridgstock, Ruth (2009) The graduate attributes we've overlooked: enhancing graduate employability through career management skills, *Higher Education Research & Development*, 28:1, 31-44, DOI: 10.1080/07294360802444347
- Denning, S. (2016). How to make the whole organization "agile". *Strategy & Leadership*, 44(4), 10-17.
- Jackson, D & Wilton, N (2016) Developing career management competencies among undergraduates and the role of work-integrated learning, *Teaching in Higher Education*, 21:3, 266-286, DOI: 10.1080/13562517.2015.1136281
- Lang, G. (2017). Agile learning: Sprinting through the semester. *Information Systems Education Journal*, 15(3), 14-21.
- McKeown, T., & Lindorff, M. (2011). The graduate job search process--A lesson in persistence rather than good career management? *Education & Training*, 53(4), 310-320.
- Ravenscroft, Brenda & Luhanga, Ulemu. (2014). Developing Employability skills in Humanities and Social Sciences using the Flipped Model. *Proceedings of the International Conference on e-Learning, ICEL*. 142-149.

Flipping the classroom in courses of statistics: analysing the feedback from students

Alcañiz, Manuela ^a; López, Jordi ^a; Pérez-Marín, Ana M. ^a; Riera, Carme ^a; Santolino, Miguel ^a and Chulià, Helena ^a

^aDepartment of Econometrics, Statistics and Applied Economy, University of Barcelona, Spain.

Abstract

The implementation of the flipped classroom strategy in two subjects of the degree in Statistics (University of Barcelona-Polytechnic University of Catalonia) and the opinion of students about the experience are analysed. The objective is to improve the learning process of statistics by promoting a more active attitude of students in the classroom. The new strategy has been welcomed by students, as most of them are satisfied with the experience. Many of them would like that the strategy would be applied to a significant number of lessons in the subject, or even in other subjects of the degree. Moreover, students think that it helped them to develop their capacity to organize their study time and their self-learning competence. They also think that with the flipped classroom strategy they learn more than with the traditional classes, but they remark the importance of including a session where the teacher answers the questions and solves the doubts of students to ensure a successful implementation.

Keywords: *Teaching innovation, flipped classroom, statistics, active learning.*

1. Introduction

For many years, it has been observed that the grades of university students in courses of statistics are low. The dropout rate in the degree of Statistics of the University of Barcelona-Polytechnic University of Catalonia (UB-UPC) is close to 40%. Moreover, a quite significant number of students dropped out some university degree before starting the degree in Statistics (usually the degree of Mathematics or some Engineering), so many of them are not really motivated to study statistics. On the other hand, the grade necessary to be accepted as student in the degree of Statistics in UB-UPC has traditionally been just a little bit higher than 5 (thus, very close to the minimum possible grade for admission), therefore many students who start the degree do not have a good background, especially in mathematics.

In general, students of statistics are used to attend the classes, listen to the lecturer's speech and try to understand the theory and exercises that are solved during the classes. It is then when they feel themselves prepared to study thoroughly the subject and solve new exercises proposed by the lecturer, or even a test. In general, the attitude of students in the classroom is too much passive, as most of them do not make any question and just take some notes, in the best case scenario. The doubts and questions appear when they start to study by themselves the subject, which we guess that most of them leave for the last weeks before the exam.

In that context, the application of the flipped classroom methodology could contribute to increase students' motivation and to take advantage of the time spent in the classroom through an active learning approach. There are evidences in the literature of the larger gains in student learning when using more interactive class formats than when using the traditional lectures (Deslauriers *et al.*, 2011, Baepler, 2014).

The flipped classroom strategy consists basically on reversing the traditional learning method. The implementation will be described in detail in the next section, but, essentially, the student starts studying by himself the lesson. Then he solves some test/exercise (which is also discussed in the classroom) and finally, the lecturer teaches the lesson.

Reversing all the process helps the student to develop their self-learning capacity. Moreover, the student comes to the class with doubts and with interest in solving them. In that way, the class time is more effective in order to consolidate their learning process. Specifically, the flipped classroom strategy focuses on the importance of the use of the class time for the construction of knowledge rather than the transmission of the information, and there are many authors who have described positive experiences derived from its implementation (Missildine *et al.*, 2013; McLaughlin, 2013; Wilson, 2013 and Abió *et al.*, 2016). Studies highlight the improvement of students' achievements and

attitudes toward learning, as well as a greater satisfaction of the teachers involved in the experience (Lage *et al.*, 2000; Strayer, 2012 and Prieto *et al.*, 2014).

The flipped classroom methodology has been implemented in two subjects of the Degree in Statistics, namely Descriptive Statistics (first semester, first course) and Survey Design (first semester, second course). The experience took place during the first semester of the course 2017-18. The objective of this paper is to describe the implementation of the strategy and also to analyse the feed-back from students after the experience.

The paper is organized as follows. In section 2 the methodology for the implementation of the flipped classroom strategy is described. In section 3 the feed-back from students after the experience is discussed by analysing the results of a survey. Finally, section 4 concludes with some final remarks.

2. The methodology

It is necessary to remark that the flipped classroom strategy has been implemented in two subjects (Descriptive Statistics and Survey Design) where other teaching strategies are used as well. The most important is teamwork, which is especially relevant in the case of Survey Design. In Survey Design there are traditional classes where the lecturer teaches the theory of survey design, but additionally students carry out a real survey working in groups. Each group has freedom to choose the topic of the survey, which it is also a motivation for them. In Descriptive Statistics, there are also traditional classes where the theory of statistics is presented, but additionally students work in groups in different activities during the course. In these activities they analyse real demographic data collected in the classroom (about themselves), which motivates them and gets statistics closer to their real life. The final grade in these two subjects are obtained as the weighted average between the grades obtained in the final exam and those obtained in the different activities carried out during the course.

In that context, the implementation of the flipped classroom method consisted of the following stages. Firstly, the student has to study by himself the lesson, by using some materials provided in advance by the teacher. The materials are basically books, practical notes or slides prepared by the teacher. Then, he has to attend the class and solve a short test individually. The test consists on ten multiple-choice questions. Then, they have to solve again the same test but working in couples. Then, some students solve the test in the blackboard and there is an open discussion in the classroom on the solution. Finally, the lecturer solves all doubts and questions and finally teaches the lesson. For the moment, the method has been applied to a single lesson in the study program of each subject, but the plan is to extend it to more lessons and also to another subjects gradually. The score

obtained by the students in the flipped classroom activity is taken into account in the evaluation system and represents 10% of his final score in the subject.

In that context, the feed-back from students was collected by using a survey which they have to complete after the flipped classroom experience. The survey consisted of three parts: 1) sociodemographic and academic information, 2) study habits and follow-up of the subject, and 3) opinion on the flipped classroom experience. In the next section the results of the survey are discussed.

3. Results

The total number of students who participated was 111 (61% of them were students of Descriptive Statistics and 39% of Survey Design). Their average age was 19 years and 53.1% of them are men.

Table 1 summarizes the answers of students to different questions on their study habits. In each case, the student has to give a score depending on their level of agreement with some sentences. We see that most of them (64.2%) agree or totally agree with the sentence “I keep up to date the subjects in which now I am currently enrolled”. Nevertheless, 79.6% disagree or totally disagree with the sentence “I normally have a look in advance at the materials that are going to be taught in the next session or do the exercises that have been proposed by the teacher”. On the other hand, only 55.1% agree or totally agree with the sentence “I ask the teacher if I do not understand something”. We observe that a very important percentage of students (43.9%) agree or totally agree with the sentence “I only prepare myself for the exams during the last week before the exam”.

The answers to the questions related to the flipped classroom experience are shown in Table 2. It is remarkable that 73.3% of students think that they learn more by using the new teaching strategy compared to the traditional method. Moreover, 61.7% considered that they had to dedicate more time to study the lesson (the one taught by using the flipped classroom strategy) than normally. Most of students (80%) think that the flipped classroom strategy let them to develop their self-learning capacity. Moreover, 62.9% consider that this teaching strategy let him to develop his capacity to organize the time they dedicate to study.

Finally, the general level of satisfaction of students with the experience is high, as 87.2% of them say that are satisfied. Finally, there was students were asked about the percentage of the subject they would like that would be taught by using the flipped classroom strategy (see Table 3), and 49.5% answered “a very significant part of the subject (between 20%-50%)” and 20% of them a percentage even higher (between 50%-80%). This result encourages the teachers to gradually increase the intensity of application of the new method in these subjects.

Table 1. Study habits and attitude in the classroom.

Question	Totally agree	Agree	Disagree	Totally disagree
I ask the teacher if I do not understand something	15.0%	40.2%	33.6%	11.2%
I keep up to date the subjects in which now I am currently enrolled	7.3%	56.9%	30.3%	5.5%
I normally have a look in advance at the materials that are going to be taught in the next session or do the exercises that have been proposed by the teacher	2.8%	17.6%	54.6%	25.0%
I only prepare myself for the exams during the last week before the exam	14.9%	29.0%	43.0%	13.1%

Source: Own elaboration.

Table 2. Feed-back about the flipped classroom experience.

Question	Totally agree	Agree	Disagree	Totally disagree
I learn more by using the flipped classroom strategy than with the traditional method	16,2%	57,1%	21.9%	4.8%
With the flipped classroom method, I had to dedicate more time to study the lesson than normally	19,6%	42.1%	33.6%	4.7%
The flipped classroom strategy let me to develop my self-learning capacity	27,8%	52.8%	14.8%	4.6%
The flipped classroom strategy let me to develop my capacity to organize my study time	16,2%	46,7%	31.4%	5.7%
In general, I am satisfied with the flipped classroom experience	33.9%	53.2%	10.1%	2.8%

Source: Own elaboration.

Table 3. Opinions on the application of the flipped classroom strategy in the subject.

Question	All/almost all (80% - 100%)	Between 50% and 80%	A significant part (20% - 50%)	Only some lessons (0% - 20%)
Which percentage of the subject they would you like that would be taught by using the flipped classroom strategy?	7.2%	19.8%	49.6%	23.4%

Source: Own elaboration.

Finally, the questionnaire also included an open question where students could express their opinion about the experience with their own words. A detailed analysis of the answers showed that 53.6% consider that the experience has been useful for them, but 9.1% remark that it is necessary to ensure that the flipped classroom strategy includes a session where the teacher answers the questions and solves the doubts of students. Moreover, 13.6% of them think that the strategy could (in some cases) be applied in other subjects of the Degree in Statistics, but depending on the characteristics of the subject.

4. Conclusions

The results confirm that the attitude of the students of the Degree in Statistics with respect to the class time is not appropriate. Most of them do not prepare the lesson in advance, and an important part of them show a passive attitude in the classroom, even not asking to the teacher when they have some doubts.

These are important problems that must be addressed. In that sense, the flipped classroom strategy could be useful in order to promote a change in their attitude towards the class time and study habits. If they realized that class time is more profitable when they prepare in advance the lesson and read the materials proposed by the teacher, probably they will start to do it in all subjects. The same survey could be completed again by students after implementing the flipped classroom strategy gradually in several subjects, to see if there is a significant change in study habits.

On the other hand, regarding the low percentage of students who ask the teacher when they have doubts, the teacher could ask more frequently students if they have any question during the class, or to give them the possibility to do it later, even by using the forum of the

virtual campus. It would be interesting to ask students the reason why they do not ask the teacher when they have questions in order to find a more precise solution.

It is clear that the application of the flipped classroom strategy has been welcomed by students, as most of them are satisfied with the experience. Many of them would like that the strategy would be applied to a higher number of lessons in the subject, or even in other subjects in the degree, depending on their characteristics. Moreover, the strategy seems to help them to develop their capacity to organize their study time and their self-learning competence, but this should be analysed more in detail.

The results of the experience provide an orientation towards the implementation of the strategy in the Degree of Statistics in the future. The flipped classroom strategy should be applied more intensively in the Degree in Statistics, but gradually. New materials, including audios and videos, could be incorporated to support self-learning in the first stage of the implementation of the flipped classroom strategy. At the same time, as the teaching strategy would be consolidated in the degree, it would be possible to measure to what extent the academic performance of students improved since the application of the new teaching strategy.

References

- Abío, G., Alcañiz, M., Gómez-Puig, M., Rubert, G., Serrano, M., Stoyanova, A. & Vilalta-Bufí, M. (2016). Retaking a course in Economics: Innovative methodologies to simulate academic performance in large groups. *Research Institute of Applied Economics, Working Paper*, 2016/01, 1-25.
- Baepler, P. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers and Education*, 78, 227-236.
- Deslauriers, L., Schelew, E., & Wieman, C. (2011). Improved Learning in a Large-Enrollment Physics Class. *Science*, 332, 862-864.
- Lage, M.J., Platt, G.J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, 31, 30-43.
- McLaughlin, J.C. (2013). Pharmacy student engagement, performance, and perception in a flipped satellite classroom. *American Journal of Pharmaceutical Education*, 77, 1-8.
- Missildine, K., Fountain, R., Summers, L., & Gosselin, K. (2013). Flipping the classroom to improve student performance and satisfaction. *Journal of Nursing Education*, 52, 597- 599.
- Prieto, A., Díaz, D., Montserrat, J. & Reyes, E. (2014). Experiencias de aplicación de estrategias de gamificación a entornos de aprendizaje universitario. *ReVisión*, 7.
- Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments*, 15, 171-193.

Wilson, S.G. (2013). The flipped classroom: A method to address the challenges of an undergraduate statistics course. *Teaching of Psychology*, 40, 193-199.

Decoding the Disciplines in higher education institutions

Chistolini, Sandra

Department of Education, Università degli Studi Roma Tre, Italy

Abstract

Decoding the Disciplines is a methodology aimed to support teachers and students of University to tackle obstacles and difficulties in learning process. It is assumed that students come to classroom with different level of secondary school preparation and teachers are generally reinforcing the inequalities in principle deplored as form of injustice in our society. The question of giving tools that students need to succeed in our disciplines requires new strategies intend to make teaching effective in line with the development of the democratic vision of teaching. The methodology represents a dynamic sequence of steps based on the understanding of the content of discipline taught and learned. All disciplines are involved, humanities as well as sciences. Under the Erasmus Plus Programme some European Universities are collecting relevant evidences to understand what to teach about an academic discipline. Monitoring students' learning and motivation means to bring out the bottlenecks, which hinder the achievement of knowledge and slow down the learning process leading to failure. Presentation of initial results aims to share the benefits of this methodology able to guide students to master basic mental operations required in university courses. Decoding emerges as challenge and option for policy-makers of higher education.

Keywords: *Decoding the Disciplines; student learning; university teaching; democracy; scientific knowledge.*

1. Introduction

The university preparation of teachers, who will work in schools and must needs be competent in the discipline of teaching, requires a *forma mentis* that is flexible enough to be able to combine knowledge and strategies, depending on the needs and expectations that are changing so quickly. To acquire and convert knowledge to make studying attractive, impassion research and encourage new ideas constitute the distinctive corollaries of each educational process intended to promote cultural progress and economic development.

The close relationship between knowledge heritage and improvement of living conditions infers concrete commitment, from the political and social implications so that university teaching is adjusted to the widespread idea of triangular growth, in terms of intelligence, sustainability and inclusion, as present in the European recommendations and having become a permanent scope in evaluating best practices.

To add more vitality to university teaching means actively accompanying the students in the aware assumption of their responsibilities towards mastery learning. To know how to study, internalise, interpret and create solutions requires the capacity to relate to the teacher, with whom a profitable, learning dialogue has been established, that is, conversing in such a way that the lesson transforms into an existential project, in which to believe and to which one commits oneself.

This interactive teaching model can be realised in differentiated learning environments, in which both humanistic and digital technologies are used.

Humanistic perspective, meaning human contact between teacher and learner, allowed students to express their difficulties in what is object of knowledge during learning process concerning specific discipline. In fact, this attitude requires more attention to educational relationships and a cure of the single section of the process. The profile of teacher is focused on the ability of bringing into light bottlenecks, obstacles, encountered by the students in the classroom.

Mathematics uses humanistic technologies, when it sets up a significant educational relationship that results in successful preparation. There are relevant studies about the human factor in economics, in which the order of the addendums is reversed. This restores vitality and responsibility to persons, placing them in the top position, while monetary earnings are recognised as the engine of change depending on the acting person. From this perspective the studies of Levinas (1985), Burggraeve (1997), De Simone (2001), Sen (2011), Zamagni (2012) are very important in considering the relevance of human person in economics.

Digital; meaning with the aid of on-line communication as an indispensable opportunity at all levels of learning, and as a guaranteed access tool to information.

The international comparison on these subjects allowed for the participation in the Erasmus+ project on the methodology known as *Decoding the Disciplines* and its subsequent application to various university courses, specifically the course of general Pedagogy and the Mathematics course. For purposes of recognition herein, reference will mainly be made to the proposal concerning the course of general Pedagogy, basic annual teaching in the degree course in Primary Education Sciences.

Being emphasised in this paper are the salient aspects of European cooperation for developing superior systems of instruction and training. *Decoding the Disciplines* is interpreted as the key to a preferred path to cut down on university drop-outs, by acting on the methods for accessing knowledge, until a sizable rise in active participation and success of the students is enabled, starting from the first year of university studies.

2. European objectives and ways of reasoning for innovation

In the *Conclusions of the Council on a strategic framework for European cooperation in education and training of 12 May 2009 («ET 2020»)*, we read that “in the period to 2020, the primary goal of European

cooperation should be to support the further development of education and training systems in the Member States which are aimed at ensuring: (a) the personal, social and professional fulfilment of all citizens; (b) sustainable economic prosperity and employability, whilst promoting democratic values, social cohesion, active citizenship, and intercultural dialogue (Council, 2009, p. 3). This is not only a European, but also a worldwide objective, having considered the impact of training on the entire system of planet Earth and the extension of employability on the international market. Young people are prepared to look beyond national borders and choose places of work, in which their competences can be fully recognised. In the period up to 2020,

In this regard, Europe 2020 emphasises three interconnected priorities: 1) intelligent growth that means development of an economy based on knowledge and innovation; 2) sustainable growth through the promotion of a more efficient economy from a point of view of resources; 3) inclusive growth intended to promote an economy with an employment rate high enough to support social and territorial cohesion. Three areas of action for achieving these priorities are indicated hereafter (Unità Organizzativa, 2010, pp. 15-28).

The first concerns innovation and refers to European spending for research and development, still at 2% in 2010 and, thus, below the percentages recorded for the United States (2.6%) and Japan (3.4%); the auspice for Europe is moving in the direction of increasing investments in the private sector and high technology.

The second area of action is that of education, training and lifelong learning and directs new attention to students with limited reading capacities, youth who leave their studies at an early age, that is, the 50% who have an average level of qualification that often does not meet the job-market requirement. Of note, on the whole, is that, in Europe, a university degree is obtained by less than one person out of three, at the age of between 25 and 34, whilst in the United States, under the same conditions, this factor is 40% and 50% in Japan. The Shanghai Ranking lists two European universities among the top 20 worldwide (Cambridge and Oxford).

The *Academic Ranking of World Universities 2016* (The ARWU, 2017) indicates three British universities among the top 20 (Cambridge, Oxford, University College London) and one Swiss university (Swiss Federal Institute of Technology Zurich). In the classification of *The Times Higher Education World University Rankings* (2017), in the section concerning *Young University Rankings 2017*, the *École Polytechnique Fédérale de Lausanne* ranks in first place and the *Scuola Superiore Sant'Anna* in ninth place, at the same rank as the Karlsruhe Institute of Technology.

The third area of action, towards which Europe is moving is that of the digital society, in consideration of the fact that the global demand for information technology and communications represents a very extensive market, in which the participation of European businesses is still scant, due also to the delay in the use of high-speed internet. The slowness of on-line communication hinders innovation, particularly in rural areas, the spread of knowledge and distribution of goods and services.

3. From mastery learning to Decoding the Disciplines

Starting from 1956, Benjamin S. Bloom made contributions concerning the human characteristics of learning. He showed how the lack of scholastic success of students does not depend on their intelligence quota, but rather the capacity of teachers to prepare the discipline for progressive acquisitions, so as to result in the full mastery of the assignment. The implications of Bloom's taxonomic model, according to which teachers are trained to organise their teaching by promptly intervening, if necessary, and not attributing inappropriate responsibilities to the students, have aroused worldwide interest, to the point of generalising this same pedagogic lexicon of teaching by prerequisites, objectives, processes, evaluation and feedback.

The basic idea of the theory of mastery learning, i.e. the progressive mastery of the discipline, can be summed up as the student learning, when confronted with the problem of what is being taught with sensitivity, a good system and clarity (Bloom, 1979, pp. 34-37). Nothing new from this point of view. What is new would be not so much in the identifying

profile of the teacher, but rather in the assumption by the teacher that the student is able to learn, if the teacher helps the development of the student's capacity to understand. The difficulties are highlighted and the time required for overcoming them, that is, to master them, is established. The revolution of the traditional model is evident. It is perfectly clear how Bloom himself particularly aimed at frequent feedback to follow-up on and correct the learning process. Shifting the attention from the teacher of the subject-matter and the student to the teaching-learning strategy has an immediate impact of reinforcing the motivation of the student and giving suitable support at the right time.

After decades of scientific work on *mastery learning*, researchers in the United States have continued to pursue the fine-tuning of the original theory. The concentration of critical thought on the subject of study has led to working up the methodology known as *Decoding the Disciplines*. The attempt to help students learn how to analyse, summarise and assess could meet with obstacles in the building of a higher order of thought, due to the gap created between the degree of thought required in the classroom and the generic assumptions being introduced. To prevent and overcome these difficulties, the relevance in facing the issue within each special field of discipline is emphasised. The general reference structure represents the epistemic, cognitive and emotional framework of the process, completed by the specific, in-depth examination of the discipline. Bloom's *mastery learning* and collaborators refer mainly to schooling, while the research in *Decoding the Disciplines* shifts in a parallel manner into higher university education.

According to the reconnaissance of John Middendorf and David Pace (2004, pp. 1-2), we can define a typology of the development of the new methodology in the academic world, starting with the studies of Shulman, Brown, Collins, Duguid, Tobias.

Lee Shulman (1987) sustains that teachers' training must pass from general theoretical proposition to the study of learning in environments created by disciplinary teaching. Other academics (Brown, Collins, Duguid, 1989) talk about "cognitive apprenticeship", as the process of learning academic disciplines compared to learning various functions in a foreign culture. Observations in the field (Tobias, 1992-1993) reveal the difficulties of even expert educators and qualified students, under conditions of transferring into inferior teaching environments, far from their own specific disciplinary competences. This is a clear sign that possessing the discipline requires adjustments to the environment that cannot be given solely in the form of the general theory of learning.

This defines the fundamental epistemological problem that one needs to try to dissect and comprehend on two analytical planes: the plane of theorised knowledge and the plane of the discipline taught.

4. The responsibility of activating the learning process

Researchers, who are interested in studying the nature of the discipline, who teach by monitoring the results of the students, show a great responsibility towards the social and cultural implications of teaching. They truly want to know what remains of what they teach, and the evaluation of the feedback relative to the mastery of the knowledge by the young people is considered an indispensable step towards improving the performance of both parties: teacher and student.

The often unsatisfied comments of the teachers about the way the students give their feedbacks on the contents of the discipline heighten the search for quality of the educational offer. To improve one's own teaching method, one can start from various tracks. No matter what the case, to scientifically study thought and learning, it is necessary to link the disciplinary knowledge to what occurs with the students in the classroom. There are teachers with excellent knowledge, but who are actually unable to communicate the contents of their own discipline and, vice versa, there are teachers who were not considered exceptional as students, but who are masterly experts in getting students to participate in a work plan, through which learning takes place in a natural, spontaneous, easy, painless, interesting and pleasant way. The attraction to the discipline is not only linked to the contents, but requires that bit of curiosity, without which the contents, learned quite rapidly at the time and solely for administrative purposes, are just as quickly forgot. Not a remnant is left in the mind or heart of the student.

Decoding the Disciplines is a process for accessing the way to think and learn within the discipline; a progressive decoding that makes something rise to the surface that is tacitly concealed in the labyrinths of the discipline itself and that is now required to be consciously and responsibly exposed. Each discipline is undoubtedly built on acquisitions promoted for decades and expanded thanks to scientific research. We are now asking students to revisit and make their own, hereby demonstrating not only having understood it, but also having achieved a self-awareness of the understanding.

The research, around which the Erasmus+ project entitled *Decoding the Disciplines in European Institutions of Higher Education: Intercultural and Interdisciplinary Approach to Teaching and Learning*, is working with the participation of Universities of Belgium (Vives), Italy (Roma Tre), Lithuania (Kaunas and Vilnius) and Ireland (Galway) has been inserted into the history of the model used by Indiana University Faculty Learning Community (IUFLC) (2016-2019) since the second half of the 1980s.

5. The ethical issue of social justice

David Pace (2017, p. xi), one of the most diligent academics in the field of methodology, states having begun tracing the path starting from 1988 and meeting face-to-face with Craig Nelson, deemed the elderly wise man in the world of teaching. This colleague, with the most experience, emphasised how what we usually call teaching is actually a sorting of talent. The proof of success of students with early education and, thus, the lack of success of students with minimum preparation, created two categories. The talented and intelligent were listed on one side and, on the other, were the lazy and non-intelligent ones. By contrast, teaching implies that all students are given the tools, which they require to be successful in the discipline.

The feeling of injustice derived from ineffective teaching describes the situation proven by Pace and, moreover, well-known from analytical, pedagogic literature about the scholastic selection, to which the criticism of university mortality is placed side-by-side. The memory of don Milani and the School of Barbiana, in Italy, is compulsory to this subject. The book *Lettera a una professoressa* (Letter to a teacher) (1967) contains the charge against a system that reproduces the injustice of exclusion and the classification in talented and not talented, at school and in universities.

In half a century, we have made many advances, but we have not overcome the problem, seeing as how the subject of dropping out continues to be especially relevant in Italy. In the report about monitoring education and training, the European Commission (2015, p. 4) recorded 15.0% for Italy in 2014 and 11.1% as a European mean with respect to young people in the age bracket of 18-24 who left their studies or training early.

The responsibility that divulgers of the *Decoding the Disciplines* methodology share is precisely what is to be avoided, that is, reinforcing the inequality that generates social injustice. Legitimising the division into talented and not talented does nothing but increase the disparity, by leaving behind those who do not succeed in the task assigned. Thus, one must ask oneself what is necessary to assure that students follow a course of study with success. One must ask oneself what can be offered by way of materials, documents, means and ways of reasoning, so that what we set as the objective of the course may be reached by any student.

The benefit of the methodology is more forceful, first of all, in its extension into programmes within the University, so as to involve teachers of the various disciplines, as well as in its international popularisation at the beginning of the third millennium, and becomes a formative teaching and learning platform.

As we know, there are lessons, in which teachers are quite committed to communicating the importance and relevance of their discipline, while there are students who truly wish to

follow and understand the lessons, but cannot manage to grasp the meaning of the teacher's words, the sense of which they do not understand (Pace, 2017, pp. 1-4). There are students who actually have no idea what they might do to acquire the mastery required by the teacher and sometimes steer in another direction. Resentment by both parties is created and, if teachers feel their efforts are wasted, students prefer investing their energy elsewhere. The spiral of separation intensifies and remedying the descent becomes increasingly more complicated; it follows that the formal system of education confirms its selective model.

6. Conclusions

The finding of partial failure of our university curricula to fully reply to the development needs of young people leads to at least two broad final considerations (Chistolini, 2017a and 2017b). The first consideration concerns the theoretical view of the starting thought and the second consideration concerns the search for the most accredited methodology for developing whatever is necessary.

The commitment to meet the European target on the prevention and overcoming of school leaving, including university, forms part of the viewpoint of allowing every person to participate in full knowledge, by means of any available tools, without excluding procedures that are the domain of the youth, like social networks, and permanently accepting the challenge of the innovation in the acquisition and communication of information. The triad of Comenius, *omnes, omnia, omnino*, that is, that everyone studies everything in-depth, constitutes the objective of pedagogy and the disciplines, both humanistic and scientific, that are meant to arrive at the destination, even when the roads to be taken appear more impervious, in order to guide and accompany man in the conquest of his most complete humanity, in wisdom, conscience and freedom.

The methodology for *Decoding the Disciplines* has allowed for activating a highly interactive process through the use of all available means. The definition of the obstacle to learning certainly represents an initial step, which must be immediately followed by putting reasonable replies in place to help students attain success.

References

- Bloom, B. S. (1979). *Caratteristiche personali e apprendimento scolastico*. Roma: Armando.
- Brown, J. S., Collins, A., & Duguid P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18 (1), 32-42.

- Burggraeve, R. (1997). *Emmanuel Levinas et la socialité de l'argent: un philosophe en quête de la réalité journalière: la genèse de Socialité et argent ou l'ambiguïté de l'argent*. Leuven: Peeters.
- Chistolini, S. (2017a, June 24). *Decoding Bottleneck Sandra Chistolini Pedagogy*. Retrieved from <https://youtu.be/0z2QL-3KJgE>.
- Chistolini, S. (2017b, June, 24), *DDm (Decoding the Disciplines Methodology) Steps 2-3-4-5 Sandra Chistolini Pedagogy 20/03/17*. Retrieved from <https://youtu.be/ANjGXk9Fgz4>.
- Council. Notices from European Union institutions and bodies (2009). Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020') (2009/C 119/02). *Official Journal of the European Union*, C 119/2.
- De Simone, D. (2001). *Per un'economia dal volto umano: contro i poteri, le guerre, i profitti*. Roma: Malatempora.
- European Commission. (2015). *Education and Training Monitor 2015. Italy*. Luxembourg: Publications Office of the European Union.
- Levinas, E. (1985). *Umanesimo dell'altro uomo*. Genova: Il melangolo.
- Middendorf, J., & Pace, D. (Eds) (2004). *Decoding the Disciplines: A model for helping students learn disciplinary ways of thinking*. San Francisco: Jossey-Bass.
- Pace, D. (2017). *The Decoding the Disciplines Paradigm: Seven Steps to Increased Student Learning*. Bloomington, Indiana: Indiana University Press.
- Scuola di Barbiana (1967). *Lettera a una professoressa*. Firenze: Libreria editrice fiorentina.
- Sen, A. (2011). *La ricchezza della ragione. Denaro, valori, identità*. Bologna: Il mulino.
- Shulman, L. (1987). Knowledge and teaching : foundation of the New Reform. *Harvard Education Review*, 57(1), 1-22.
- The ARWU International Advisory Board (2017, June 16). *Academic Ranking of World Universities 2016*. Shanghai Ranking Consultancy. Retrieved from <http://www.shanghairanking.com/ARWU2016.html>
- The Times Higher Education World University Rankings (2017, June 16). *Young University Rankings 2017*. Retrieved from <https://www.timeshighereducation.com/world-university-rankings/2017/>
- Tobias, S. (1992). *Disciplinary cultures and general education: what can we learn from our learners?*. *Teaching Excellence*, 4 (6), 1-3.
- Unità Organizzativa della Comunicazione e Qualità del PON Ricerca e Competitività 2007-2013 (a cura di) (2010). *Strategia Europa 2020 e politica di coesione*. Roma: Arti Grafiche Agostini.
- Zamagni, S. (2012). *Per un'economia a misura di persona*. Roma: Città Nuova.

Cluster Analysis of Digital Performance in Educational Techniques in Conditions of EU

Huculova, Eva and Solcova, Lucia

Department of Banking and Investment, Technical University of Košice, Slovakia

Abstract

Global technological trends affect broad spectrum of areas in our life, and through the implementation of particular tools, they are affecting the development of educational levels in particular countries and also educational process itself. This study is aimed at the comparison and revealing of the effect of digitalization and e-skills on the level of education in 20 selected EU member countries by using Factor Analysis and Cluster Analysis. As a result, we consider four clusters of countries with similar characteristics in terms of education, digital literacy and public funding and expenditure on development of ICT and education. Population e-skills demonstrated almost identical levels. The implementation of technological trends into the educational process does not depend only on its positive effects on the educational level, but also on the real opportunity to use these modern tools within the educational process. This is determined by a number of socio-economic, political and cultural aspects. Their detailed examination requires the access to more structured data. Those conditions also create a platform for a subsequent research.

Keywords: *DESI index, cluster analysis, technological trends, educational process.*

1. Introduction

In the course of several decades, countries around the globe were affected by several system changes, from the change in the policy direction of particular states, to the transformation of economic systems onto market economies, European Union creation, etc. The consequence of these processes is the extension of the economy openness towards global and civilization trends, including technological progress and innovations in many countries. Some countries fall behind in this process; therefore, one of the key preconditions of technological progress is the preparedness of broad range of population classes for using modern information and communication technologies (ICT) or spreading of digital literacy. Although, there is no generally accepted definition of digital literacy (Chetty et al., 2017), according to American Library Association's digital-literacy task force, the digital literacy can be defined as „The ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills.“ Digital literacy is the deciding factor of digital transformation. It is the ability to understand the information and use them in various formats presented by means of ICT. It also enables the participation in social networks for creation and sharing of knowledge and supporting wide range of professional computing skills (UNESCO, 2011). Global technological trends affect wide spectrum of areas in our life, and through the implementation of particular tools, they are influencing in some way the development of educational levels in particular countries and also the educational process itself. Although digital technologies have the tendency to improve the teaching process and learning by various methods, they cannot achieve this improvement, as other factors are influencing them. On the other hand, undoubtable advantage is the fact that the digital education can ease and provide education to those, who do not have physical access to it (Pagani et al., 2016; Devaux et al., 2017). An important tool for education are ICT tools which helps students and teachers in the cooperation, communication and by solution of wide spectrum of problems (Afshari et al., 2009). Implementation of technological trends into the educational process is not dependent only by its positive effects on the educational levels, but it depends also on real opportunity to use these modern tools within the educational process. It seems that different level of access to ICT and low level of digital literacy can be a significant future factor of social differences deepening and it can lower chances for quality education (Velšić, 2005; Montoya, 2017). In our paper, we are trying to analyze not only the current level of digitalization in particular EU member country, but also other factors affecting the use of modern trends in the education, where belong mainly government expenses of countries on the education, level of use of ICT in the education, as well as the analysis of households without internet connection due to too high costs. This paper is divided into four parts. In the second part of the paper, we are focusing on the new trends in education that have been transformed by the technology deployment. The third

part describes methodology used in our analysis. Based on our findings and used methodology we have collected and described our results, shown in fourth part. In conclusion, we are summarizing our results.

2. Transformation trends in education

The transformation of educational system is one of the areas of interest and discussions around the globe. European Political Strategy Centre (EC, 2017) points out in its publication 10 main transformation trends in education, displayed on the Figure 1. To new trends in education belong gamification, use of virtual laboratories, role change of a teacher onto mentor and couch, use of interactive aid tools, as well as digitally oriented education using online libraries, interactive tables, webinars.

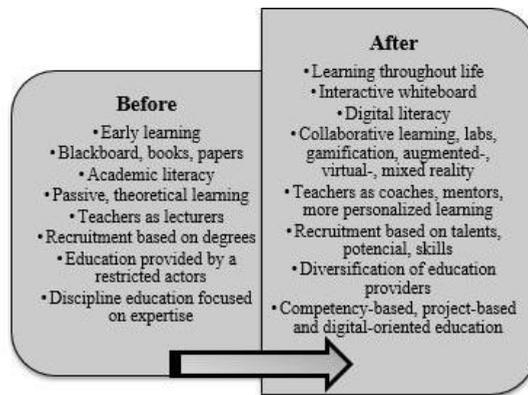


Figure 1. New transformation trends in education. Source: own processing according to EC (2017).

An additional aspect by the application of these transformation trends is the fact that despite the using of technological trends, online available information and materials, it is necessary to establish some culture cooperating on sharing the knowledge and information, and becoming the part of, so called, participative educational culture (Brooks & Gibson, 2012).

3. Methodology

The aim of this paper is the comparison and determination of the digitalization impact and e-skills on the educational level in selected EU countries by means of graphical representation of data through the using geographic information systems (QGIS) and multivariate statistical methods, specifically by factor and cluster analysis. Factor analysis is multidimensional statistical method explaining mutual linear dependence of observed variables by the existence of lower number of unobservable factors called as common

factors (Škaloudová, 2010). The essence of the cluster analysis is formation of clusters, mainly on the basis of similarity, or dissimilarity of clusters, while objects in the cluster are as similar as possible, and clusters are as dissimilar as possible (Trebuňa & Halčinová, 2011; Sebera, 2012). The most frequently used metrics for the calculation of the distance within the Cluster analysis is the Euclidean distance given by the formula:

$$d_{ij} = \sqrt{\sum_{k=1}^n (X_{ik} - X_{jk})^2}$$

, where X_{ik} and X_{jk} are vectors of similar number of items. (1)

In this paper, we apply the cluster analysis by means of Ward’s method. It is necessary to calculate the correlation matrix among particular countries from normalized quantities. Subsequently, we use the statistics Kaiser, Meyer, Olkin (KMO), of which value is higher than 0.5, which proves the correlation in the data and suitability of the use of factor analysis. In this paper, the cluster analysis is created for the year 2015 by the comparison of 20 selected EU countries, while necessary data was obtained from Eurostat databases, United Nations Development Program, EU Data Portal and European Commission. Considered are following variables of the model (Table 1):

Table 1. Description of variables

x1	Education Index (EI) – the indicator is calculated from the average index of school education and index of expected years of school attendance.
x2	Digital Economy and Society Index (DESI) Connectivity – this indicator is calculated as the weighted average of the four sub-dimensions: Fixed Broadband, Mobile Broadband, Speed, Affordability.
y1	Percentage of young people using the PC - Percentage of individuals who used a computer, by 16 to 24 years old.
y2	Percentage of adults using the PC - Percentage of individuals who used a computer, by 25 to 64 years old.
y3	Percentage of young people using the internet - Percentage of individuals who used the internet, by 16 to 24 years old.
y4	Percentage of adults using the internet - Percentage of individuals who used the internet, by 16 to 64 years old.
c1	Population with secondary education - The share of population with the highest education by the 25-64 years old, in percentage.
c2	Population with tertiary education - The share of population with the highest education by the 25-64 years old, in percentage.
v1	Expenditures on education - Government expenditure on education (current, capital, and transfers) as a percentage of GDP.
v2	ICT Government budget allocations for R&D – Indicator for distinguishing, which part of budget resources for the research and development sponsors expenses for the area of the ICT development, in Millions of current euros in PPS.

Source: own processing.

4. Results and discussion

Based on obtained data from European Commission and by carrying out analysis through the statistical system QGIS, we can point out to the comparison of the digital performance of 28 EU member countries, where the main examined indicator is a composite index DESI composed of five principal policy areas: Connectivity (25 %), Human Capital (25 %), Use of Internet (15 %), Integration of Digital Technology (20 %) and Digital Public Services (15 %). DESI index uses more than 30 key indicators and it is published every year (EC, 2017). Graphical representation of digital performance of 28 EU member countries is presented by Figure 2, which divides countries by their achieved performance in 2017 in 4 intervals, where the average of EU represents level of DESI index 0.526. The countries with index above the average of EU belong overall 15 analyzed countries (DK, FI, SE, NL, LU, BE, UK, IE, EE, AT, DE, MT, LT, ES, PT), whose composed index DESI is in interval $(0.526, 0.707)$, on the other hand countries with index under average of EU, are 13 (FR, SI, CZ, LV, SK, HU, CY, PL, HR, IT, EL, BG, RO) and their index is in interval $(0.332, 0.526)$. Countries like Denmark, Finland, Sweden and the Netherland lead and the other way around countries like Romania, Bulgaria and Greece are lagging behind in comparison with other analyzed EU countries. Looking at the comparison with last year's DESI index, countries, which have improved their digital performance this year for more than 8 % are Slovakia (9.9 %), Slovenia (8.9 %), Italy (8.8 %) and Cyprus (8.1 %).

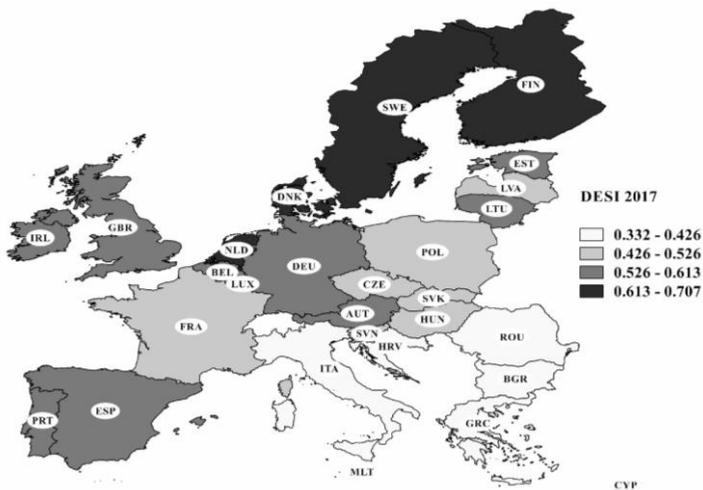


Figure 2. Graphical representation of DESI (Digital Economy and Society Index) of 28 EU member countries, ranking 2017. Source: own processing according to EC (2017).

Secondly, we use multidimensional statistical methods. According to our results, the MSA (measure of sampling adequacy) index of the statistics KMO is higher than 0.5, which means that in this case, it is suitable to use the factor analysis. By the calculation of own

values of correlation matrix (3.98; 1.99; 1.41; 0.77; 0.67; 0.47; 0.44; 0.18; 0.051; 0.018) we have found out that three own numbers are higher than 1; therefore, as suitable number of factors are chosen three factors. From the results of this factor analysis it is clear that the first factor explains almost 40 % of total variability; the second factor explains almost 20 % of total variability and the third factor approximately 14% of total variability. The percentage of remaining factors on the variability is relatively low, so we can state that for the explanation of original variables, it is necessary to use three factors, by which we are able to explain almost 74 % of total variability. Continuing with the factor analysis directly with the rotation VARIMAX, by means of which we can estimate positive or negative correlation of the indicator with one factor and subsequently, we can calculate the factor score. The results of this analysis are three factors and their load called as factor saturation, introduced in the Table 2.

Table 2. Factor load after rotation VARIMAX.

variables	factor 1	factor 2	factor 3
X₁	0.15	0.18	0.68
X₂	0.58	0.36	0.43
Y₁	0.28	0.74	-0.07
Y₂	0.55	0.50	0.53
Y₃	-0.14	0.89	-0.09
Y₄	0.06	0.78	0.35
C₁	0.95	-0.02	0.14
C₂	0.94	-0.05	0.06
V₁	0.78	0.16	-0.03
V₂	-0.05	-0.19	0.85

Source: author's work.

The Table 2 indicates that after the variation VARIMAX, it is possible to assign each variable (exception of y_2) as positively or negatively correlating with one of three factors. The variable y_2 cannot be explained by any factor. It is slightly positively correlated by all three factors. On the basis of results of factor load, we can interpret the first factor 1 as the factor of the educational level in the connection with government financing (variables of the percentage of the population with secondary and tertiary education, and expenditures on education as the percentage of GDP). Second factor can be interpreted more clearly as digital skills (variables of the percentage of the population using the PC and internet) and the third factor 3 as the level of financing of ICT (variable budget resources for the research and development of ICT). In the last step, we have created the cluster analysis, and on the basis of graphical output (Figure 3), as optimal number of clusters we consider 4 clusters. This statement is also supported by Ratkowsky index used for the determination of optimal number of clusters and its value is 0.4015, by which it is recommended to consider 4 clusters, which is displayed also on the Figure 3.

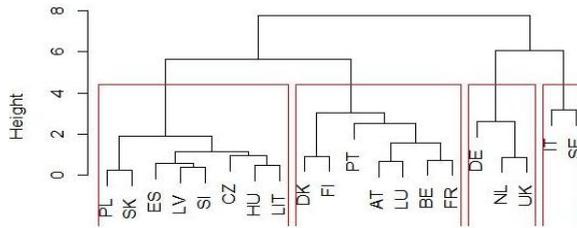


Figure 3. Cluster analysis of EU countries in the form of Dendrogram. Source: own processing.

According to results of the cluster analysis (Figure 3), we have considered 4 clusters or groups of examined countries. The first and the smallest group within the cluster analysis with similar characteristics contain Italy and Sweden. In this cluster, mentioned countries are comparable in the indicator Education index (x_1) with average value 0.830, as well as in the indicator DESI Connectivity (x_2) with average value 0.158. From all results, countries in this group are typical by high percentage of expenses on education (4 – 6.3 % of GDP). Countries of this cluster differ by indicators c_1 and c_2 (with average values 15.57 and 26.60), which represent different level of the population in the given country with secondary and tertiary education, but also the indicator of budget expenses for the development of ICT with average value $v_2=216$. Second cluster includes countries United Kingdom, Netherlands and Germany. In this group, similar values can be found in the indicator x_1 and x_2 with average values 0.851 and 0.13. Indicator c_1 achieves values 3.39 – 4.68 %. Significant differences in averages of the second group of countries can be found by the indicator v_2 with average value 101.84, as well as by c_1 , c_2 with average values 5.375 and 12.837. In the case of the third cluster, which is formed by countries France, Belgium, Luxemburg, Austria, Portugal, Finland and Denmark we can see average values by indicators $x_1=0.901$ and $x_2=0.173$. The indicator v_1 achieves the average value 4.34%, which is comparable with the second analyzed group of countries. Also, in this cluster, the most significant differences of particular countries are in indicators $c_1=13.033$, $c_2=20.366$, as well as by the indicator $v_2=861.39$. Fourth cluster belongs to Lithuania, Hungary, Czech Republic, Slovenia, Latvia, Spain, Slovakia and Poland with results $x_1=0.835$ $x_2=0.135$. Indicators $v_1=4.375$, $v_2=458.44$, $c_1=16.55$, $c_2=27,75$ indicate the biggest differences in values within the group, with average values.

5. Conclusion

According to our digital performance comparison and its financing we have calculated four clusters of selected European countries with similar characteristics where the highest values were analyzed in the first and third clusters (DK, FI, PT, AT, LU, BE, FR and DE, NL, UK). In all four examined clusters, indicators are representing population e-skills which have almost identical levels. Living in higher educated countries does not necessary mean higher level of digital performance. The implementation of technological trends

into the educational process does not bring only its potential positive effects on the educational level, but also the opportunity to make educational process easier, more interactive and digitally oriented. Despite of the fact that the amount of internet availability has increased slightly in last years, some countries have still low internet affordability. This is determined by socio-economic, political and cultural aspects. Their detailed examination requires the access to more structured data. Wide development of digitalization in educational system can motivate young generations to support and create the digital single market in Europe.

References

- Afshari, M., Bakar, K.A., Luan, W.S., Samah, B.A., Fooi, F.S. (2009). Factors Affecting Teachers' use of Information and Communication Technology. *International Journal of Instruction*, 2(1), 77-104.
- American Library Association's digital-literacy task force. (2012). Digital Literacy Definition. Retrieved from <http://connect.ala.org/node/181197>.
- Brooks, Ch., Gibson, S. (2012). Professional Learning in a Digital Age. *Canadian Journal of Learning and Technology*, 38(2), 1-17.
- Chetty, K., Liu, Q., Wenwei, L., Joise, J., Gcora, N., Shenglin, B. (2017). Bridging the Digital Divide: Measuring Digital Literacy. G20 Insights, Germany, 1-8.
- Devaux, A., Bélanger, J., Grand-Clement, S. and Manville, C. (2017). Education: Digital technology's role in enabling skills development for a connected world. RAND Corporation, PE-238-CI (2017). <https://www.rand.org/pubs/perspectives/PE238.html>.
- European Commission. (2017). 10 Trends Transforming Education as We Know It. Retrieved from https://ec.europa.eu/epsc/publications/other-publications/10-trends-transforming-education-we-know-it_en.
- European Commission. (2017). Digital Economy and Society Index (DESI) 2017. Retrieved from http://europa.eu/rapid/press-release_MEMO-17-352_en.pdf.
- Montoya, S. (2017). Tracking Literacy in an Increasingly Digital World. UNESCO Institute for Statistics. Retrieved from <http://uis.unesco.org/en/blog/tracking-literacy-increasingly-digital-world-0>
- Pagani, L., Argentin, G., Gui, M., Stanca, L. (2016). The impact of digital skills on educational outcomes: evidence from performance tests. *Educational Studies*, 42(2), 137-162.
- Sebera, M. (2012). Vícerozměrné statistické metody. Shluková analýza. Masarykova univerzita, Brno. Retrieved from http://www.fsps.muni.cz/~sebera/vicerozmerna_statistika/shlukova.html.
- Škaloudová, A. (2010). Faktorová analýza. Faktorová skóre. Univerzita Karlova, Prague. Retrieved from http://kps.pdf.cuni.cz/skalouda/fa/faktorova_skore.htm.
- Trebuňa, P., Halčinová, J. (2011). Graphic Interpretation Cluster Analysis and select the number of important clusters. The 14th International Scientific Conference Trends and Innovative Approaches in Business Processes, 1-3.

- UNESCO, Institute for Information Technologies in Education. (2011). Digital Literacy in Education. Retrieved from <http://unesdoc.unesco.org/images/0021/002144/214485e.pdf>
- Velšic, M. (2005). Digitálna gramotnosť na Slovensku. Správa z výskumu. Inštitút pre verejné otázky, Bratislava.

A study on assessment results in a large scale Flipped Teaching Experience

Turró, Carlos^a; Morales, Juan Carlos^a and Busquets-Mataix, Jaime^a

^aÁrea de Sistemas de Información y Comunicaciones, Universitat Politècnica de València.

Abstract

Universitat Politècnica de Valencia (UPV) has developed a large scale experience in flipped teaching (FT), with 64 different courses and 3083 students (2512 unique). Teachers could decide to participate in the experience on their own, and in quite a number of courses we have groups with FT and groups without it. Assessment of the students was done using classical systems (mostly written exams).

Evaluation of the experience was done through several ways: First we did a qualitative survey to teachers and students, and then we carried out an analytical study about the results of the assessments, comparing between years, between FT and classical courses and also internally in the courses with FT and classical groups. Results of this analysis show that students like the FT system and that they got statistically significant better results in the classical assessments, with at least a 5% gain. Also we have no correlation results with the perceived teacher quality and the student group size. So this study allows to verify the capabilities of FT approach in higher educational institutions.

Keywords: *Flipped Teaching, Assessment, Learning Outcomes.*

1. Introduction

Flipped teaching, or flipped classroom is a teaching model defined by a change in the use of class time and out-of-class time, as defined in Abeysekera & Dawson (2015) and Lage & Platt (2000). This model “inverts” in the sense that the activities that were homework are now done in class in the forms of active learning, peer learning and problem solving. To make class time the same, class lectures are delivered through a LMS (Learning Management System) and usually as videos for out-of-class viewing. Students view those videos (and content) corresponding to the classical lecture previously to the class time.

So, as less time is dedicated by the teacher to repeat information he can prove students with more exercises and activities and at the end making active learning possible with a reasonable amount of resources.

Reported benefits of flipped learning model include an increased student satisfaction, improved communication skills and consequently, an enhanced learning experience, as can be seen in O’Flaherty & Phillips (2015). We have also studied qualitative effects of FT in our university in Turró et al (2016) and the short answer is that both students and teachers get more involved and satisfied by the use of this teaching style.

However, when teachers develop a flipped teaching experience make big changes in the way they behave and assess the students, with a focus on a more personalized evaluation. While we strongly support that, a criticism from the classical teaching side is how the same students would behave in a classical exam. We only found a little work in that area in a survey of Bishop & Verleger (2013), so to fill the gap in research, this study focuses in the performance of FT students in classical examinations. More specifically this analysis aims for the following questions:

- Q1. Is there an effect to students’ performance in classical assessments when flipped classroom is adopted as a teaching model?
- Q2. Do students perceive that the best teachers choose FT?

This paper is structured as follows: Section 2 will display briefly the Flipped Teaching Initiative in the UPV, and then the data available for this study. Section 3 will elaborate on the data and will provide insights on the results. Finally section 4 will draw some available conclusions on the proposed questions.

2. Context and Methods

Universitat Politècnica de Valencia (UPV) has since 2006 an initiative, called Networked Teaching aimed to encourage the production of high quality e-learning materials as a companion material for the standard lectures. The idea behind that plan is to find ways to

coordinate and produce useful results from all small-scale initiatives from teachers and staff that had been developed in the previous years. A key concept in the plan is the integration of the different units of the University in the process. For instance, to create a Video learning object, the IT department should be involved, but also the institute of Education, the Library, and the Legal department shall take part in the definition of the process. At the end all these interactions should be hidden to the teachers, so they find a clear and easy path to produce the content.

While this initiative had a remarkable success as reported in Turró et al. (2014), most of that content was used as a side product in Blended Learning schemes, so in 2013 UPV decided to aim for more active or newer methodologies, like Flipped Teaching and MOOCs.

First we made a pilot test to know what would be the challenges and the results of actually deploying Flipped Learning in a wide scenario of courses. So, for the first semester of the 2014-2015 academic year, a group of students in two faculties (Computer Science and Business) received all their courses with Flipped Learning.

The results of that experience were great in terms of satisfaction of both the students and teachers, while there wasn't a significant improvement in the assessment. Those results were considered enough good to continue the project.

So, for the 2015-2016 academic term UPV moved a step forward in applying FL to his courses, by planning a large-scale deployment of more than 100 courses with around 200 teachers involved. Teaching is done on two semesters, and for the first semester 45 courses were flipped. Then the experience has continued during 2016-2017 and 2017-2018.

In our case we define the flipped classroom as an educational technique that consists of two parts: computer-based individual instruction before the lecture session and interactive group learning activities inside the classroom in the time that was set up for lecturing in standard courses. It's worth noting that we don't restrict this definition to employ videos as an outside of the classroom activity.

2.1. Implementing flipped teaching at UPV

Teachers that apply for the flipped teaching project have learning sessions in which they get the directions to apply FT in their courses. However, while they are encouraged to use videos they are allowed not to do it and rely in more conventional techniques like HTML content on the University's LMS platform or even PDF files.

After those learning sessions some teachers decided not to implement FT due to a variety of reasons (required time or effort, unclear results, other). We selected them as the control

group for the experience, because we thought that they are interested teachers, so they are more similar to the group of teachers participating in the FT project.

Courses are from a variety of topics around UPV grades, including Engineering, Computer Science, Business and Arts. They are also in different years of the curriculum, as we didn't make any restriction on the applying teachers.

While UPV encourages a change in teaching style, assessment of students already relies heavily in classical examinations (written), because is compulsory that a student can pass with one or several written exercises. So the way that the assessment is made for FT courses is very similar to the classical ones.

Students can't decide if they want FT or not: As they are assigned to a group and a teacher they have to and can follow FT methodology only if their teacher is doing it.

Both the written examinations and the student selection process allow us to compare FT and Classical teaching. But more than that, it makes possible to have mixed-teaching groups, in which some groups students use FT and other not and they have a common assessment via written exams. Those groups ("mixed groups") will be very valuable for comparing performance.

2.2. Research data

The research data comes from the official results of the assessment in the academic year. Assessment results follow Spanish standards, marks being from 0 to 10, being 0 the lowest and 10 the highest. Usually a 5.0 mark is required to pass.

In order to populate the dataset properly we selected out the courses with less than 10 students, or the courses that did FT partially, e.g. only for some months in the semester. We also dropped out the courses that were pilot in the previous academic year.

So the dataset contains data from 64 courses with 7818 non-unique students (4915 unique), that includes both students with FT and without it. Other data like number of groups, students per group, etc. come also from the university's databases.

Also UPV makes an official and compulsory anonymous survey about teaching in which students value different aspects. There is a question there that is commonly used as a proxy of the teacher performance: "With all the restrictions in mind, I think that he/she is a good teacher". We will use this data, in a 1-5 likert scale to dig about question 2.

Table 1. Courses in the Dataset per teaching style.

Teaching style	# Courses
Flipped Teaching	43
Mixed (FT & Classical groups)	15
Classical (Control group)	6

Table 2. Number of groups and students in the dataset.

Teaching style	Classical groups	Classical students	FT groups	FT students
FT	-	-	81	2380
Mixed	66	3088	20	703
Classical	48	1647	-	-

3. Results

In this section we are going to review the results that we have obtained by analyzing the dataset.

3.1 Students with Flipped Teaching get better results in the assessments

In figure 1 we show both a boxplot and a density plot showing the grades of the students. Grades are from 0 to 10, being 0 the lowest.

We can clearly see that there is a positive effect on the FT students. A t-test on the data shows statistical significance ($t = 12.308$, $df = 7183.5$, $p\text{-value} < 2.2e-16$).

The difference between both groups is 0.27 standard deviations, which is around a 5% (0.5 points).

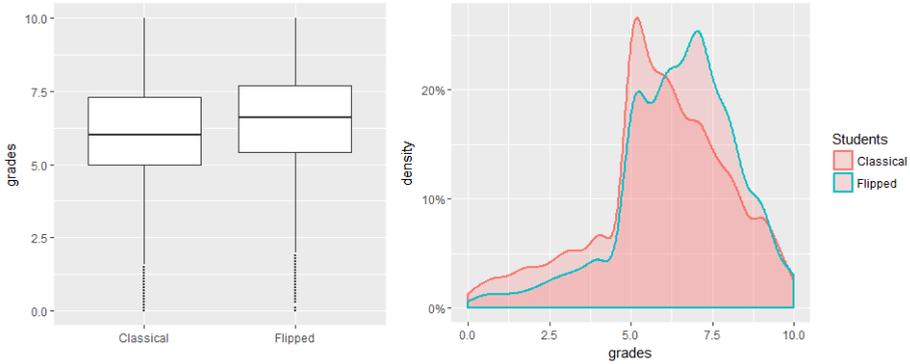


Figure 1. Grades for students in Classical and Flipped Teaching

3.2 In courses with both Classical and Flipped Teaching groups (with the same exam), students with Flipped Teaching perform better

In figure 2 we filter out the results of figure 1 so we only include the courses with mixed groups. Results are very similar to those of figure 1, which is quite remarkable.

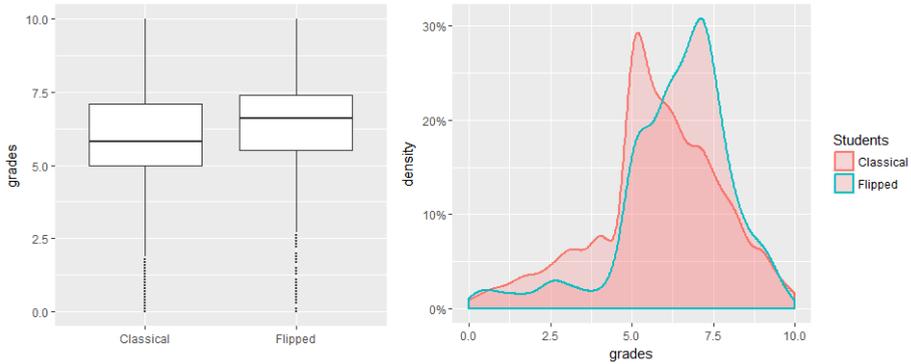


Figure 2. Grades for students from mixed courses in Classical and Flipped Teaching

Here the t-test is also significant ($t = 7.5595$, $df = 1126.7$, $p\text{-value} = 8.361e-14$) and the effect is of 0.29 standard deviations, which is around 5% also.

3.3 Results for Classical students are no different this year than the year before

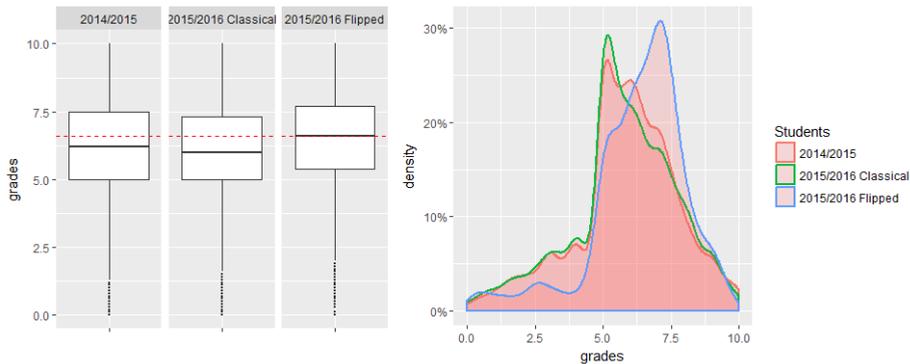


Figure 3. Comparison of assessment results between years

A variable that could influence the results of the previous sections is that maybe the this year is in any sense “special”. To rule this out we took the results of the same courses from the previous year, which are all in Classical format.

The results display that, for classical teaching, both years are very similar and follows the same density pattern, which support the hypothesis that FT correlates a positive increase in grades. Differences between these two years are not statistically significant.

3.4 Teachers choosing Classical teaching are of equivalent quality than those that chose FT

This is a quite interesting topic in which our results maybe are counterintuitive. As can be shown on figure 4, students don’t perceive any group of teachers as preferred. An ANOVA test gives F-value 0.92, $p=0.341$ which means that the hypothesis can’t be rejected with the data.

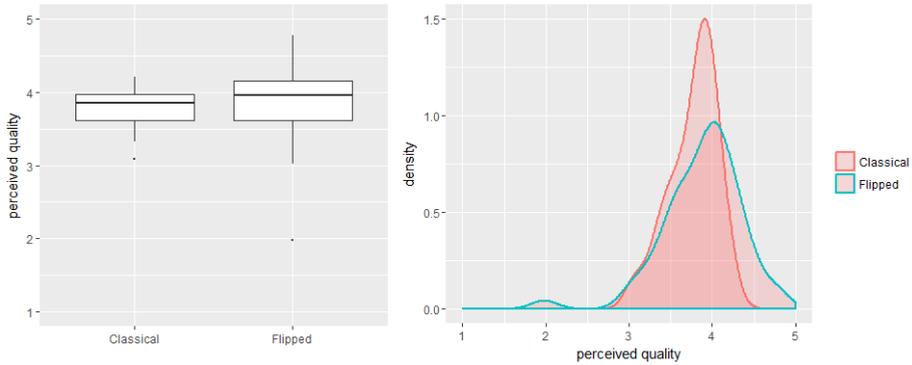


Figure 4. Perceived teaching quality for Classical and FT teachers

3.5 There is no correlation between the group size, the mean grades for both classical and FT.

In figure 5 we show a scatterplot of the mean grade for all the groups in the dataset, classified by teaching style, and both visually and through an ANOVA test is clear that the null hypothesis can't be rejected.

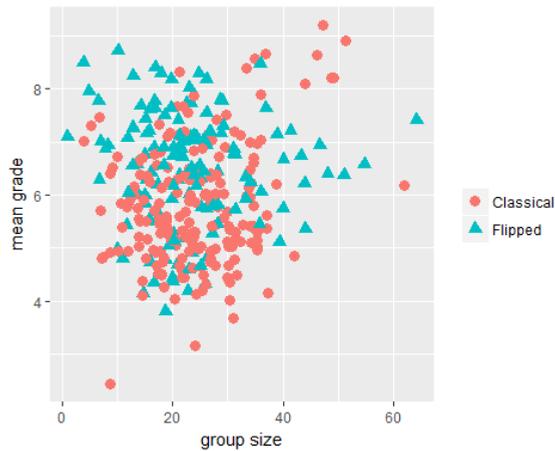


Figure 5. Mean grades per group size

4. Conclusions

We have presented the results of an analysis carried out in a large scale flipped teaching experience at Universitat Politècnica de Valencia. The analysis was directed to solve these questions:

- Q1. Is there an effect to students' performance in classical assessments when flipped classroom is adopted as a teaching model?
- Q2. Do students perceive that the best teachers choose FT?

The answer of question one is a clear yes, FT students perform better when compared with their classical colleagues. This is a great result for FT, because most of the perceived value of the methodology is directed to skills that don't necessarily show up in a written exam. In our results FT students won clearly this round.

Question 2 was directed to investigate a common criticism for these experience: intuitively we may think that the "best" teachers should choose "more advanced" methodologies, where "best" and "more advanced" are not clearly defined.

Results don't hold up that idea. This can be because of several different reasons, including the capabilities of the students to value teacher's quality. Anyway that result is also good in terms of valuating the FT scheme: FT don't need the "best" teachers to perform significant better than our old classical teaching style.

References

- Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher Education Research & Development*, 34(1), 1-14.
- Bishop, J. L., & Verleger, M. A. (2013, June). The flipped classroom: A survey of the research. In *ASEE National Conference Proceedings*, Atlanta, GA (Vol. 30, No. 9, pp. 1-18).
- Esperanza, P., Fabian, K., & Toto, C. (2016, September). Flipped Classroom Model: Effects on Performance, Attitudes and Perceptions in High School Algebra. In *European Conference on Technology Enhanced Learning* (pp. 85-97). Springer, Cham.
- Lage, M. J., & Platt, G. (2000). The internet and the inverted classroom. *The Journal of Economic Education*, 31(1), 11-11.
- O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The Internet and Higher Education*, 25, 85-95.
- Turro, C., Despujol, I., & Busquets, J. (2014). Networked teaching, the story of a success on creating e-learning content at Universitat Politècnica de València. *EUNIS Journal of Higher Education*.

Turro, C., Mengod, R., Morales, J. C., & Busquets, J. (2016). Video is Key for Flipped Learning: An Experience at Universitat Politecnica de Valencia. In SE@ VBL@ LAK (pp. 18-25).

Start It Up – Support for young entrepreneurship

Torniainen, Anna-Maija

Department of Digital Economy, South-Eastern University of Applied Sciences, Finland.

Abstract

The aim of the paper is to disclose how entrepreneurship education can be developed and examined in a Higher Education Institution (HEI) via a EU funded local project. The paper examines HEI students' motivation factors and needs concerning Entrepreneurship education (EE). Start It Up – Support for young entrepreneurship project's objective is to support students and young people in entrepreneurship, new business creation and innovation, and also employment in and out the innovation ecosystems. Differentiating entrepreneurial methods, best practices, entrepreneurship coaching, and entrepreneurship spirit are tested and organized throughout the project. The project strives to deliver tools and motivation towards entrepreneurship. This article introduces the activities that have been done to support EE and a case study which examines how the entrepreneurship education can be improved to develop EE in the Finnish HEI. The main testing platforms for EE are presented and the results of the case study show that to promote entrepreneurship and to enhance students' awareness and motivation towards entrepreneurship in the Finnish HEI, the offering of EE teaching, events and competitions for students should be increased and promoted more effectively.

Keywords: *student entrepreneurship; learning; entrepreneurship education; entrepreneurial intentions.*

1. Introduction

The aim and focus of the paper is to disclose how entrepreneurship education (EE) has been assessed and developed in a local project managed by a Finnish University of Applied Sciences. In 2017, the Finnish Ministry of Education and Culture published new alignments for EE to guide, develop and direct the activities that promote EE in different educational levels.

The article starts with the current sights of EE in Finland and proceeds to a case study executed in Start It Up - Support for young entrepreneurship project. The main testing platforms for EE are presented in the paper. The results of the case study show that to promote entrepreneurship, more teaching, events and competitions can act as useful promotion tool and as a way to increase the awareness and motivation towards the entrepreneurship. The results introduce students' ideas for developing student entrepreneurship. Consequently, the paper focuses on the current state of students' needs involving EE in a Finnish University of Applied Sciences.

Start It Up – Support for young entrepreneurship project is carried out between 2017-2019. The project is managed by a Finnish University of Applied Sciences and funded by the EU via the Centre for Economic Development, Transport and the Environment. The central objective of the project is to support students and young people in entrepreneurship, new business creation and innovation, and also employment in and out the innovation ecosystems and HEI's in a Finnish region. The project strives to deliver tools and motivation towards entrepreneurship. Differentiating entrepreneurial methods, best practices, entrepreneurship coaching, summer school, and the innovation and entrepreneurship spirit are tested and organized throughout the project.

2. New alignments for entrepreneurship education

Entrepreneurship is observing and seizing possibilities and the capability to transform ideas into such actions, that generate economical, cultural, social and societal values. Entrepreneurship and intrapreneurship can be learned. Entrepreneurship and intrapreneurial spirit include creativity, innovation, risk management and accountability, as well as the ability to plan, set goals and lead action to achieve goals. The importance of entrepreneurial skills is emphasized in the change of working life. (Ministry of Education and Culture, 2017.) Drucker (2007) posited that entrepreneur is often defined as the one who starts his own, new business and small business. Nevertheless, not every new small business is entrepreneurial or presents entrepreneurship. According to Burns (2007), research consistently shows a positive association between the probability of starting up a business and increases in educational attainment and business growth.

Entrepreneurship education is one of the fastest growing fields in education globally. This indicates the importance of entrepreneurship for the economy of any society. (Sirelhatim & Gangi, 2015.) Fretschner and Weber (2013) state out that the importance of EE has expanded rapidly in higher education institutions around the globe. (ref. Nabi, Walmsley, Liñán, Akhtar, and Neame, 2016.) According to Smith and Beasley (2011), the development of entrepreneurial intentions is increasingly encouraged from the outset of higher education through to the graduation, with the aim of stimulating entrepreneurial behavior. (ref. Nabi et al., 2016.) DeGeorge and Fayolle (2008) mention that the early development of entrepreneurial intentions is particularly important because it can lead to later persistence in the intention to start up a business. (ref. Nabi et al., 2016.)

Developing the entrepreneurship education is a current issue in all levels of education. In Finland, entrepreneurship education and positive attitudes towards entrepreneurship and entrepreneurial behaviour are striven to be promoted in all levels of education. EE is teaching the skills and capabilities that are needed in life, which aim at the comprehensive development of attitudes and skills. The entrepreneurial education encourages entrepreneurial attitudes and entrepreneurship. The main factor is that young people are successful in their life and find their place in the society. This way well-being is created to the young generation and for the whole society. (YES organization, 2017.)

In the spring 2017, the Finnish Ministry of Education and Culture published new alignments for EE. The alignments are meant to increase positive attitudes towards entrepreneurship, to develop entrepreneurship related knowhow and skills and to create new entrepreneurship. Implementation of the entrepreneurship education requires the management and development of an entrepreneurial business culture, entrepreneurial pedagogy and teaching, and the utilization of learning environments that support the above-mentioned factors. Activating the entrepreneurial culture is inclusive and the key issues include pedagogical leadership, openness and cooperation between teaching staff and other actors. (Ministry of Education and Culture, 2017.)

Cooperation between degrees and fields of education build up strength in the entrepreneurship education. In addition to the education sector, many working life organizations support and offer entrepreneurship education. The entrepreneurship education follows the principles of lifelong learning, a network-based approach that bases on science. An entrepreneurial culture contributes to the creation of a stimulating environment and the creation of goal-oriented activities by creating a creative, experimental and interactive atmosphere. The key themes in the entrepreneurship education are experimentation, functionality, learning, project-oriented working methods, business co-operation, and entrepreneurship related tasks and experiences. (Ministry of Education and Culture, 2017.)

3. Developing Entrepreneurship Education in a HEI

Start It Up – Support for young entrepreneurship project supports students and young people in entrepreneurship with differentiating entrepreneurial methods by testing and organizing events and courses. In this chapter, three main testing platforms organized to develop EE in the case project are presented.

3.1 NY Start Up -programme

NY Start Up programme was launched in the Finnish University of Applied Sciences in October 2017. The programme is a part of an international JA Worldwide and locally offered by Junior Achievement Finland, organization that offers entrepreneurship, working skills and financial skills for 7- to 25-year-old people – learning by doing. (Nuori Yrittäjyys, 2018.) NY Start Up is targeted at students in HEI. The programme has clear steps, and support and guidance is given to teachers by the organization. (NY Start Up, 2018.)

In this 10 credit study module, students found a real, multi-disciplinary company. The companies operate in real markets offering products and services to consumers. The study module is an excellent route for developing own ideas and skills needed in the business management. The purpose is that the students learn by doing and the learning process is supported by regular workshop sessions. The workshops have their own themes and visiting experts that support the process. The role of the teachers is coachy, so there are no lectures in the module and the aim is that the students find the answers to their questions by themselves.

In the pilot, 10 students from multi-disciplinary programmes started their business. There were students from business, forestry and hospitality management programmes. During the autumn period the students formed teams in which they started to develop and do business. Some students found the companies individually, others in teams. The process proceeds in a way that in the middle of the course, students have their companies founded, business plans ready, and possess the abilities to sell their product or service. The students participate in different kinds of activities and events. In the meanwhile, they gain valuable knowledge of running a business, cooperation with other members of the team, the potential customers, and the financial management of their companies. As the course gets closer to its end, the operations of the companies are ended carefully under control and the experiences are assessed – what were the success factors and what were the learned lessons. The business ideas and activities can also be continued into real companies with the support of the coaches.

3.2 *Innovate or die – innovation competition*

Innovate or Die (IOD) is an innovation competition for students. The competitions have been organized since 2013. IOD opens a door to innovative thinking and entrepreneurship. The programme is arranged in Finland and in Spain. There have been four events in Finland and two in Spain, Barcelona. (Innovate or Die, 2018). Students from a Finnish University of Applied Sciences had a unique possibility to take part in IOD Finland 2017 training and competition. In the competition, the students had a chance to network with companies and other higher degree students from other Finnish Universities and Universities of Applied Sciences.

IOD is open for all fields of study and the working language is English. Most of the Universities grant 2 ECTS for participating in the competition. The participants have a training day before the main event and the main event that lasts for approximately 24 hours. Pre-coaching gives the students all the necessary information concerning innovating in the main event. For the main event, all the students and company representatives gather together. In the competition, the students work with the company representatives and take part in developing the case companies by solving real working life problems. The teams work their ideas and solutions during 24 hours, competing with the other teams. In the end of the process, the teams can sharpen their pitches at the pitching corner before the final presentations for the client companies. (Innovate or Die, 2018).

3.3 *Entrepreneurship events*

During one week each November, thousands of events and competitions in 170 countries inspire millions to engage in entrepreneurial activities while connecting them to potential collaborators, mentors and even investors. Powered by the Kauffman Foundation, the initiative is supported by dozens of the world leaders. There are more than 15,000 partner organizations in the network. (Gen Global, 2018.) As a part of the case project, Global Entrepreneurship Week (GEW) was arranged in a Finnish University of Applied Sciences for the first time. The week included several entrepreneurial programmes for students, companies and anyone interested in entrepreneurship. During the week, the students had the ability to give feedback on the entrepreneurship education, to meet and greet with company representatives, and take part in multiple entrepreneurial events. The purpose is to make GEW a yearly event in the Finnish University of Applied Sciences.

To motivate and arise curiosity towards the EE, *entrepreneurial lectures* (personal entrepreneurship stories) and *events* are organized to promote and share experiences and knowledge of entrepreneurship. As an example, a former successful country manager, who had chosen to make a career change and establish an SME, gave a lecture for 50 students. 36 of the lecture participants gave feedback from which it can be generalized that real-life

stories are a great way to give students entrepreneurial motivation, new perspectives, new thinking and the possibility to see entrepreneurship as a future career possibility.

4. Promoting entrepreneurship for HEI students

To develop EE in a Finnish University of Applied Sciences, data was collected from the students. During the GEW week the students were asked to share their thoughts and ideas about the question "What can a Finnish University of Applied Sciences do to promote student entrepreneurship". The data was collected during the GEW week at the Finnish University of Applied Sciences and by collecting feedback from the participants of Innovate or Die –innovation competition. The research material and results have been analyzed and concluded by an R&D Advisor involved in the project.

There were 50 (30 respondents during GEW, 20 during IOD) respondents and altogether 91 suggestions were given. In the following picture (Figure 1), the answers are themed up and results presented quantitatively. The conclusions and suggestions also encompass interpretations that are based in empiricism and conversations with the students.

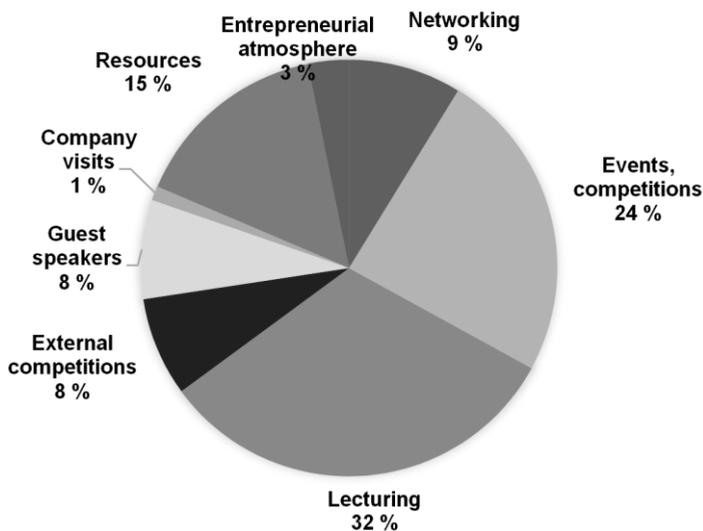


Figure 1. How can the HEI promote student entrepreneurship. Source: START IT UP – Support for young entrepreneurship project study (2017).

The collected data was themed up and organized by the answers. 32% of the respondents mentioned more lecturing as the tool to promote EE. The students suggested optional courses and entrepreneurship lectures with themes such as entrepreneur process, business models and practicalities of entrepreneurship. 24% of the respondents mentioned that there should be more events and competitions on entrepreneurship. The respondents suggested

entrepreneurship events for students, such as innovation and a entrepreneurship week or a course.

Resources were mentioned as supporting actions by 15 % of the respondents. Financial support and guidance in entrepreneurship, such as providing offices and resourcing for successful startups, and providing scholarships for the best start up ideas were suggested. Some (9 %) raised up networking – such as introducing suitable partners for cooperation of students and companies. A small part (3 %) of the respondents mentioned entrepreneurial atmosphere and suggested encouraging students to come and join entrepreneurial activities and overall producing a creative, friendly and productive atmosphere.

Guest speakers (8 %) and external competitions (8 %) were mentioned as a development method in the answers. The stories of successful entrepreneurs and workshop days with local entrepreneurs were suggested as well as external competitions such as innovation competitions and hackathons. In addition, introducing project opportunities for students to learn by doing. Only 1% of the respondents suggested company visits and fieldtrips to local companies.

4. Conclusion

To conclude the case study, 32 % of the respondents suggested simply increasing the teaching of entrepreneurship. In this case, entrepreneurship studies are already available for students. The assumption is that the communication involving the opportunities of entrepreneurship studies have been ineffective. It can also be discussed whether the students are actually given the opportunity to choose these courses as a part of their studies. With self-organized entrepreneurship and innovation events, 49 % of the suggestions concerning networking, events, external competitions and guest lecturers can be covered. In the Start It Up – Support for young entrepreneurship project, the aim is to continue arranging entrepreneurial activities through GEW, entrepreneurial events, NY Start Up course and by continue to offer the inputs and support for student entrepreneurship.

In the Finnish University of Applied Sciences the aim is to develop a community, an incubator, from where the students gain the guidance and support to work and develop their entrepreneurial ideas. 15 % of the case study respondents hoped for financial support and guidance in entrepreneurship, such as providing offices and resourcing successful ideas and startups. The results of the case study show that to promote entrepreneurship and enhance students' awareness and motivation towards the entrepreneurship in a Finnish HEI, actions such as offering entrepreneurship teaching, events and competitions for students should be increased and promoted more effectively. The results give ideas on how to develop

entrepreneurship in the Finnish HEI. Creating an entrepreneurial support community for students bolsters the development of the entrepreneurial spirit and atmosphere.

References

- Burns, P. (2007). *Entrepreneurship and Small Business*. New York: Palgrave McMillan.
- Drucker, P. (2007). *Innovation and entrepreneurship*. Oxford: Elsevier Ltd.
- Gen Global. (2018). Global entrepreneurship week. Retrieved February 5, 2018, from <https://genglobal.org/gew>
- Nabi, G., Walmsley, A., Liñán, F., Akhtar, I. & Neame, C. (2016). Does entrepreneurship education in the first year of higher education develop entrepreneurial intentions? The role of learning and inspiration, *Studies in Higher Education*, 43:3, 452-467, DOI: 10.1080/03075079.2016.1177716
- Innovate or Die. (2018). A journey towards innovations. Retrieved February 1, 2018, from <http://www.innovateordie.eu/en/home/>
- Ministry of Culture and Education. (2017). New alignments of entrepreneurship education. Retrieved from http://minedu.fi/artikkeli/-/asset_publisher/tulevaisuuden-tyo-on-yhannenman-yrittajyytta-koulutuksen-yrittajyyslinjaukset-julki
- Ministry of Education and Culture. (2017). New alignments for entrepreneurship education. Retrieved February 4, 2018, from <http://minedu.fi/documents/1410845/4363643/yrittajyyslinjaukset-koulutukseen-okm-2017.pdf/dd81b6e7-888e-45e4-8c08-40d0d5a5277e>
- Nuori Yrittäjyys. (2018). Nuori Yrittäjyys. Retrieved February 2, 2018, from <https://nuoriyrittajyys.fi/en/>
- NY Start Up. (2018). Steps of the NY Start Up –programme. Retrieved February 1, 2018, from <http://nystartup.fi/teachers/>

Scene Design: First as a Methodology then as a New Professional Field

Milićević, Slađana

Faculty of Technical Sciences, University of Novi Sad, Serbia.

Abstract

This work depicts the way in which the term of scene design is formed, used and developed in professional and educational system in the Republic of Serbia. The introductory part presents what that term means, how it was made and how it has evolved since the 90s. The main part of the work by means of particular examples shows how scene design was first a specific methodology in educating the students of architecture at the Department of Architecture and Urbanism at the Faculty of Technical Sciences in Novi Sad, then how establishing the studies of scene design at the same faculty made this methodology evolve into the professional field, where new and authentic research methods relating space emerged. Method of performing is outlined and analysed as one of that new methods, formed in the processes of contemplation, articulation, and realisation of performing space through different subjects of the curriculum of new scene design studies. The goal of the work is to show the potential of this method for thorough research not only of performing space but space in general. Likewise, to show how this method could be a valuable tool in educating not only scene design and architecture students, but all the other educational profiles interested in spatial research and spatial design.

Keywords: *scene design; architecture; methodology; performing; performing space.*

1. Introduction

The emergence of scene design in the Republic of Serbia is related to the activities of YUSTAT – Yugoslav Society for Theatre Art and Technology, established during the 90s with the idea to improve “quality of professional production in performing arts”, as well “to make visible all of the individual and collective efforts that theatrical people make in the world ‘behind scene’, or to show what all performing event is, what it could be, or in relation to that, where all we can recognize performance or performing space” (Dinulović, 2010). In order to realize these goals, YUSTAT run Biennial of Scene Design in 1996 when the term scene design was used for the first time, and when it was officially established. Theatre architect, professor and founder of the studies in the field of scene design Radivoje Dinulović did the most for the term of scene design to be incorporated into the Serbian language. He wrote in a wide number of his works what the term refers to and what its etymological role model was. Dinulović especially emphasizes his encounter with scenographer Pamela Howard and the influence her understanding of scenography and performing space made on him. In the essay *‘Expanded scenography’, or what is scene design?* he wrote: “It seems to me that Pamela Howard was the first to introduce the word Scenography into the modern English language ... in order to emphasize her unambiguous conviction that the term ‘scenography’ does not refer only to the creation of décor (Stage Design, or Set Design), but implies contemplation, articulation and realization of the whole stage design – including its visual, auditory, tactile, as well as all other sensory aspects – in one word, scenography is a kind of approach that belongs to the theatre understood not as ‘a play for seeing’ (Schauspiel), or ‘a play for hearing’ (Hörspiel), but as ‘an interplay’ (Mitspiel)” (Dinulović, 2010). Seeking to make visible the same difference in professional practice in Serbia, but confronting the fact that the word scenography has already been in use in Serbian language, Dinulović, Milosav Marinović, and Irena Šentevska introduced a new term – *scene design*. In hindsight, the term has evolved notably since the beginnings and beside its primary meaning – a specific synthesis approach to creation of performing space in theatre, it also got a number of other different readings. Theorist of scene design Tatjana Dadić Dinulović wrote that scene design nowadays is “a unified process of thinking, creating and realization of a stage design in the widest sense of that word, or, a process of creating complex, synthesis environment, physical or metaphorical, where the stage design can be built, thought of, or be found in a much wider space than theatre itself” (Dadić Dinulović, 2017). She points out the fact that today scene design stops to be exclusively theatrical phenomenon, and that it can be identified within different professional and artistic practices, curatorial practices, within theory and critics, but also everywhere where it is possible to implement a theatrical way of thinking or to apply a structural logic inherent to the performing space (stage plus auditorium). Eventually, besides being specific way of thinking or tool for creating of performing space in theatre or

non-theatre practices, scene design appears also to be an extremely effective means of the research of space in general.

2. Scene Design as a Methodology

Space has always been a central preoccupation for architects, but only after the influence of the Modern Movements the architecture will essentially be defined as the art of spatial design. *Architecture as space* becomes a distinctive mark of the 20th century architecture, while space becomes central issue in learning, understanding or creating of architecture. This is how manipulating the space and its presentation have come to be in the main focus of modern architects rather than presenting facades or the architectural styles. However, over the time, and especially after the postmodern critique of the late modern formalism, the phenomenological reflections on the bond between man and space, or after the emergence of so-called spatial turn at the end of the century, complexity of the role that space has in human life will finally become apparent. Today, pointing to this complexity and finding the ways to explore and understand it the most directly, are among the main pedagogical challenges in the education of architecture students. Simultaneously, this challenge proved to be an impetus for methodological inventiveness in dealing with space, and specially for the development of different interdisciplinary approaches.

Scene design as methodology can exactly be recognized as a such interdisciplinary approach, where the intent was to combine the theatrical way of thinking and understanding of space with the architectural environmental analysis. In the education of architecture students this approach provided an opportunity for profound and more intimate understanding of the bond between the space and the user. In theatre, the space is the key element of a play, which is underlined by the words of the theatre architect and director Meta Hočevar, who says that: “nothing could happen without happening somewhere” (Hočevar, 2003). This means that space provides authenticity and credibility of the story, and allows the story as such to happen. Understanding of this existential dimension of space for architecture students meant very important confrontation with the fact that space is not an abstraction, but very often a key actor – “dramatic character” (Milićević, 1980) – of the life process happening in it. After being using scene design students of architecture have no longer considered only proportions, forms and materiality of architectural space, but some new and for them even more important questions: the relation between body and space, narrative and space, time and space, dramatic and scenic potential of space.

For the first time in the Republic of Serbia, scene design was implemented as a research method in dealing with space in the education of architecture students at the Department for Architecture and Urbanism (Faculty of Technical Sciences at the University of Novi Sad). The first realised project named *Essay* was initiated by the students of different years of

undergraduate studies, who under the mentorship of professor Radivoje Dinulović and theatre director Ljubomir Draškić performed their works in different space of the faculty building in 1999 (Dadić Dinulović, 2017). In the years that followed, the course Architectural Design was principally the place where scene design was tested and gradually implemented into the official curriculum of architectural studies. Scene design was at times a kind of methodology within the practical classes, and at times a specific way of thinking about space and contemporary architecture. But, the first systematic and formal use of scene design was within the subject Introduction to Architectural Design on the first year of undergraduate studies. During the workshops organised within this course the students designed and physically built small performing events for/in different space at the faculty and in the city. The aim of these workshops was to establish and explore the link between (performing) event and space, or (performing) event and an experience of space. For students, who were at the beginning of their studying of architecture and surrounding space, this task was a valuable step forward to meet the architecture and a creative introduction to their future profession. Thus, the workshops employed „a form of non traditional thinking in order to adequate form of studying architecture be discovered“ (Babić, Balzam, 2012).



Figure 1. To Europe, by Boulevard? (2010) and Faces of the City (2011), projects at the course Introduction to Architectural Design at the undergraduate studies Architecture and Urbanism.



Figure 2. Story Space and Personal Space of Tonio Kröger 2012/2013, project at the course Architectural Design 1 at the undergraduate studies Architecture and Urbanism.

At the course Architectural Design 1, in the third year of architecture studies, the scene design as methodology was implemented through the tasks having reading some dramatic texts in their focus, then translating dramatic space from those texts into the spatial concepts finally materialised as different forms of three-dimensional models (maquettes). A distinctive part of these tasks was exhibiting the representative maquettes in public space, organisation and curation of the exhibition at the end of the semester. That part students

found to be completely new way of dealing with real space and impetus for new research of relations between space and performance, architecture and event.

The platform for implementation of the scene design as methodology into the process of research of architecture and urban planning at the doctoral studies of Architecture since 2012 has been the course Theoretical and Creative Research in Architecture and Urbanism. A part of this was the first realised project where students questioned relations between their inner imaginary spaces and real physical spaces of their immediate surroundings. During this process the scene design was used as a means for translation of abstract spatial experiences into the real spatial concepts. Spatial installations, as the final outcome of this project, were exhibited at the Students Cultural Centre of Novi Sad as a part of the side programme of the 39th International Festival of Alternative and New Theatre. The real specificity of this project is a fact that scene design was used as a tool during the process of creation of the displayed works, while these works by themselves could partly be characterised as independent works of scene design as art. Therefore, this project is important because it is among the first at the Department of Architecture and Urbanism in which it is possible to follow this twofold function of scene design: first as a tool for artistic research, then as independent artistic practice.



Figure 3. Inside (2012), project at the course Theoretical and Creative Research in Architecture and Urbanism at the doctoral studies of Architecture.

3. Scene Design as a New Professional Field

The Scene Design Group at the University of Arts in Belgrade was an academic format where scene design could have been studied for the first time in the Republic of Serbia at the level of magister or doctoral studies. These studies existed from 2001 to 2008, and during these years more than one hundred students were studying scene design (Dadić Dinulović, 2017). In 2013 at the Department of Architecture and Urbanism at the Faculty of Technical Sciences new study programmes in the field of scene design were formed, but

this time on all three academic levels – undergraduate, master, and doctoral.¹ Since the last year the studies of scene design have been a part of the Section for Art and Design at the Faculty of Technical Sciences. These studies are unique in their character because of the inconvenient mixture of science and art, architecture and theatre. The studies are interdisciplinary and allow students to gain different knowledge and skills. Simultaneously, this approach requires contemporary, active attitude to studying and independence in professional orientation. At the undergraduate studies of Scene Architecture, Technique and Design students have the opportunity to orient themselves toward the three main areas: scene architecture, scene technique and technology, and scene design. Master studies of Scene Architecture and Design are dedicated to the different levels of analysis and interpretation of artistic components of performing space, while the doctoral studies are exclusively focused on the phenomenon of scene design as art. Eventually, by establishing these studies, after more than one decade of application of scene design as methodology at the school of architecture in Novi Sad, scene design today is finally being studied and developed as an independent field.

The studies of scene design still have space at their main focus, explore the relations between architectural and performing space, or physical space and performing event. But, in terms of methodology, approaching the space become wider and strikingly more complex. Methodological diversity was primarily generated by interdisciplinary and experimental character of the studies themselves. On the other hand, in the last four years of the studies of scene design being in existence, one method proved to be the most essential and primarily important for the field of scene design. This is the method of performing. This method in its character is at the same time a kind of research and a mode of representation. This ambiguity on one hand refers to the practice of performing, the processual nature of creative research in performing arts, while on the other it refers to the performance itself that finally appears as a product of the practice of performing. It means that the performance is a material product of the process of performing (Šuvaković, 2005). The performing as a teaching method at the studies of scene design implies both of these meanings. The most of student works are by themselves performing events shown to the audience (teaching collective, other students or general public). But, these works very often also emerged *in* performing, as side effect of performing. In the second case, we speak of “the performing as research method”² (Ponjavić, 2016), while in the first we have the performing as a method of representation.

¹ The most teachers lecturing today at the new studies programmes of scene design in Novi Sad earned their PhD diplomas at the Scene Design Groupe at the University of Arts in Belgrade.

² Monika Ponjavić uses this term in examination of her artistic work *Body never lies*, realised at the Faculty of Architecture, Civil Engineering and Geodesy at the University of Banja Luka within the course Buildings of Spectacle. That was the project where



Figure 4. *Synthesis Project (2017), Reading of Space (2017), projects at the undergraduate studies of Scene Architecture, Technique and Design.*



Figure 5. *King Ubu (2015), project at the master studies of Scene Architecture and Design and the performing of the student work at the course Scene Movement 1 at the undergraduate studies of Scene Architecture, Technique and Design (2016).*



Figure 6. *Synthesis Project (2016), Winning the Play Space (2015), projects at the undergraduate studies of Scene Architecture, Technique and Design.*

Finally, while having in mind the well-known fact that performing space appears only when there is one man (actor) who performs something for another man (audience) it becomes clear why the performing is the beginning and the end of each articulation of performing space. It is also understandable why performing is a dominant methodological approach in

scene design was used as a teaching method in the analysis of architectural and city space, but first of all in the research of relations between body and space, i.e. body in space.

the teaching of scene design, regardless of whether this is performing as research method or performing as representation.

4. Conclusion

The dynamics of development of scene design in the last twenty years at the school of architecture in Novi Sad shows that from today's perspective scene design could be seen as a kind of methodology, but also as a professional practice. While it should be born in mind that in historical terms scene design was in the first place methodology, and only then an independent professional activity. Eventually, it means that in the beginning scene design was used as a tool in different disciplines, but also that in the end, after constituting itself as a new discipline, it started creating its own tools and for that purpose using those disciplines it originated from – architecture, theatre, visual arts etc. This fact, finally, makes scene design a powerful means for different interdisciplinary approaches related to space, to designing and creating a variety of performing events, and especially for improving contemporary teaching practices in higher education.

References

- Babić, T; Balzam, R. (2012). 'Istraživanje kroz projekat' – novi oblik učenja arhitekture i savremene arhitektonske prakse (Research by Design – New Way of Learning of Architecture and Contemporary Architectural Practice). *Proceedings / IV International Symposium for Students of Doctoral Studies in the Fields of Civil Engineering, Architecture and Environmental Protection - PhIDAC 2012*. Faculty of Civil Engineering and Architecture. Niš.
- Dadić Dinulović, T. (2017). *Scenski dizajn kao umetnost (Scene Design as Art)*. Klio&Scen. Belgrade.
- Dinulović, R. (2010). 'Proširena scenografija' ili šta je scenski dizajn? ('Expanded scenography' or what is scene design?). Available: <http://www.scen.uns.ac.rs/wp-content/uploads/2013/10/Pro%C5%A1irena-scenografija-ili-%C5%A0ta-je-scenski-dizajn.pdf>
- Hočevar, M. (2003). *Prostori igre (Play Spaces)*. Jugoslovensko dramsko pozorište. Belgrade.
- Milićević, O. (1980). *Prostor, dramsko lice (Space, Dramatic Character)*. Sterijino pozorje. Novi Sad.
- Ponjavić, M. (2016). Tijelo nikad ne laže: Transponovane uloge prostora i tijela (Body Never Lies: Transposed Roles of Space and Body). *Scena*. 1-2. 231-238. Available: <http://www.pozorje.org.rs/scena/scena1612.pdf>
- Šuvaković, M. (2005). *Pojmovnik suvremene umjetnosti (Glossary of Contemporary Art)*. Horetzky. Zagreb.

Students' Learning and Satisfaction In An Alternative Learning Centre In Malta

Schembri, Antoinette

Centre for Education Studies, University of Warwick, United Kingdom.

Abstract

This paper seeks to establish the preliminary perceptions of students attending an alternative learning centre in Malta and whether it has succeeded in reaching one of its targets, that of tackling the problem of early school leaving in Malta and the problem of absenteeism. As a study, it represents a small-scale research, undertaken on five students, attending this school, who were chosen randomly. These students were interviewed with regards to their learning objectives, expectations, achievements and failures. The main result is that the students are happy with the type of education being given. They are now learning the things which interest them in a safe and caring environment. The major conclusion is that such type of education should continue to be encouraged in the Maltese Islands as there is a demand for it. One hopes that this study serves as a spring board for more detailed research about alternative education.

Keywords: *Alternative Education; Special Education Provision; Early School Leaving.*

1. Local context

The island of Malta is situated in the middle of the Mediterranean. Throughout its history, Malta has been a melting pot of cultures, having been conquered by different countries and civilizations. The greatest impact on modern times was left by British rule. This rule lasted for nearly two hundred years. The British influenced every aspect of Maltese life, especially education. In fact, even in this present day, Maltese educationalists still look to Britain for inspiration and innovation in the Maltese education system.

2. Background to the setting up of the school

In 2013, Malta, one of the EU smallest member states ranked very high in the early school leaving statistics published by Eurostat. Almost a quarter of Maltese sixteen year olds were early school leavers. Spurred by these findings, the Maltese government sprung into action. The publication of the National Early School Leaving Strategy in 2014 (p. 40) by the Maltese Education Department advocated the setting up of an offsite school, which would cater for those students who are disenchanting with mainstream education.

The ALP (Alternative Learning Programme), opened in that same year. In truth this is a fully fledged school. When one reads the set government objective, one must admit that this is an ambitious programme targeting pupils with a low academic performance. At the same time, it seeks to target students who are interested in pursuing a vocational pathway, since it was not offered in mainstream colleges. I am keeping these two separate, as students who wish to take a vocational pathway are not necessarily low achieving students. Then, the same school sought to target students who were at risk of early school leaving and students with a high incidence of absenteeism. This research will focus on the last two categories. According to the Early School Leaving Strategy (2014), habitual absenteeism is an indication that could lead to students to disengage from the educational system and thus become early school leavers.

This school is open to both boys and girls who come to do their last year of formal schooling (form 5). After the one-year course, they can either pursue another year of education at the Alternative Learning Programme to continue honing their skills in vocational education, or else move on to the many post-secondary education schools or start working.

I am interested in this study because I currently work in this newly set up ALP school. Prior to working in this school, I used to teach in an area secondary school, where the intake came from socially deprived areas, many of whom, even in year 7 were already

disenchanted with education. My daily experiences with disenchanted students in these past twenty years have made me ask what can be done for such students.

This study is one small step to fulfil my wish of providing a better education to such types of students. As far as I know, never did an education professional, working with these types of students, try to carry a preliminary survey on what is the best type of alternative education for the students. What has been carried till now is an external review, by professionals who are unfortunately, distinct, distracted and distant from these students. My approach can have its disadvantages but it has the advantage that besides the preliminary information that I am gathering from interviews, I am also a participatory observer. What I can state from this preliminary search is that due to my continuous contact with students, confidence is built up and the students will be more than ready to speak the truth in an interview than one interviewed by an external who is detached from their personal realities.

3. This study

Thus, this research will seek to find out the perceptions of students within this off-site school which is in its fourth year since its inception. All this is to be framed within the local context, in that there was no formal alternative pathway for those secondary students who felt disenchanted with the Maltese educational system prior to 2014, with the consequence that they became early school leavers.

The author intends to achieve this by looking at the answers given in the interview about their perceptions. Those interviewed were considered by the educational system as students at the risk of dropping out from mainstream education about their educational experiences. This is why they have ended in this school.

As the school where I am conducting the research is co-educational, it is interesting to know whether boys and girls have the same opinions on the subject or not, and if they have different opinions, whether this is related to biology or social factors.

Thus, this paper aims to answer the following research question:

How do students who are on the verge of early school leaving, and who have a track record of absenteeism perceive the alternative education provided to them?

4. Methodology

Will Gibson (2013, p.60) recommends that after one has formulated the research question, it is important to 'reflect on the various types of data that each available method may

produce...'. I have thought deeply about my research design and in order to answer my research question, I have chosen a qualitative approach. This is because I would like to explore and explain new theoretical insights (Hammond and Wellington, 2013) and generate new theoretical models after an in-depth study of the data resulting from how people experience a given research issue.

The number of interview samples hinges on a variety of methodological and epistemological issues. These include reliability, replicability, generalization, validity and saturation. Mason (2010) goes in depth into the concept of data saturation. He quotes Glaser and Strauss (1967) and argues that when the collection of new data does not shed any further light on the issue under investigation, it should stop. For this research, I opted to interview a sample of five students, using random sampling. At face value, this sample may appear small. But this is a school with an in-take of 200 students. Therefore, this sample represents 2.5 per cent of the school population, which is normally above the required average for the production of a reliable scientific survey.

An important variable underpinning the above studies is the students' perceptions, in particular towards the school where they are undertaking their alternative provision (Jahnukainen, and Helander, 2007, Online). Jahnukainen and Helander focused on students' perceptions, in particular among those at the risk of dropping out of school, through a series of interviews, in which the students made their voice heard about what they think is the best education for them. Even if the same model is used in the proposed study, the context is different, as Jahnukainen's research was conducted in Finland while the proposed study covers an alternative school in southern Europe.

The interviews with the students within the school were held between October 2017 and January 2018. The persons involved included three boys and two girls, pursuing their higher education course at ALP. As this is their second year at this school, they are more informed about their education process. Understanding the students' perceptions is important as these are the ones who can guide the educational policy makers help to structure and implement what the students need to learn to have a better preparation for life. The students come from different parts of Malta and thus, they pursued their mainstream education in the different colleges found on the island. They did not know each other prior to coming to ALP.

The students were informed about the purpose of the study, and that any information they give was going to remain confidential and anonymous. They all agreed and gave their informed consent. These one-to-one semi-structured interviews were held in an empty classroom at the convenience of the interviewee. The interviews were digitally recorded and were then fully transcribed and analysed for the emergence of topics.

5. Findings from the interviews

My study has put to the fore that the students are very happy to be studying at the Alternative Learning Programme. Like McCluskey et al.(2015), the students mentioned the caring environment and the pastoral care that they receive from their teachers. This is what makes ALP different from the main stream colleges that the students attended previously.

The students had to apply to attend ALP school. Then, they were asked to sit for an interview, where their personality was assessed to see what motivated them to come to ALP school. This tallies with what Raywid (1994) and Gutherson *et al.* (2011) argue, that is, that alternative education provisions can be applied to early school leavers. These authors link alternative education provision with motivation. Imposing courses on students, in particular those with social and emotional problems, can be a real barrier for academic learning. Thus, Gutherson *et al.* (2011) conclude that alternative educational models, wherever possible, have to be voluntary and this applies irrespective of the gender of the students.

ALP school has a pupil population of around 200 students, and the students are grouped in small groups of not more than 10. This was also highly commended by all the students. They all mentioned that they get individual attention and that the teachers do not get angry if they have to repeat. The teachers involved everybody so that they felt as if they were part of one big family. As student D said:

'... the teachers here are compassionate, they do not put you aside as happened in my mainstream college. Over there, the teachers told me to sit at the back... Lessons were done for those who sat at the front... if I asked for the teachers to repeat, many of them would get angry.'

These comments tally with the findings of Harper *et al.* (2011) and Biesta (2014), both of whom emphasized the need for small classes as these provide for a more personalized teaching and engagement from students. This is considered beneficial for those categories of students who drop out because of disenchantment with school or the learning environment.

Student A pointed out another facet of his education at ALP. He said that:

'...I am happy here because lessons are always done. In my previous school, there were lessons where the teachers had no control... Lessons were not done because of a handful of rowdy students, who were not interested.'

The students also mentioned that the teachers were more relaxed, in that there was no race to finish off the syllabus by the end of the year.

'... the teachers have drawn up the syllabus catering for our needs. We are learning what we want to learn, what we are going to need in the future. Also it is not so difficult...'
(Student E)

The negative points were also mentioned. These included the fact that as it is not an area college, there are students from all the different colleges in Malta. Some of the students have challenging behaviour, others have mental health problems.

'...the place for some of the students is not here.... they need to be sent to an institution or rehabilitation.... Such students are a danger when one is doing vocational practice.'
(Student B)

Lack of appropriate teaching resources was also mentioned, while the physical building in itself needs renovation to bring it up to scratch.

'... More students want to come to ALP. The fame of this school is growing.. there is a real need for such a type of school. But it needs to be well maintained, ...look, it is shabby, it needs paint, regular maintenance...also, we need more up to date resources to work with....'

6. Conclusion

All in all, this particular category of students think that the education that they are receiving at the alternative learning programme is better than in the mainstream, yet there is still room for improvement. It is now an integral part of the Maltese Education system and the demand for it is greater than the amount of students that it can cater for.

This preliminary review shows that all those interviewed were in favour of this school and they want this type of education and schooling to continue. Such an experiment has contributed, even if mildly, to tackle or lower the incidence of early school leaving and absenteeism in Malta.

As education systems vary from one country to another in the European Union, I hope that this study gives an insight into what these formerly disenchanted students think is the best way forward for alternative education in Malta, the EU's smallest state member. Without doubt, such a small study cannot represent in anyway a conclusive and final word on the subject, but it can serve as an indication of the way forward and may serve as an appetizer for more research on the subject.

References

- Baker, S.E. & Edwards, R. (2012) How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research (online) Available from http://eprints.ncrm.ac.uk/2273/4/how_many_interviews.pdf [Accessed on 6th August 2017].
- Chalker, C.S. & Stelsel, K. (2009) A fresh approach to alternative education: using malls to reach at-risk youth in *Kappa Delta Pi Record*, 45, 2, 74–77 (online) Available from <http://www.kdp.org/publications/archives/recordw09.php> [Accessed on 28th November, 2016].
- Cohen, L., Manion, L., Morrison, K. (2011) *Research Methods in Education*, London and New York: Routledge.
- Earl, L. & Katz, S. (2006) *How Networked Learning Communities Work*. Seminar Series Paper. No.155. Centre for Strategic Education.
- Eurostat (2015) The EU is moving closer to its Europe 2020 goals on education. (online) Available from <http://ec.europa.eu/eurostat/documents/2995521/6787423/3-20042015-BP-EN.pdf/b2f295ba-2e15-409c-bec9-91c4e49c5d32> [Accessed on 15th March, 2017].
- Gibson, W. (2013) *Qualitative Research as a Method of Inquiry in Education* in Hartas, D. (ed.) (2013) *Educational Research and Inquiry Qualitative and Quantitative Approaches*, Great Britain: Bloomsbury. Ch.3.
- Hammond, M. & Wellington, J. (2013) *Research Methods The Key Concepts*, London and New York: Routledge.
- Hobbs, C. & Power, J. (2013) *Engaging Disadvantaged Young People In The Course Of Their Lives: The Importance Of Staff/Student Relationships In Alternative Education* (online) Available from academia/Engaging_Disadvantaged_Young_People_in_t.pdf [Accessed on 10th December, 2016].
- Mason, M. (2010) *Qualitative Social Research Forum* (online) Available from <http://www.qualitative-research.net/index.php/fqs/article/view/1428/3027> [Accessed on 5th August, 2017].
- McCluskey, G., Riddell, S. and Weedon, E. (2015) Children's rights, school exclusion and alternative educational provision in *International Journal of Inclusive Education*, 19(6), pp. 595–607.
- McGregor, G. & Mills, M. (2012) *Alternative education sites and marginalised young people: 'I wish there were more schools like this one'*, (online) Available from <http://www.tandfonline.com/doi/abs/10.1080/13603116.2010.529467> [Accessed on 27th December, 2016].

- Ministry of Education and Employment (2012) A National Curriculum framework for All 2012. Malta. Available from <https://curriculum.gov.mt/en/resources/Resources/the-NCF/Pages/default.aspx> [Accessed on 15th February, 2017].
- Ministry of Education and Employment (2014) Early School Leaving Strategy. (online) Available from education.gov.mt/esl/Documents/School%20Leaving%20in%20Malta.pdf [Accessed on 21st November, 2016].
- National Education Association (2017) The views of education professionals about alternative schools. (online) Available from <http://www.nea.org/home/15016.htm> [Accessed on 7th September, 2017].
- Robson, C. (2011) *Real World Research*, Great Britain: Wiley.
- Spiteri, A. (2016) *Communication and Power in the Colleges*, Malta: Malta University Publishing.

A pedagogical response to the challenges of delivering collaborative probation education in online environments

Martin, Laura and Fowler, Andrew
Sheffield Hallam University, UK

Abstract

This paper explores the challenges in delivering post graduate probation education in a predominately online environment. It discusses the key pedagogical theories underpinning the teaching approach, with a particular emphasis on social constructivism, communities of practice and enquiry based learning. The complexities of engaging students in the types of discursive and collegiate activities inherent within these approaches whilst learning at a distance are discussed. A case study exploring the facilitation of a collaborative enquiry based task into the role of emotion work in probation practice is used to demonstrate our response to the challenges identified. Whilst the context of this paper is probation education, it has relevance to those teaching other disciplines within online settings.

Keywords: *Technology Enhanced learning; Digital Pedagogy; Probation Education; Professional Qualification in Probation*

1. Introduction

The implementation of the Transforming Rehabilitation policy reform (Deering and Feilzer, 2015), introduced a mixed economy approach to probation services; splitting the state run probation service into public and private providers of probation. This has had consequences for the probation qualification, the learning experience and the teaching approach within higher education for those training to be probation officers. This paper explores how we have sought to adapt to the new probation landscape within the module, Skills for Probation Practice (a core component of the Professional Qualification in Probation); focusing on the use of communities of learning, facilitated by the use of WhatsApp to engage students learning about emotion work in probation.

There are a number of theoretical approaches which have influenced our teaching practice within the Professional Qualification in Probation, notably Biggs and Tang's notion of constructive alignment (2007), McGregor's theory of X and Y learners (1960) and a social constructivist approach (Mathieson, 2015). All of these theories focus on the reciprocal roles of both students and teachers in facilitating successful learning. Knowledge is not simply transferred but is constructed in a collaborative endeavour, within an effective learning environment (Biggs and Tang, 2007). Here we want to pay particular attention to the challenges of creating these learning environments within the context of professional probation education and to reflect on the use of enquiry based learning and communities of practice as effective teaching approaches (Kahn and O'Rourke, 2004, Wenger-Traynor et al, 2015). Both of these practice models support student self-efficacy in their role of constructing and directing their own learning as well as the establishment of "rootedness" within professional practice (Ashton and Stone, 2018: xviii). This links well to the notion of curriculum as praxis, to focus on how the theory, skills and knowledge created with and by the students can then be applied and enacted both within and outside the module. Grundy (1987) describes this as a dynamic interaction which involves both an active and a reflective component. We will further explore this approach in relation to the development of an enquiry based learning task undertaken by our professional practice students which culminates in a community discussion within an online forum.

2. The context of postgraduate probation education

The Professional Qualification in Probation (PQiP) consists of five modules taught over a twelve month period, with only twelve hours of face to face teaching time and the rest of the teaching and learning taking place in online environments. This creates challenges for a social constructivist approach in that learners have a very limited opportunity to engage in discursive, collegiate activities and much of their learning take place in isolation. This inhibits their ability to engage with their fellow learners and debate and test out their

understanding and construct meaning (Mathieson, 2015). In order to better understand the structure and delivery of this professional qualification, it is first important to set this programme in the wider context of education and criminal justice policy.

Whilst probation education has escaped from some of the more significant recent changes in higher education; the rising influence of the government, ideologically driven changes and the role of the market have equally changed the face of the probation landscape as they have in education (Foskett, 2011, Burke and Collett, 2015). Due to the partial privatisation of the field of probation work there have been consequences for probation education, with a key issue being the time and space learners have to devote to their studies. The vast majority of the probation service has now been privatised and there are now multiple operators in this field, with different practice models and expectations of their staff (Deering and Feilzer, 2015). This greater incursion of the market into probation and education has created spaces that can be problematic and fraught with dilemmas. Some of these dilemmas relate to inconsistencies across providers in relation to access to technology and a lack of parity in relation to support mechanisms as well as the organisational challenges associated with reducing staff numbers and poor performance (HMIP, 2017). These problematised spaces impact on the way in which the teaching is structured as we are responding to different agency priorities in terms of the content of our modules. Honig (1996) offers a further perspective on dilemmatic spaces as being those where decisions have to be made but all the outcomes have negative consequences. In the context of our PQiP learners this is usually the decision about whether to neglect work or study in the face of competing demands and, with the responsibilities involved in managing individuals on probation, it is likely that studying is de-prioritised in these situations (Ansbro, 2006).

3. Challenges within the delivery of postgraduate probation education

This new landscape has led to a focus on developing our skills and creativity in online teaching and learning, considering the flexibility of our pedagogy in line with Gordon's approach to technology enhanced learning (2014). Whilst the PQiP learners are vocal and engaged in the teaching sessions, the challenges they face regarding their engagement with online learning need to be addressed. They are full time employees, with a caseload of service users alongside the requirement to complete a vocational qualification and the graduate diploma in community justice. These pressures can create an environment which increases the likelihood that students engage with superficial strategies of engagement and surface learning, where they are motivated by successful completion of assessments as opposed to a desire to enhance their theoretical knowledge and application (Biggs and Tang, 2007).

In recent face to face sessions, the majority of learners highlighted that the pursuit of such knowledge was a key priority for them and as such it is clear that there is motivation to learn and engage, at least at this early stage in their qualification. It is therefore essential that our teaching approaches capitalise on this intrinsic motivation and mitigate the potential for this to be diminished by external, structural pressures. In order to achieve this, online discussions with staff have been planned and a WhatsApp group set up to allow staff and students to interact more informally and this will be used to promote these learning activities, focusing on linking to the content of the module workbook. In particular the use of WhatsApp was motivated by a desire to place ourselves where the learners locate themselves, after attempts to engage them with blackboard discussion boards was unsuccessful (Purvis et al, 2016). On a wider scale, techniques of differentiation and signposting of areas which are essential and those which are more developmental/optional have been additional strategies that have been employed to support engagement and motivation within the online learning materials (Ashton and Stone, 2018).

Whilst Fox's teaching typologies can be viewed as somewhat dated, they offer a perspective on online teaching at its best and worst (1983). One of our main concerns is that the online learning environment does not become simply a mechanism to 'transfer' knowledge and the professional nature of the programme does not encourage us to simply 'shape' the learners in the mould of what we believe is an effective probation practitioner. We want to learners to 'grow' and develop their own perspective on what effective practice looks like and construct their own meaning and understanding. Our question remains as to how we can support the learners to achieve this at a distance and how the module can be constructed in a way that best facilitates this. Fox's metaphor of the guide has resonance with Fenton-O'Creevy et al's (2015) discussions of practice based education and the way in which students negotiate their route through a multitude of landscapes, both academic and professional. We do not want the learners to feel like 'tourists' within the academic environment and whilst they may not decide to take up residence within this sphere, we hope that they will interact and engage in a way that has a transformative impact on their professional identity.

Gordon (2014) also provides some useful guidance around the role of flexibility within the online teaching environment and has encouraged us to think about this ontologically, pedagogically and systematically. From an ontological perspective this is about some of the issues already discussed about time and space for learning but also about students' ability to engage with different learning environments and approaches. From a pedagogical perspective this is about ensuring that enquiry based learning and communities of practice are the right approaches as well as building in greater mechanisms for formative assessment - outside of formal formative submission points, of which this proposed intervention is an example. Finally, systematically this is about the wider probation education team viewing

the course structures to ensure that the learning and teaching can be done effectively. It is hoped that by paying greater attention to these dimensions of flexibility, a more 'creative and empowering' relationship between the students and the online learning environment can be developed to facilitate the social construction of knowledge (Burnett, 2011). As the learners are immersed in practice, they become the experts in their own experience and their engagement with the learning community actually helps the epistemological development of the field (Farrell, 2001).

With particular attention being paid to the ontological and pedagogical dimensions of Gordon's (2014) approach as well as notions of enquiry based learning (Kahn and O'Rourke, (2004) and communities of practice (Wenger-Traynor et al, 2015), we have developed a collaborative formative assessment opportunity. This supports Grundy's (1987) view of curriculum as praxis and encourages students to construct their own perspectives on key practice areas as well as engage with their community of practice to test out these views and further contribute to the social construction of knowledge (Mathieson, 2014). Students are first asked to read a key text regarding the role of emotional literacy in working with offenders, they will then respond to a range of questions regarding the relevance of this approach to their own practice, reflecting on their professional values and identity. The students will be asked to record their answers on a Google Form, allowing us to collate and analyse their responses in addition to providing a structured way for them to respond to the questions. This will be followed by an online group discussion, evidencing the above approaches whereby students shape both the construction and application of knowledge with probation practice. Following on from these community discussions, the students will be asked to respond to a further Google Form to collect feedback on the relevance of the task as well as the manner in which it was facilitated. This will allow us to address the last of Gordon's (2014) dimensions and reflect on the structural operation of the programme. By gathering this feedback we are also seeking to ensure that the module is constructively aligned and that learners are provided with opportunities to engage with deep learning (Biggs and Tang, 2007).

4. The importance of emotion work in postgraduate probation education

In order to further justify the approach to learning we have taken with regard to this activity and support the assertion that this module is constructively aligned (Biggs and Tang, 2007), it is important to explore the relevance of emotional work to effective probation practice. As discussed above, learner time is scarce and such, it is important that we utilise these occasions to focus on key aspects of professional probation education.

The relationships between practitioners and service users have fallen in and out of favour in terms of both research and policy, throughout the history of the probation service (Burnett

and McNeill, 2005). Emotion work is difficult to capture and measure and as such it has not been included within the standards governing probation practice (NOMS, 2015). Thus a paradox ensues, with assessment and management of risk and the protection of the public being heralded as the core components of practice yet the need to draw on emotions in order to perform these tasks was effectively ignored (Knight, 2014). Karsetdt et al (2011) argue that the landscape of criminal justice is emotionally charged and this is exemplified by Bottom's (1995) notion of popular punitivism, whereby the collective emotional perspectives of the public are seen to influence the operation of politics and the enactment of policy. The experiences and 'stories' of victims, witnesses and offenders are emotion-laden and Knight (2014) recognises the need for practitioners to be skilled in understanding and managing their own emotions as well as those of service users and their victims. She further suggests that it is through practitioners' ability to hear these stories and regulate their responses, that they can help service users begin the process of change.

The relationship between the service user and their worker thus provides the context in which the sharing of these stories takes place and where the construction of new, pro-social identities can begin. The desistance literature offers a renewed focus on these relationships and evidences their importance in encouraging service users to see the potential for their 'future selves' and in promoting optimism for change (McNeill and Weaver, 2010). However, Trotter (2015) suggests caution around the use of emotions, with a specific focus on empathy, highlighting that practitioners need to couple the use of empathy with effective pro-social modelling to ensure that service users do not misconstrue this understanding with tacit approval of their behaviour.

Therefore it can be argued that it is not only important for learners to have an understanding of the value of the productive use of emotions within their practice, but also to have an opportunity to explore how these skills can be effectively deployed. Thus the proposed activity facilitates the learners to conduct their own enquiries into this area of practice. This is then scaffolded by an opportunity to interact with their peers and tutors in a community of learning, whereby they can test out their understanding and also help to construct practice based knowledge and application. This collaborative endeavour acts to enhance the learners 'rootedness' within their profession and enhances their status as active participants in their community of practice (Wenger-Traynor et al, 2014, Ashton and Stone, 2018).

5. Conclusion

This paper has sought to explore the challenges of delivering effective probation education in an online environment, with particular attention being paid to the way in which students participate in the social construction of knowledge (Mathieson, 2015). At this stage the

enquiry based activity has not been undertaken and as such our hypothesis that this enquiry based task, facilitated in a collegiate manner will promote deeper learning and increased engagement has yet to be tested. It is the authors' intention to further develop this paper, with analysis of the students' contributions and their feedback as well as our own reflections on how this activity has achieved our objectives.

References

- Ansbro, M. (2006) Serious Further Offence Inquiry, *Probation Journal*, 53(2): 167-169
- Ashton, S. and Stone, R. (2018), *An A-Z of Creative Teaching in Higher Education*, London: Sage
- Bottoms, Anthony E. (1995) 'The philosophy and politics of punishment and sentencing', in Chris Clarkson and Rod Morgan (eds) *The politics of sentencing reform*, pp. 15-49. Oxford: Clarendon
- Briggs, J.B. and Tang, C.S. (2007) *Teaching for quality learning at university: what the student does*, Maidenhead : Open University Press
- Burke, L. and Collett, S. (2014) *Delivering Rehabilitation: The politics, governance and control of probation*, London: Routledge
- Burnett, R. and McNeill, F.(2005). The place of the officer-offender relationship in assisting offenders to desist from crime. *Probation Journal*, 52(3), 221-242
- Deering, J. and Feilzer, M. (2015), *Privatising Probation: Is Transforming Rehabilitation the end of the probation ideal?* Bristol: Policy Press
- Entwistle, N.J. (2009), *Teaching for Understanding at University: deep approaches and distinctive ways of thinking*, Basingstoke: Palgrave Macmillan.
- Farrell, L. (2001), Negotiating knowledge in the knowledge economy: Workplace educators and the politics of codification, *Studies in Continuing Education*, 23(2): 201-14
- Fenton-O'Creevy, Bringham, L., Jones, S. and Smith, A (2015) in E. Wenger-Traynor, M. Fenton-O'Creevy, S. Hutchinson, C. Kubiak, and B. Wenger-Traynor. (2015) *Learning in Landscapes of Practice: Boundaries, Identity and Knowledgeability in Practice Based Learning*, London: Routledge
- Foskett, N. (2011) in M. Molesworth, P. Scullion and E. Nixon, *The Marketisation of Higher Education and the Student as Consumer*, London: Routledge
- Fox, D. (1983). Personal Theories of Teaching, *Studies in Higher Education*, 8, 151-163
- Gordon, N. (2014), *Flexible Pedagogies: technology-enhanced learning*, York: Higher Education Academy
- Grundy, S. (1987). *Curriculum : Product or praxis?* Falmer.

- Her Majesty's Inspectorate of Probation (2017), *Annual Report*, London: HMIP
- Higher Education Academy (2011), *United Kingdom Professional Standards Framework*, York: Higher Education Academy
- Honig, B. (1996). Difference, dilemmas, and the politics of home. In S. Benhabib (Ed.), *Democracy and Difference. Contesting the Boundaries of the Political*. (pp. 257–277). New Jersey: Princeton University Press.
- Kahn, P. and O'Rourke, K. (2004), *Guide to Curriculum Design: Enquiry Based Learning*, York: Higher Education Academy
- Karstedt, S., Loader, I. and Strang, H. (2011), *Emotions, Crime and Justice*, Oxford: Hart
- Knight, C. (2014), *Emotional Literature in Criminal Justice*, Basingstoke: Palgrave Macmillan
- McGregor, D. (1960) as cited by: Briggs, J.B. and Tang, C.S. (2007) *Teaching for quality learning at university: what the student does*, Maidenhead : Open University Press
- McNeill, F. and Weaver, B. (2010) *Changing Lives? Desistance Research and Offender Management: The Scottish Centre for Crime and Justice Research*.
- Mathieson, S. (2015) Student Learning, In: H. Fry, S. Ketteridge and S. Marshall *A Handbook for Teaching and Learning in Higher Education*, Oxon: Routledge
- National Offender Management Service (2015) *National Standards for the Management of Offenders in England and Wales*, London: Ministry of Justice
- Purvis, A., Rodger, H. and Beckingham, S. (2016) Experiences of social media in higher education: barriers, enablers and next steps. In: *Social Media for Learning in Higher Education 2015 Conference proceedings* (#SocMedHE15). Sheffield: Sheffield Hallam University.
- Trotter, C. (2015), *Working with Involuntary Clients: A guide to practice*, London: Routledge
- Wenger-Traynor, E., Fenton-O'Creevy, Hutchinson, S., Kubiak, C. and Wenger-Traynor, B. (2015) *Learning in Landscapes of Practice: Boundaries, Identity and Knowledgeability in Practice Based Learning*, London: Routledge

Education for innovation: engineering, management and design multidisciplinary teams of students tackling complex societal problems through Design Thinking

Charosky, Guido^a; Hassi, Lotta^b; Leveratto, Luciana^c; Papageorgiou, Kyriaki^d;
Ramos, Juan^e; Bragos, Ramon^e

^aDepartment of Management, Universitat Politècnica de Catalunya, Spain, ^bDepartment of Operations, Innovation and Data Sciences, ESADE, Spain ^cMaster Department, Istituto Europeo di Design, Spain ^dInstitute for Innovation and Knowledge Management, ESADE, Spain ^eDepartment of Electronic Engineering, Universitat Politècnica de Catalunya, Spain

Abstract

Innovation education involves a different approach both for professors and students. It requires understanding people, technology and business to develop truly innovative solutions that can succeed in the market.

The aim of this paper is to analyze the benefits, learning outcomes and self-learning perception about innovation from students participating in an innovative learning experience co-developed by an Electrical Engineering School, a Business School and a Design Institute. Challenge Based Innovation (CBI) is a program created by CERN to host educational projects where multidisciplinary teams of students tackle innovation challenges. The objective is to design solutions to social problems through Design Thinking. It was observed that engineering students, after this learning experience increase their understanding of user's needs and the relevance of focusing on them when approaching innovation challenges. Also, they improve their ability to ideate break-through solutions thanks to a better understanding of the relationship between people, business and technology due to their in-depth interaction with management and design students. Furthermore, their self-confidence is significantly increased along with their entrepreneurial skills. The level of engineering student's understating of innovation as a whole is higher with this approach compared to standard design-build projects performed at the Engineering Schools.

Keywords: *Design Thinking, Innovation, Challenge Based Education, Multidisciplinary projects*

1. Introduction

The understanding of the design process is important both to manage the design activity and to aid the improvement of products and the overall efficiency of engineering based companies (Howard, Culley, Dekoninck, 2008). It is also fundamental to tackle innovation challenges and to minimize uncertainty during the innovation process. It is also important for engineering students to understand the overall process and going beyond the purely engineering skills or activities.

Originally developed at the Massachusetts Institute of Technology, the CDIO framework (Crawley et al. 2014), defines 4 phases for the product development cycle: Conceive, Design, Implement and Operate.

The Conceive stage includes defining customer needs, understanding technology, company strategy, and regulations and developing conceptual, technical, and business plans. Nevertheless, the emphasis of the Syllabus section 4 of the CDIO Syllabus 2.0 is mainly in the “Design”. Also, most engineering schools curricula focuses on this phase, generally starting projects from requirements or even directly from specifications (Hassi et al., 2016). In the professional world, also is often assumed that engineers need another agent to state the requirements (design, marketing, management...).

Although engineering students feel comfortable with this approach, it limits the capabilities of graduated engineers on influencing on strategy and concept definition for new products and services.

In the past years, new approaches to innovation like Co-Creation and Design Thinking (Brown, 2008) have arisen as methodologies to dealing with uncertainty involved in the “Conceive” phase of any innovation project. Some references can be found about this approach (Yang et al., 2014) (Ping et al., 2011).

According to Dym et al. 2005, the currently most-favored pedagogical model for teaching design is project-based learning (PBL), using Design Thinking.

The aim of this work is to describe and discuss the benefits and learning outcomes detected along four iterations of a multidisciplinary challenge based learning experience carried out by three institutions from Barcelona: an Engineering School, a Design School and a Business School. This study is focused on the Engineering students.

2. Design Thinking

Searching for new ideas and innovative solutions to complex problems (either business, social, educational or others) it is inherently uncertain and has less certain outcomes than the improvement of existing solutions. Innovation is uncertain by definition.

At the outset of an exploration project, there is neither a clear predefined target, nor a known route to achieve it, certainly no requirements nor specifications. In opposition, classical engineering student projects or even modern engineering capstone projects often start from requirements or even directly from specifications provided by an external or internal stakeholder (Hoffman, 2014).

Design Thinking is an approach to innovation that helps to deal with uncertainty, understanding user needs, exploring solutions and ideas, and validating them through an iterative rough and quick prototyping process. It is a human-centered methodology that uses the tools and methods from the design disciplines and it is recognized for its clear bias towards abductive and integrative thinking, exploration and visualization. According to Rattcliffe (2009), the Design Thinking process can be separated in two clear “spaces”: the problem space and the solution space. From the cognitive perspective, it is a divergent and convergent process combined, where a set of alternatives are created and only then, choices are made based between the different options (Brown, 2009). It is a process composed of six iterative phases involving back-and-forth movements between the phases in a non-linear way (Figure 1). The phases are Understand, Observe, Point of view, Ideate, Prototype and Test.

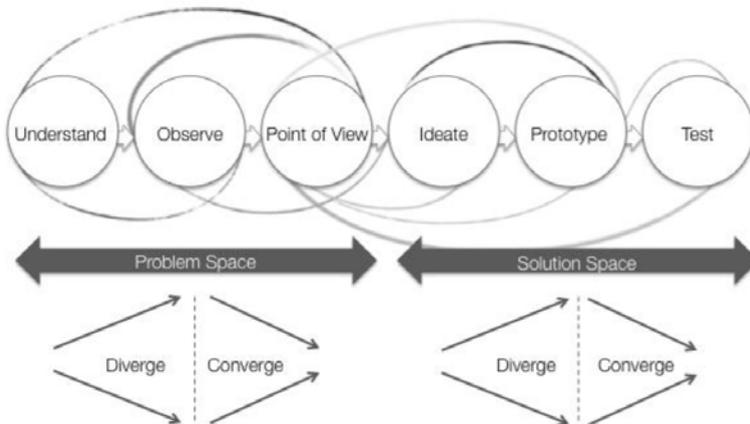


Figure 1. Adapted from Rattcliffe (2009)

3. Mixing engineering, design and management students at CERN to solve social challenges

Challenge Based Innovation (CBI) is a program created by CERN, the European Organization for Nuclear Research, to host educational projects in which students from different disciplines, universities and nationalities are put together in multidisciplinary teams to tackle innovation challenges. The objective for the students is to design solutions to social problems through the innovation methodology called Design Thinking.

During one semester the students spend 3-4 weeks at IdeaSquare (<http://ideasquare.web.cern.ch/>), a creative environment created at CERN Meyrin site in Switzerland, where they can consult and interact with scientists and knowledge transfer experts about possible applications and uses of CERN technologies in the student's proposed solutions.

Management, Design and Engineering schools usually perform project or case based courses about product or service development, but the fulfillment of the aforementioned design phases gains a lot of added value if the three agents of the process participate simultaneously on it because they cover the three key aspects: economic viability, usability/desirability and technical feasibility. The three institutions started performing shared activities four years ago, being the most relevant one the one that is performed in collaboration with IdeaSquare at CERN.

Together with IdeasSquare staff and mentors and faculty from the three different universities, teams draw inspiration from relevant novel technologies and create tangible prototypes. In three out of four editions, the teams have also included students from universities of other countries.

The basic structure of CBI course is divided into three parts: Discover, Design and Deliver (Design Council, 2005). In the Discovery phase, the student teams deep dive into their societal challenges, seeking to understand the “big picture” and in depth user needs. The phase ends with a clear statement and specific need or problem to address within its challenge. In the Design phase, the teams create quick and rough prototypes of the solutions for the needs they have discovered and then they test with users to get feedback. They choose one of the concepts and in the Delivery phase, this concept is developed including a functional, proof-of- concept prototype. At the end, the results are presented in a gala at CERN.

Some examples of the challenges tackled in CBI are: allowing people to restore or enhance their ability to move, providing a way for safe and fair distribution of electric power in refugees' camps or improving the water usage in developing countries.

A risk of this kind of multidisciplinary activities is the possibility that the students of a given discipline remain in their silo and only develop skills related with their previous knowledge. This is avoided by a course time plan, which drives all the students through all the design phases by doing collaborative activities, often taking them out of their comfort zone. There are also short lectures on key disciplines aspects oriented to all the students. Only in the last step (final proof-of-concept prototype) the engineering students devote more time to the technical development, the business students to the business plan and the design students to the graphical and communication aspects of the final presentation, reports and video, but even in this last phase the cooperation is intense thanks to the fact of being performed in a 10 days intensive period.

4. Challenge-based learning

According to Malmqvist et al. (2015) a challenge-based learning experience “is a learning experience where the learning takes places through the identification, analysis and design of a solution to a sociotechnical problem. It is typically multidisciplinary, takes place in an international context and aims to find a solution, which is environmentally, socially and economically sustainable.”

It could be said that challenge-based learning is an evolution of problem-based learning, with a more holistic approach. In problem-based learning, students are required to tackle a design, research or technical problem and their learning occurs in the process of working on the solution, normally in teams with the same or similar skills (i.e. engineering students).

Challenge-based learning experiences are more complex but more enriching, as they expose the students to work in multidisciplinary teams, and to address more complex societal challenges. These challenges combine not only the societal goals and the technical solutions, but also the business development or business model required to tackle them.

In this multidisciplinary, students get to understand how other disciplines’ professionals think, talk, tackle problems, face uncertainty, make decisions,... This type of interactions are extremely beneficial to prepare engineers to manage real life innovation challenges, where multidisciplinary is mandatory and understanding “the big picture” and understanding the needs and objectives of all stakeholders is fundamental.

The evolution from problem-based learning to challenge based learning in engineering education is illustrated in Table 1, where key aspects of each approach are compared. Main differences are the different disciplines involved in challenge-based (engineering and business) versus only engineering in problem-based. Also, the main activities that go from designing the solution in problem-based to formulating the problem and then designing the solution in challenge-based education.

Table 1. The evolution from problem-based learning to challenge based learning is illustrated in table 1 highlighting key aspects of each approach

	Problem-based	Challenge-based
Disciplines involved	Engineering	Engineering & business
Context	Product context	Societal context
Main activities developed	Designing the solution	Problem formulating & designing the solution
Working model	Team based	Team based and individual
Main focus	Customer needs	Customer needs and societal value creation

Source: Adapted from Malmqvist, Rådberg & Lundqvist (2015)

5. Conclusions and learning outcomes

According to the feedback surveys and personal reflections performed by the students in the four course editions, the most valuable learning outcomes, above the singularity of CERN-related issues and the international experience are the aspects derived from the multidisciplinary: knowing the way the others think, their tools and methods, being able of giving the right value to the other's work and developing a common language.

As one student mentions about his main take away from the course: "How to work with people from other disciplines, understanding their points of view, in order to come up with the best solution to a problem not only from a technological approach." The understanding of innovation beyond technology and engineering is one of the great achievements of this learning experience when talking about engineering students.

In the specific case of engineering students, in addition to the multidisciplinary values, there is a clear improvement in self-confidence and also a clear increase of user-awareness. Also, they gain a broader understanding of the value delivered by a product or service, on top of the technical functionality.

Regarding innovation, when asked what they understood by innovation before taking this course, reponses are mainly related to creating something new or improving something existing. When asked the same question after the course, there are some similar responses but is significant the appearance of many asnwars regarding impact on the society ,

solutions to real needs, finding problems and being able to changing your point of view as you gain more knowledge through research and prototyping.

From the methodological point of view, the students appreciate the intensive periods, although the regular academic year schedule does not have the needed flexibility to perform that kind of activities and the students have to do an extra effort to follow this course.

According to the surveys, engineering students agree that their knowledge on innovation increased significantly after taking the CBI course, as well as their business sense.

References

- Brown, T. (2008). Design Thinking. *Harvard Business Review*, (June 2008).
- Crawley, E. F., Malmqvist, J., Östlund, S., Brodeur, D. R., & Edström, K. (2014). *Rethinking engineering education: The CDIO approach, second edition*. <https://doi.org/10.1007/978-3-319-05561-9>
- Dym, C. L., Agogino, A. M., Ozgur, E., Frey, D. D., & Leifer, L. J. (2005). Engineering Design Thinking , Teaching , and Learning. *Journal of Engineering Education*, (January).
- Hassi, L., Ramos-Castro, J., Leveratto, L., Kurikka, J. J., Charosky, G., Utriainen, T. M., Bragos, R., Nordberg, M. (2016). Mixing Design, Management and Engineering Students in Challenge-Based Projects. *Proceedings of the 12th International CDIO Conference*, Turku University of Applied Sciences.
- Hoffman, H.F., (2014), The engineering capstone course. *Fundamentals for students and instructors*. New York, USA, Springer.
- Howard, T. J., Culley, S. J., & Dekoninck, E. (2008). Describing the creative design process by the integration of engineering design and cognitive psychology literature. *Design Studies*, 29(2), 160–180. <https://doi.org/10.1016/j.destud.2008.01.001>
- Malmqvist, J., Rådberg, K., & Lundqvist, U. (2015). Comparative Analysis of Challenge-Based Learning Experiences. *Proceedings of the 11th International CDIO Conference, Chengdu University of Information Technology, Chengdu, Sichuan, P.R. China, June 8-11, 2015*
- Ping, C. S., Chow, P., Teoh, C. (2011) The Use of Design Thinking in C-D-I-O Projects. *Proceedings of the 7th International CDIO Conference*, Technical University of Denmark, Copenhagen, June 20 -23, 2011.
- Ratcliffe, J. (2009). Steps in a design thinking process. <https://dschool.stanford.edu/groups/k12/wiki/17cff/> (retrieved 04-04-2013).
- Yang, K.Y.E. and Cheah, S.M. (2014) Chemical product design as foundation for education as sustainable development. *Proceedings of the 10th International CDIO Conference*, Universitat Politècnica de Catalunya, Barcelona, Spain, June 16-19, 2014

Mindfulness and gamification in the higher education classroom: Friends or foes?

Karadjova, Katia G.

University Library, Humboldt State University, USA

Abstract

The paper provides short overview of the gamification, mindfulness and contemplative pedagogy approaches in higher education with focus on specific experiences in the Information Literacy (IL) field in higher education. Students seem to engage eagerly with both mindfulness activities and games in the classroom. Although at first these two might give an impression of activities which stand on opposite sides an evident overlapping has been present through employing games as mindfulness activities.

The paper discusses recent developments of the Brain Booth Initiative at a rural, public university as an example of an innovative practice, which shows how mindfulness and gamification complement each other in helping students optimize learning and support their wellbeing. In addition to the scholarly literature the Brain Booth initiative shows that librarians are well-positioned to adopt contemplative pedagogy in their information literacy instruction and to serve as resources for departmental faculty, who may be willing to explore its use in their courses.

Keywords: *mindfulness; gamification; information literacy; contemplative pedagogy; undergraduate students; graduate students; academic library.*

1. Introduction

Mindfulness has been around for thousands of year within specific cultures over the world but only lately has started to make its way into the higher education classroom of the western world. Contemplative pedagogy has become recently a growing field of interest to some educators in colleges and universities. Gamification has also slowly but surely invaded the higher education classroom during the last decades. Recently, Information Literacy (IL) instruction practices have also experienced a noticeable infusion of both – mindfulness approach in the classroom and gamification. Students seem to engage eagerly with both mindfulness activities and games in the classroom. Although at first these two might give an impression of activities which stand on opposite sides an evident overlapping has been present through employing games as mindfulness activities.

2. Mindfulness and Gamification in the Information Literacy (IL) Field in Higher Education

The section provides a short overview focusing on the most recent scholarly literature on mindfulness approaches, contemplative pedagogy and gamification in the IL field in higher education.

2.1. Mindfulness and Contemplative Pedagogy

Nowadays, college students face a lot of different challenges in a very fast-paced society. In general, they have to navigate between two major factors affecting their performance and wellbeing, namely, coping with stress (Coiro, Bettis & Compas, 2017; Denovan & Macaskill, 2013; Li & Yang, 2016; Rose, Godfrey & Rose, 2015; etc.) and dealing with distractions to sustain productive cognitive activities (Berry & Westfall, 2015; Chen, 2015; Cheong, Shuter & Suwinyattichaiorn, 2016; Lineweaver et al., 2012, etc.). As a result, lack of concentration known also as mind wandering is one of the pronounced problems among college students. Contemplative pedagogy offers educational methods that support the development of student attention, emotional balance, empathetic connection, compassion, and altruistic behavior, while also providing new pedagogical techniques that support creativity and the learning of course content (Zajonc, 2013).

Mindfulness is a mental state of focused attention in the present moment without judgmental perspectives. Scholars and practitioners have discussed in length mindfulness theories and practices (Hassed, 2015; Khazan, 2013; Langdon et al., 2011; McCown, Reibel & Micozzi, 2016; McKay, 2016; Paulson et al., 2013; Vago & Silbersweig, 2012; etc.) with their perceived positive effects on the human wellbeing (Broderick, 2013; Brown & Ryan, 2003; Cayoun, 2015; Kabat-Zinn, 2003; Rogers, 2012, etc.).

The literature suggested that mindful practices could have a positive impact on student learning (Hartel, Nguyen & Guzik, 2017; Hassed, 2015; Jennings, 2015; Rechtschaffen, 2016; Srinivasan, 2014), on reducing emotional exhaustion and improving workplace satisfaction and effectiveness (Hall, 2013; Hülshager et al., 2013; Leroy, Dimitrova & Sels, 2013), as well as on preventing mental health problems (Bettis et al., 2017; Brown & Ryan, 2003; Cayoun, 2015).

Engagement with mindfulness practices and the use of contemplative classroom pedagogy supports such proven activities as intentional brain breaks, emotional self-regulation, and singular focus.

Intentional brain breaks: taking as little as a few minutes to give the brain a break from thinking, can lead to better focus and better academic study outcomes (Bamber & Kraenzle-Schneider, 2016; Hassed, 2015).

Emotional self-regulation practice (Cayoun, 2015; McKay, 2016): educators ask students to engage in courageous conversations both in- and outside of the classroom. Teaching contemplation and mindfulness is a way to prepare students to more successfully engage in those conversations while also teaching them to cultivate patience and compassion for diverse viewpoints (Kabat-Zinn, 2012; Shapiro et al., 2008). All these facilitate and complement applying critical pedagogy in the classroom.

Singular focus: many students struggle with attempting to multitask as well as foster strong, singular focus when it is needed for short or sustained periods of time. Mindfulness training has quite immediate impacts on attention and focus (Hassed, 2015; Moniz et al., 2015; Shapiro et al., 2008, etc.).

Some scholars and practitioners have gone even further by designing and conducting ongoing mindfulness training in the classroom across curriculum to support an attentive, present centered, and non-reactive mental mode (Hartel, Nguyen & Guzik, 2017; Morrison et al., 2014) as well as by development and standardization of mindfulness qualities scale for college students (Arunya & Thamilselvan, 2017).

Lately, librarians have started to pay attention to mindfulness and to engage with mindful practices (Mastel & Innes, 2013; Moniz et al., 2015; Ruhlmann, 2017, etc.). A few university libraries have even started to dedicate time and spaces to mindfulness activities. Most of these libraries focus primarily on meditation. A recent study (Mourer & Karadjova, 2017) was the first one to involve a broader spectrum of mindfulness activities, which offer intentional brain breaks to students, faculty and staff. The results reported on high interest for this innovative approach among students. Further analysis of patterns of use suggested preferences for certain mindfulness activities. This research study provided evidence to support educators' use of contemplative pedagogy and its value in the information literacy

workplace. It also showed an overlapping of mindful practices and gamification through employing games as mindfulness activities.

2.2. Gamification

Gamification is defined in Merriam-Webster Dictionary as “the process of adding games or gamelike elements to something (such as a task) so as to encourage participation”. There has been significant amount of experimentation in the realm of information literacy gamification (Clyde & Thomas, 2008; Cowing, 2017; Kearns et al., 2017, Laubersheimer et al., 2016; Markey et al., 2011; Porter, 2012; Smale, 2011, etc.) that has led to some ideas about best practices. The typology of trivia, role-playing, casual, physical/virtual mix, alternate reality, and social is a good one and allows some comparative work to happen about the most effective kinds of game design in a library context (Broussard, 2012). For example, the use of an immersive first-person experience and a narrative similar to many commercial games seems that potentially could be a useful method to engage complex information literacy skills (Clyde & Thomas, 2008). The challenge with gamification seems to be creating the right level of fun and ‘immersiveness’ of virtual reality in a way that engages user expectations of what games are nowadays while still imparting meaningful skills.

Some publications on the gamification in the information literacy field focus on the theoretical aspects of gamification (Becker, 2013; Cheong et al., 2014; Felker, 2014), which includes both the creation of games but also the incorporation of game-like structures into instruction. The rethinking of how instruction works may entail the redesign of entire instruction programs as opposed to just the addition of a game to the toolkit of learning objects (Felker, 2014). There has been a fair amount of success in hybrid games that require in-person exploration in the library. When connected to an app or even some low-tech way of creating a quest framework, games seem to have been effective in getting patrons to explore a library and its resources. It has been most effective as part of an information literacy instruction session embedded in specific courses, where employing games as an active learning technique makes imparting the necessary information a more fun experience (Broussard, 2012; Margino, 2013).

3. Students Engagement with Mindfulness and Games through the Brain Booth Initiative

We have started the Brain Booth Initiative about two years ago. The Brain Booth has the goal of introducing mindfulness as a means of introducing students to metacognition for academic success. The Library Brain Booth is an informal, experiential space to learn about the mind body connection and optimize learning.

Mission: The Library Brain Booth seeks to introduce the campus community to international scientific research on the effects of mindfulness, attention, and contemplation through hands-on tools and activities in an informal, experiential setting. Students are especially encouraged to explore the positive impacts that taking an intentional brain break can have on their academic success. Although the Library Brain Booth recognizes the contributions of people of all faiths and backgrounds to mindfulness practices, it has no religious affiliation. People of all abilities, cultures, and faiths are welcome in the Library Brain Booth.

The Brain Booth offers different activity stations: color-relax, game-relax, light-therapy, sound-relax, audio-meditate, prompt-meditate, video-meditate, gratitude-express, virtual reality-immense, and biofeedback. The biofeedback unit is a resilience training device that measures your coherence levels and heart rate variability (HRV). Coherence directly impacts how you physiologically react to and reduce stress. The Brain Booth hosts weekly drop-in hours as well as provides equipment to check out at the library circulation desk and use at the Brain Booth Designated Open Space (BBDOS). The BBDOS also accommodates a book & media collection on mindfulness and contemplative pedagogy, a stationary biofeedback machine, two pedal desks, and a meditation corner.

The initiative has been received very well by the campus community. During the last semester the Brain Booth was embedded in the course curricula across the departments of Child Development and Kinesiology & Recreation Administration. The School of Business joined them this semester. The departments to follow next semester are World Languages & Cultures and Psychology.

In relation to a course curriculum assignment students visited the Brain Booth during class time, engaged with the activities and had to write a reflection on the activities in relation to their studies and their wellbeing. Overall, the students acknowledged the high value of the approach. They expressed high interest in the game-relax station which was among the top three preferred activities along with color-relax and biofeedback.

4. Conclusions

In addition to the scholarly literature the Brain Booth initiative shows that librarians are well-positioned to adopt contemplative pedagogy in their information literacy instruction and to serve as resources for departmental faculty, who may be willing to explore its use in their courses. It also attests that mindfulness and gamification complement each other as suggested by the literature. As of now we are working on designing and developing an experimental study which connects directly mindfulness in the classroom with assessment of student learning outcomes.

References

- Arunya, B., & Thamilselvan, P. (2017). Development and standardization of Mindfulness Qualities Scale for college students. *Indian Journal Of Positive Psychology*, 8(1), 64-67.
- Bamber, M. D., & Kraenzle Schneider, J. (2016). Mindfulness-based meditation to decrease stress and anxiety in college students: A narrative synthesis of the research. *Educational Research Review*, 18, 1–32. doi: 10.1016/j.edurev.2015.12.004
- Becker, B. W. (2013). Gamification of library instruction. *Behavioral & Social Sciences Librarian*, 32(3), 199-202. doi:10.1080/01639269.2013.821372
- Berry, M. & Westfall, A. (2015). Dial d for distraction: The making and breaking of cell phone policies in the college classroom. *College Teaching*, 63(2), 62-71.
- Bettis, A. H., et al. (2017). Comparison of two approaches to prevention of mental health problems in college students: enhancing coping and executive function skills. *Journal of American college health*, 1-10.
- Broderick, P. (2013). *Learning to Breathe: A Mindfulness Curriculum for Adolescents to Cultivate Emotion Regulation, Attention, and Performance*. Oakland, CA: New Harbinger Publications.
- Broussard, M.J.S. (2012). Digital games in academic libraries: A review of games and suggested best practices. *Reference Services Review*, 40(1), 75-89. doi:10.1108/00907321211203649
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology: Interpersonal Relations and Group Processes*, 84(4), 822-848. doi:http://dx.doi.org/10.1037/0022-3514.84.4.822
- Cayoun, B. (2015). *Mindfulness-integrated CBT for Well-being and Personal Growth: Four Steps to Enhance Inner Calm, Self-confidence and Relationships*. Chichester, West Sussex: John Wiley & Sons Inc.
- Chen, V. (2015). From distraction to contribution: A preliminary study on how peers outside the group can contribute to students' learning. *Canadian Journal for the Scholarship of Teaching and Learning*, 6(3),
- Cheong, C., Filippou, J., & Cheong, F. (2014). Towards the gamification of learning: Investigating student perceptions of game elements. *Journal of Information Systems Education*, 25(3), 233-244.
- Cheong, P., Shuter, R., & Suwinyattichaiorn, T. (2016). Managing student digital distractions and hyperconnectivity: Communication strategies and challenges for professorial authority. *Communication Education*, 65(3), 272-289.
- Clyde, J. & Thomas, C. (2008) Building an information literacy first-person shooter. *Reference Services Review*, 36(4), 366-380. doi:10.1108/00907320810920342
- Coiro, M. , Bettis, A. , & Compas, B. (2017). College students coping with interpersonal stress: Examining a control-based model of coping. *Journal of American College Health*, 65(3), 177-186.
- Cowing, J. (2017). Developing an online platform for gamified library instruction. *Code4Lib Journal*, 35. Retrieved from <http://journal.code4lib.org/articles/12122>

- Definition of gamification. Merriam-Webster Dictionary. Retrieved on January 31, 2017 from <https://www.merriam-webster.com/dictionary/gamification>
- Denovan, A., & Macaskill, A. (2013). An interpretative phenomenological analysis of stress and coping in first year undergraduates. *British Educational Research Journal*, 39(6), 1002-1024. doi:10.1002/berj.3019
- Felker, K. (2014). Gamification in libraries: The state of the art. *Reference & User Services Quarterly*, 54(2), 19-23.
- Hall, L. (2013). *Mindful Coaching: How Mindfulness Can Transform Coaching Practice*. London: Kogan Page Limited.
- Hartel, J., Nguyen, A., & Guzik, E. (2017). Mindfulness Meditation in the Classroom. *Journal Of Education For Library & Information Science*, 58(2), 112-115.
- Hassed, C. (2015). *Mindful Learning : Reduce Stress and Improve Brain Performance for Effective Learning*. Boston: Shambhala Publications.
- Hülshager, U. R., Alberts, H. J. E. M., Feinholdt, A., & Lang, J. W. B. (2013). Benefits of mindfulness at work: The role of mindfulness in emotion regulation, emotional exhaustion, and job satisfaction. *Journal of Applied Psychology*, 98(2), 310-325. doi:http://dx.doi.org/10.1037/a0031313
- Jennings, P. (2015). *Mindfulness for Teachers: Simple Skills for Peace and Productivity in the Classroom*. New York: W.W. Norton & Company.
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: past, present, and future. *Clinical psychology: Science and practice*, 10(2), 144-156.
- Kearns, A., Kirsch, B. A., & Cononie, V. (2017). Agoge: An information literacy game for transfer students. *Reference Services Review*, 45(2), 314-331. doi:10.1108/RSR-09-2016-0054
- Khazan, I. (2013). *The Clinical Handbook of Biofeedback: A Step by Step Guide for Training and Practice with Mindfulness*. Chichester, West Sussex, U.K.: Wiley-Blackwell.
- Langdon, S., Jones, F. W., Hutton, J., & Holttum, S. (2011). A grounded-theory study of mindfulness practice following mindfulness-based cognitive therapy. *Mindfulness*, 2(4), 270-281.
- Laubersheimer, J., Ryan, D., & Champaign, J. (2016). InfoSkills2Go: Using badges and gamification to teach information literacy skills and concepts to college-bound high school students. *Journal of Library Administration*, 56(8), 924-938. doi:10.1080/01930826.2015.1123588
- Leroy, H., Anseel, F., Dimitrova, N. G., & Sels, L. (2013). Mindfulness, authentic functioning, and work engagement: A growth modeling approach. *Journal of Vocational Behavior*, 82(3), 238-247.
- Li, M., & Yang, Y. (2016). A Cross-Cultural Study on a Resilience-Stress Path Model for College Students. *Journal Of Counseling & Development*, 94(3), 319-332. doi:10.1002/jcad.12088
- Lineweaver, T., Kercood, S. , O'Keeffe, N. , O'Brien, K. , Massey, E. , et al. (2012). The effects of distraction and a brief intervention on auditory and visual-spatial working

- memory in college students with attention deficit hyperactivity disorder. *Journal of Clinical & Experimental Neuropsychology*, 34(8), 791-805.
- Margino, M. (2013). Revitalizing traditional information literacy instruction: Exploring games in academic libraries. *Public Services Quarterly*, 9, 333-341.
- Markey, K., Leeder, C., & Hofer, A. (2011). Bibliobouts: What's in a game? *College & Research Libraries News*, 72(11), 632-645. Retrieved from <http://crln.acrl.org/index.php/crlnews/article/view/8668/9124>
- Mastel, K., & Innes, G. (2013). Insights and practical tips on practicing mindful librarianship to manage stress. *LIBRES: Library and Information Science Research Electronic Journal*, 23(1), 1-8.
- Mckay, M. (2016). *Emotion Efficacy Therapy: A Brief, Exposure-based Treatment for Emotion Regulation Integrating ACT and DBT*. Oakland, CA: Context Press.
- McCown, D., Reibel, D., & Micozzi, M. (2016). *Resources for Teaching Mindfulness: An International Handbook*. Switzerland: Springer Verlag.
- Morrison, A.B., Goolsarran, M., Rogers, S.L. & Jha, A.P. (2014). Taming a wandering attention: short-form mindfulness training in student cohorts. *Frontiers in Human Neuroscience*, 7, DOI: [10.3389/fnhum.2013.00897](https://doi.org/10.3389/fnhum.2013.00897)
- Moniz, R., Eshleman, J., Henry, J., Slutzky, H., & Moniz, L. (2015). *The Mindful Librarian: Connecting the Practice of Mindfulness to Librarianship*. Chandos Publishing.
- Mourer, M. M & Karadjova, K.G. (2017). Dare to Share the Silence: Tools & Practices of Contemplative Pedagogy in a Library Brain Booth, In S. Kurbanoglu et al. (Eds.) *Information Literacy in the Workplace. ECIL 2017 Conference proceedings in Communications in Computer and Information Science*. Heidelberg, Germany: Springer.
- Paulson, S., Davidson, R., Jha, A., & Kabat-Zinn, J. (2013). Becoming conscious: the science of mindfulness. *Annals of the New York Academy of Sciences*, 1303(1), 87-104.
- Porter, T. D. (2012). Games and activities: An alternative foundation for library instructional learning. *Codex: The Journal of the Louisiana Chapter of the ACRL*, 2(2), 61-77.
- Rechtschaffen, D. (2016). *The Mindful Education Workbook: Lessons for Teaching Mindfulness to Students*. New York: W.W. Norton & Company.
- Rogers, H. (2012). *Mindfulness for the Next Generation: Helping Emerging Adults Manage Stress and Lead Healthier Lives*. New York, New York: Oxford University Press.
- Rose, C., Godfrey, K., & Rose, K. (2015). Supporting student wellness: De-stressing initiatives at memorial university libraries. *Partnership: The Canadian Journal of Library and Information Practice and Research*, 10(2), 1-21.
- Ruhlmann, E. (2017). Mindful librarianship. *American Libraries*, 48(6), 44-47.
- Shapiro, S. L., Brown, K. W., & Astin, J. A. (2008). Toward the integration of meditation into higher education: A review of research. *The Center for Contemplative Mind in Society*. Retrieved from <http://www.contemplativemind.org/admin/wp-content/uploads/2012/09/MedandHigherEd.pdf>.

- Smale, M. A. (2011). Learning through quests and contests: Games in information literacy instruction. *Journal of Library Innovation*, 2(2), 36-55.
- Srinivasan, M. (2014). *Teach, Breathe, Learn: Mindfulness in and out of the Classroom*. Berkeley, California: Parallax Press.
- Vago, D. R., & Silbersweig, D. A. (2012). Self-awareness, self-regulation, and self-transcendence (S-ART): a framework for understanding the neurobiological mechanisms of mindfulness. *Frontiers in human neuroscience*, 6.
- Vanden Elzen, A. M. & Roush, J. (2013). Brawling in the library: Gaming programs for impactful outreach and instruction at an academic library. *Library Trends*, 61(4), 802-813.
- Zajonc, A. (2013). Contemplative pedagogy: a quiet revolution in higher education. *New Directions for Teaching and Learning*, 2013(134), 83-94.

New university experiences: intergenerational archaeological excavations as a participatory learning method

Valero Tévar, Miguel Ángel^a and Huete Alcocer, Nuria^b

^aDepartment of History, Faculty of Letters of Ciudad Real, University of Castilla-La Mancha, Spain. ^bDepartament Spanish and International Economics, Econometrics and History and Financial Institutions. Faculty of Economics and Business, Albacete, University of Castilla-La Mancha, Spain.

Abstract

The present paper outlines a new training process carried out during the summer of 2017 by the research team at the site of the Roman villa of Nohedá. The project is based on the practical implementation of an archaeological excavation experience and the study of related materials by an intergenerational team. The activity was carried out by students of various Spanish and foreign universities together with senior citizens who had previously been thoroughly trained in archaeological methodology. Not all of the senior citizens had university degrees, but they did have extensive life experience allowing them to bring a high degree of commitment to the project. All the students were able to implement the archaeological knowledge acquired in the preceding months through theoretical lessons covering a wide range of subjects. They worked through participative procedures in intergenerational teams, thereby fostering the exchange of knowledge and new learning methods. The results were very positive, from both an academic and a scientific perspective, as well as in terms of the participants' personal gratification.

Keywords: *Roman villa, archaeological excavation, participation, teamwork, intergenerational cooperation.*

1. Introduction

Society has undergone an astonishing change in recent years. Today, people not only enjoy visiting museums and archaeological sites, but also taking part in many other heritage-related cultural activities (Monsalve et al., 2014, 74). The days of archaeology as a hobby for a relatively wealthy minority are long gone. Nowadays, the general public, regardless of sex, age, education or income, has taken an interest in the subject. And this interest is not limited to mere observation. On the contrary, people wish to play an active role in the field's advancement.

In this regard, the scientific team of the Roman *villa* of Noheda, made up of teachers from a number of universities, has launched an innovative programme to promote the integration of students and postgraduates completing practical and theoretical training with senior citizens who have previously been thoroughly trained in archaeological methodology.

In this context, the archaeological excavation at the Roman *villa* of Noheda was useful both to further the site's investigation and to create an environment for interaction both amongst senior citizens and between them and the other age groups. This gave rise to an educational setting that fostered both social and intergenerational interaction and cooperative deliberation.

2. The Roman *villa* of Noheda

The Roman *villa* of Noheda, and the existence of its mosaics, has long been known (Larrañaga 1966, 438; Abascal 1982, 68; Palomero, 1985, 169). The site is located in the central area of the Iberian Peninsula, close to the towns of Segobriga, Ercavica and Valeria, 17 kilometres north of the city of Cuenca. The *villa* is a mere 500 metres northeast of the place it is named for and is part of the municipality of Villar de Domingo García.

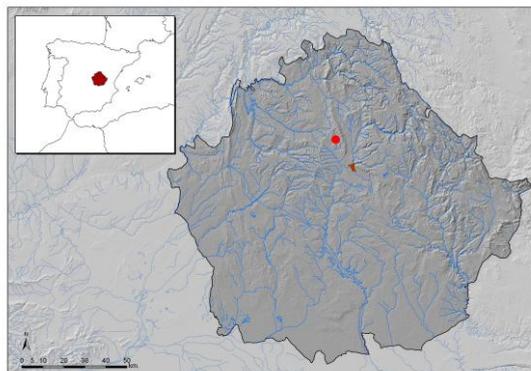


Figure 1. Location of the Noheda site in the peninsular context.

The archaeological complex was listed as a Site of Cultural Interest in 2012, mainly due to the mosaics discovered there, which are the site's most outstanding and best known feature (Valero, 2009, 54; 2010, 6; 2011, 91-105; 2013a, 312-327; 2014a, 523; 2014b, 54-60; 2014c, 81 ss.; 2015a; 2015b, 1347 ss.; 2015c, 439-444; 2016a, 131-152; 2016b, 10-12; 2017a, 79-80; Valero and Gómez 2013, 87 ss.). Although the Late Antique period is the best documented period to date, evidence of anthropic activity has been found from other periods as well. Furthermore, territorial analyses conducted in the immediate vicinity (Valero, 2013b, 232) have revealed signs of intense human activity in the area, offering proof of the uninterrupted existence of inhabitants from protohistoric times up to the Middle Ages.

So far, three areas of the rural complex have been excavated. The first contained various structures belonging to the *pars rustica*, which, in and of themselves, indicate that the complex had all the necessary buildings to confirm its agricultural nature, inherent to the concept of a rustic *villa* (Balmelle, 2001, 16; Mulvin, 2002, 3, Arce, 2006, 14; *idem* 2012, 27, Sfameni, 2006, 110).

The second excavated area, which was the focus of the efforts discussed here, consisted of a section of the chambers of the *pars urbana*. Amongst these, the *triclinium* clearly stands out, due to its astonishing size (290.64 m²) and extraordinary flooring, as well as the intricate architectural layout and exquisite parietal decorations. This is the chamber where the aforementioned exceptional figurative mosaic is located. Made mostly of *opus vermiculatum*, the preserved portion spans an area of 231.62 m².



Figure 2. Mosaic of the Noheda triclinium indicating the locations of the figurative panels (image by M. Á. Valero over a photograph by José Latova).

Currently, in the same sector, the *balneum* is under excavation. According to the data available so far, it would have spanned nearly 900 m² and had an axial-symmetric floorplan (García-Entero, 2005, 751). It is made up of a number of utility rooms arranged around a central axis and is marked by a *narthex*-type entrance, an *apodyterium* and a large *frigidarium*. On the left edge are two chambers, which are interconnected with the cold room by way of two bays. The first of these chambers has a quadrangular shape, rounded off by an exedra-shaped appendix, and straight walls arranged in a half octagon that could be interpreted as a possible *uctorium*. Annexed to the latter is a quadrangular chamber with heated walls corresponding to the pool. On the opposite side, by the *natatio*, are the warm *tepydarium* and *caldarium* chambers, the latter containing two *alvei* that face each other, as well as three *praefurnia* to service the warm areas (Valero, 2015a, 123-126).

Based on the scant area excavated, it is impossible to confirm whether the *balneum* was an isolated structure or was connected to the dwellings by a corridor or even a *xystus*. This latter option is thought to be more likely, since such layouts were fairly common from the 3rd century on, although some examples have been dated to the 2nd century.

3. Excavations as a pretext for intergenerational relations and learning methods

As with most excavations carried out in summer, in addition to the workers employed for the purpose, the scientific team encouraged the integration of students and postgraduates on certain dates to engage in theoretical and practical training that would prove useful in their curriculum.

However, this rather standard practice in research projects of enlisting postgraduates as workers in exchange for training was taken one step further at Noheda by integrating, in a single working environment, both young people and senior citizens who had something in common: they were all university students. To this end, work was planned with young people from various European universities together with senior citizens from a number of towns who had previously received archaeological training.

Thus, an intergenerational group was formed. The contribution of those members aged 55 and over, who constituted a diverse and heterogeneous group, proved to be a strong human, social and cultural resource that endowed the project with a strong sense of commitment, knowledge and extremely valuable life experience.

One of the main objectives was teamwork. Thus, the few weaknesses shown by some of the group's members were compensated for by others. This also increased the group's potential: if a given member proved to be particularly effective at a certain task, he or she would not only carry it out but also explain his or her method to the other members.



Figure 3. Intergenerational excavation team

Both young people and seniors became equally involved, fostering dynamic communities that stimulated communication and intergenerational work.

The prior knowledge brought by the senior citizens proved to be an important asset in executing the project. The tasks they undertook, together with the various ways in which they had accessed the university environment, provided a wide range of possibilities that proved beneficial for the project as a whole.

These possibilities were leveraged to achieve what most programmes oriented towards senior citizens set out to do (Pinazo et al., 2009, 30 ss.). First, they facilitated a reciprocal and mutually beneficial exchange of knowledge and values between the two generational groups. Second, the excavation itself was enriched by the anthropological knowledge of the seniors, who, for example, taught the youths, *in situ*, wall-building techniques or the methodology of extracting and preparing lime used for traditional constructions, which, incidentally, was closely related to the chrono-cultural period under study at Noheda.

The result was the gestation of an inclusive, socially committed project as a means of bringing together people of different generations whilst fostering interactive alliance mechanisms between archaeology and society. Such was the success and repercussion of the training activities that they were picked up by a number of provincial, regional and even national media outlets, which described them as a model to follow.

4. Conclusion

The spirit of the project pivoted around the concept of intergenerational education understood as a tool for learning, cooperation, interaction and exchange amongst different age groups with the aim of allowing people of all ages both to achieve and contribute their

best, determining their role according to their needs and capabilities (Alonso & Mackay, 2011, 10).

The undertaking proved very rewarding and was very well-received by the entire team, as a novel experience in which all participants were able both to learn and to teach. The positive outcomes have encouraged the team to continue fomenting this type of experience, both at the Roman *villa* of Noheda and at other nearby sites in the province of Cuenca in the coming years.

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References

- Abascal, J. M. (1982). *Vías de Comunicación romanas de la provincia de Guadalajara*. Guadalajara, Spain: Diputación Provincial de Guadalajara.
- Alonso, F. & Mackay, M. (2011). Hacia una nueva cultura de ser mayor: Cambios y oportunidades al filo del 2012, Año Europeo del Envejecimiento Activo y la Solidaridad Intergeneracional. *Sesenta y más*, 304, 8-13.
- Arce, J. (2006). Villae en el paisaje rural de Hispania romana durante la Antigüedad tardía. In A. Chavarría, J. Arce & G.P. Brogiolo (Eds.), *Villas Tardoantiguas en el Mediterráneo Occidental, Anejos de AEspA XXXIX*. Madrid, Spain: Consejo Superior de Investigaciones Científicas, 9-15.
- Arce, J. (2012). Campos, tierras y villae en Hispania. In L. Caballero, P. Mateos & T. Cordero (Eds.) *Visigodos y Omeyas. El territorio*. Mérida, Spain: Consejo Superior de Investigaciones Científicas, 21-30.
- Balmelle, C. (2001). *Les demeures aristocratiques d'Aquitaine. Aquitania*, Supplément, 10, Mémoires (Ausonius Institute), 5. Bordeaux, France: Ausonius-Aquitania.
- García-Entero, V. (2005). *Los balnea domésticos -ámbito rural y urbano- en la Hispania romana*, Anejos de Archivo Español de Arqueología, XXXVII. Madrid, Spain: Consejo Superior de Investigaciones Científicas.
- Larrañaga, J. (1966). *Guía de Cuenca*. Cuenca, Spain: Excma. Diputación Provincial de Cuenca.
- Monsalve, A., Coletto, G., González, J., España, S., Lloret, M^a D., Marín, L. & Torrejón, J. (2014). De la sociedad civil a la sociedad arqueológica: una visión actual de la socialización del patrimonio en la ciudadanía española, *Monográfico*, 9, 73-88.

- Mulvin, L. (2002). *Late Roman Villas in the Danube-Balkan Region*, Oxford, United Kingdom: BAR Int. Ser. 1064.
- Palomero, S. (1987). *Las vías romanas de la provincia de Cuenca*, Cuenca, Spain: Excma. Diputación Provincial de Cuenca.
- Pinazo, S., Sánchez, M., Sáez, J., Díaz, P. & López, J. (2009). La mejora de la convivencia escolar desde la intergeneracionalidad. La mentorización como recurso, *Revista Información Psicológica*, 95, 27-45.
- Sfameni, C. (2006). *Ville residenziali nell'Italia Tardoantica*. Bari, Italy: Edipuglia.
- Valero, M.A. (2009) La villa de Noheda: esplendor tardoimperial. *Revista Memorias*, 15, 53-58.
- Valero, M.A. (2010). La villa romana de Noheda: Avance de los primeros resultados. *Informes sobre Patrimonio*, 1. <http://informes.patrimoniohistoricoclm.es/2010-03/patrimonio.html> [Consulta: 2/1/ 2018].
- Valero, M.A. (2011). Les images de ludi de la mosaïque romaine de Noheda (Villar de Domingo García, Cuenca). *Nikephoros*, 24, 91-114.
- Valero, M.A. (2013a). The late-antique villa at Noheda (Villar de Domingo García) near Cuenca and its mosaics. *Journal of Roman Archaeology*, 26, 307-330.
- Valero, M.A. (2013b). El cambio de patrón poblacional en el territorium de Ercávica: Avance sobre un proyecto de evolución del paisaje en La Alcarria. In M^aL., Cerdeño, T. Sagardoy, & E. Gamo, (Eds.) *La Romanización en la provincia de Guadalajara*. Guadalajara, Spain: La Ergástula, 221-236.
- Valero, M.A. (2014a). El triclinium de la villa de Noheda (Villar de Domingo García. Cuenca). In P. Pensabene & C. Sfameni, (Eds.) *La Villa Restaurata e i Nuovi Studi sull'Edilizia Residenziale Tardoantica*. Bari, Italy: Edipuglia, 521-531.
- Valero, M.A. (2014b). Estudio arqueométrico de las muestras procedentes del mosaico de la villa romana de Noheda (Cuenca): primeros resultados. *Actas del X Congreso Ibérico de Arqueometría*. Castellón, Spain: Instituto de Conservación y Restauración Valenciano, 54-68.
- Valero, M.A. (2014c). La representación de instrumentos musicales en el mosaico de la villa romana de Noheda. *Libro de la 53 SMR de Cuenca*. Cuenca, Spain: Excma. Diputación de Cuenca, 81-104.
- Valero, M.A. (2014d). Los mosaicos del triclinium de la villa romana de Noheda (Villar de Domingo García, Cuenca). In J.M. Álvarez, T. Nogales, & I. Rodà, (Eds.) *Proceedings XVIIIth International Congress of Classical Archaeology*. Mérida, Spain: Museo Nacional de Arte Romano, 1347-1351.
- Valero, M.A. (2015a). *La villa romana de Noheda: la sala triclinar y sus mosaicos*. Tesis Doctoral no publicada. Universidad de Castilla-La Mancha, Toledo, Spain. <https://ruidera.uclm.es/xmlui/handle/10578/7161>, [Consulta: 2/1/2018].
- Valero, M.A. (2015b). Los mosaicos de la villa romana de Noheda (Villar de Domingo García, Cuenca). In G. Trovabene (Ed.), *XII Colloquio AIEMA*, Verona; Italy: Scripta Edizioni, 439-444.

- Valero, M.A. (2016a). La iconografía del mito de Pélope e Hipodamía en la musivaria romana. Nuevas aportaciones a partir del mosaico de Noheda. *Anales de Arqueología Cordobesa*, 27, 125-160.
- Valero, M.A. (2016b). Los mosaicos de la villa de Noheda (Cuenca), *Arqueología somos todos*, 4, 10-12.
- Valero, M.A. (2016c). Primeras aproximaciones a los mosaicos del balneum de la villa romana de Noheda (Cuenca). In L. Neira (Ed.), *Estudios sobre mosaicos antiguos y medievales*. Roma, Italy: L'Erma di Bretschneider, 358-363.
- Valero, M.A. (2017a). La representación del circo en el mosaico de Noheda. In J. Vilar (Ed.), *Tarraco Biennial. La glòria del circ. Curses de carros i competicions circenses*. Tarragona, Spain: Fundación Privada Mutua Catalana, 75-82.
- Valero, M.A. (2017b). El proyecto Fundus de la villa romana de Noheda: planteamientos metodológicos y primeros resultados. In C. Teixeira & A. Carneiro (Coord.), *Arqueologia da Transição: entre o mundo romano e a Idade Média*. Coimbra, Portugal: Coimbra University Press, 65-94.
- Valero, M.A. & Gómez, J. (2013). El mimo celoso adinerado: literatura y espectáculo en la uilla romana de Noheda. *Quaderni Urbinati de Cultura Classica*, 102, 87-106.

Internationalisation of a teaching experience: ToSCA UPC education for innovation workshop at UFPS, Colombia

Adroer Puig, Marta^a; Carmen Xiomara Díaz Fuentes^b; Zamora i Mestre, Joan Lluís^c

^aDepartment of Architectural Technology, Universitat Politècnica de Catalunya, Spain,

^dDepartment of Architecture, Universidad Francisco de Paula Santander, Colombia,

^cDepartment of Architectural Technology, Universitat Politècnica de Catalunya, Spain.

Abstract

ToSCA is an optional and intensive technical product innovation workshop that aims to include education for innovation of constructive solutions in the grade architecture programme, by applying a didactic structure based on problem solving skills, combined with cooperative learning structures and involving an industry of the sector every edition a client. The workshop has been held annually at the Vallès School of Architecture, Universitat Politècnica de Catalunya, since 2007 and the results of each edition can be found at:

<http://www.etsav.upc.edu/assignatures/tosca>.

After eleven editions of ToSCA_ETSAV and one edition in TUM Munich, with a very good outcomes and by the invitation of the School of Architecture of the Francisco de Paula Santander University in Cúcuta, Colombia, we assumed, between both institutions, the challenge of internationalizing the ToSCA experience, to carry out within the Deepening Course "the ceramics in the architectural project", a first educational workshop for the innovation of technical product, suggesting the adaptability of the ToSCA methodology, in a different socio-cultural environment.

Keywords: *Internationalization, innovation, building technologies, education, workshop.*

1. Introduction

ToSCA is an optative and intensive week workshop on Technical Product Design Innovation (PDI), that was born in January 2007 under Dr J. LL Zamora direction and a team of UPC Department of Technology's lecturers, that wanted to achieve the incorporation of s.21th new exigencies to the Architecture program in ETSAV_UPC, in association with appropriate educational technical skills into the training of future architects to these new challenges. ToSCA team focused, in particular, on following challenges: education for innovation, collaborative work in multidisciplinary working teams, the importance of communication skills, and promoting students self-learning. Zamora (2014).

The ToSCA team had two main starting hypotheses. Firstly, that to add a real client on the known problem-solving educational methodologies, increases the stimulus on constructive learning and work. Secondly, that it will be natural and appropriate to apply cooperative learning principles into ToSCA workshop, since cooperative work among different profiles was a successful tool in Technic PDI process. Ulrich & Eppinger (2014).

In order to achieve its goals ToSCA ETSAV_UPC is structured within a framework schedule, based on PDI Step Process, that infer rhythm in order to guarantee intense work during a week, and following the educational principles of collaborative work. Pujolas & Lago (2004) This principle includes team work with inner diversity of profiles working in roles, that in ToSCA are inspired in Innovation Product values, as Novelty, Rigor, Communication and Implementary. One real Client purpose to the workshop his Innovation needing, professors act as a coach, and some external experts as lecturers in workshop, and the final an external jury, that includes the client, made the workshop final assessment. (More detail in <http://www.etsav.upc.edu/assignatures/tosca>)

Eleven ToSCA_ETSAV editions and one in TUM-ToSCA workshop in Technische Universität München, had been successfully held since 2007. These experiences allow us to confirm that the ToSCA program, provides students tools and confidence about their Innovative skills, show PDI as a professional issue in itself, make them recognize that the success is the team outcome, rather than individual one. The experience also confirms us that involving a real client in problem and in the evaluation results, increases the team's stimulus and create bonds between Industry and University. Zamora, (2014).

In 2017, ToSCA team, with the aim of raising in his knowledge on education for innovation, have accepted the challenge from Department of Architecture of Francisco de Paula Santander University (UFPS) in Cúcuta, Colombia: to transfer ToSCA methodology into its Deepening Course in the Architecture Program

2. Justification for the UFPS internationalisation proposal

The experience of Internationalization of ToSCA_ETSAV taken to the architecture Program from the Francisco de Paula Santander University, located in Cúcuta city in Colombia is presented after the invitation made by the Colombian institution, which already knew in advance the path of the Workshop directed by Dr. Joan Lluís Zamora and its impact on the industrialized construction sector through the ToSCA methodology. The region of Norte de Santander highlighted until a few years ago as the first producer and exporter of unglazed red ceramic products at a national level, unlike the current scenario in which the marked need to diversify the supply of products and construction systems is evident of local manufacturing for its use in construction, requiring the industrial environment to assume structural changes in the productive processes. Sánchez (2004, 2008).

The growing synergy among universities, companies and the Colombian government through recent agreements has allowed to broaden the discussion about the needs of new constructive alternatives. OCyT (2012). As a result, the ceramic industry from Norte de Santander, is projected for the next 10 years, as an industrial sector highly equipped in technology, qualified human resources and national and international recognition, in the development of project initiatives and products that place it as a reference cluster for the Colombian Ceramic Industry. PEDCTI, (2014).

In this way, the theme assumed in this international version of ToSCA "Ventilated ceramic facades applied to sustainable housing", coincides with the statement made by the national housing ministry in Colombia through the National Sustainable Construction Policy and the action plan about innovation projects and technology update. MINVIVIENDA (2015). Thus, the results of this practice carry an important leap forward in a tropical region with an outdated industrial environment in terms of innovation.

UFPS proposes to carry out, under the ToSCA methodology, the last subject of the Deepening Course, which is a specialization course and a possible way in the UFPS study plan to obtain the Degree in Architecture.

3. ToSCA UPC a Design Lab.II UFPS Cúcuta Colombia

In order to transfer ToSCA UPC to workshop that finishes the Deepening course at UFPS, Colombia, the involved team must face how ToSCA teamwork are going to work when it moves to another continent, another culture, another society, and how compromise the shorter calendar that UFPS offered with weekly ToSCA structure, and no interfere on the innovation results.

Department of architecture- Francisco de Paula Santander University				
Cúcuta, Norte Santander, Colombia				
Degree modality for the architecture and urbanism program				
Deepening Course : “Ceramic in the architectural Project”				
Subject	Module 7: Lab design II: “Ventilated Ceramic Facades applied to sustainable			
Dates	May 2017	Thursday 25	Friday 26	Saturday 27
		8:00-12:00	8:00-12:00	8:00 – 12.00
		14:00-18:00	14:00-18:00	
N° participants: 32				

3.1 Adapting ToSCA methodology for a new context

For the internationalization of ToSCA UPC to the UFPS Deepening Course, a management team is established conformed by Dr. J.L Zamora and Marta Adroer, in Barcelona and the coordination of Carmen Xiomara Díaz Fuentes in Cúcuta.

From the UFPS coordination, the committed key professional team for the development of a workshop with the ToSCA methodology is defined:

Customer	Cerámica Italia,
Teaching staff	Carmen Xiomara Díaz Fuentes, Architecture Program and CIMAC UFPS
Instructor	Ramon Galvis Centurión, Miguel Niño Ramirez Architecture Program UFPS
	Miguel Peñaranda Canal/ Deepening course coordinator UFPS
Evaluating court	Erika Ayala García/Architecture Department Director UFPS
	Jorge Sanchez Molina/ CIMAC Director UFPS
	Gustavo La Rotta/National leader of training at Cerámica Italia

In sum, the participants’ team in this internationalization of the experience of education for innovation ToSCA has a high involvement of participants from the University and the Norte de Santander Region. Besides, there will be support by Marta Adroer from the ToSCA UPC team, who will act as director of the workshop and as a teaching instructor.

3.2 Structural adaptation

There are structural differences in the programming of Design Lab II and ToSCA UPC, so to deal with them in the design of the workshop for UFPS some specific didactic strategies will be implemented.

	ToSCA ETSAV UPC	Design Lab II UFPS
Optional	Optional workshop for grade architecture students	Module into an optional Deepening Course "the ceramics in the architectural project"
Students Profile	Students between 7th and 10th fourth month grade period.	Students for obtaining the Degree or that are already graduated
	Students aren't specific knowledge on the subject of innovation	Specific knowledge on ceramics as building material from the entire course.
Schedule	Intensive seven days week workshop,	Intensive tree day workshop with a previous autonomous tutorized phase.
Participants	28 students working in four participants collaborative teams with assigned roles: Novelty, Rigor, Implementability and Communication.	
	Minimum two teachers as coach, not experts	One tutor in the autonomous phase, and four teachers as coach in the workshop.
Real Client	Real client that purposes the problem to resolve and he will receipt at the end of workshop multiple innovative projects to solve it.	
Assessment	External committee that includes the client made the final assessment.	

3.3 Adaptation proposal ToSCA UPC to Design Lab II

Firstly, the schedule differences implies some challenges about the framework that has been designed and practiced in twelve ToSCA editions.

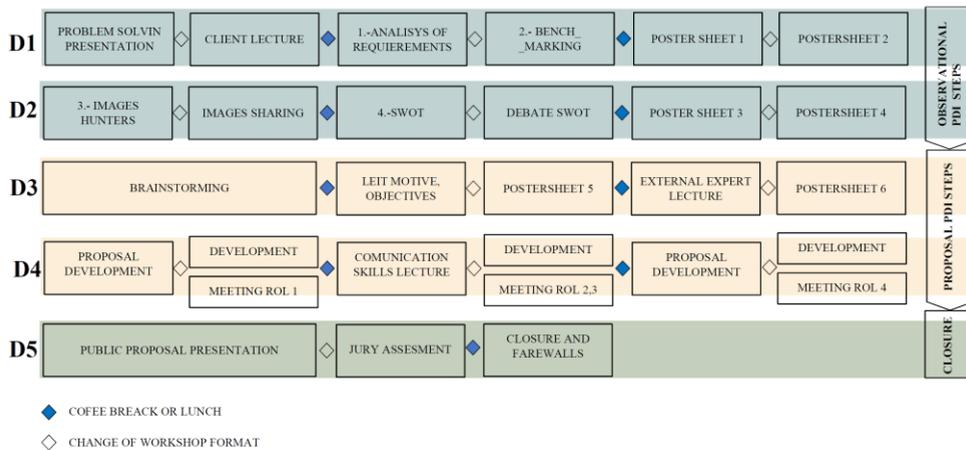


Figure 1 Schema ToSCA ETSAV UPC workshop structure.

Could the observation activities of the innovative product process be developed through autonomous tutored learning?

ToSCA UPC team proposed to change the usual didactic format of the observation phase to an autonomous tutorized format. Therefore, is essential to provide tutorial documents to UFPS, where questions are proposed to guide participants through the observation steps and implies also the involvement of a UFPS professor that assume the assignment of work and their supervision.

As a consequence, the adapted design framework must include workshop presentation and to debate and share the results of the autonomous work among students into proposal steps period, and it must be interesting to increase the number of teachers into Design Lab staff for better student's assistance during the shortened proposal period.

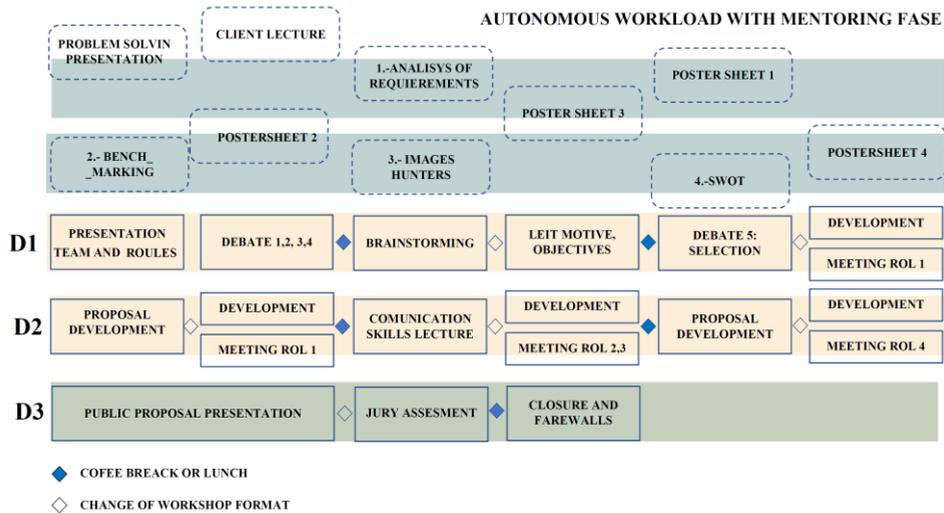


Figure 2 Schema Design Lab. II final workshop structure.

4. Evaluation of the experience results

The implementation of the workshop showed the importance of carrying out in detail the discussion sessions of the observation phase, at the beginning of the face-to-face activity, due its importance to elaborate, rigorously, an evaluation of innovation opportunities of the challenge raised

As a consequence of this necessary debate, all the proposed activity finally had to be concentrated in a day and a half, assuming the risk of lack of preparation time.

Some difficulties that could arise as a result of cultural differences between the UPC faculty and the UFPS students were quickly corrected by the mediation of UFPS professors itself.

The academic result of the experience is considered very satisfactory at the discretion of the management of the UFPS Architecture Program and the customer Cerámica Italia, judging by the assessment and comments on the closure day. The assessment of the committee members was remarkable, with average team scores between 4.18 and 4.75 out of 5.

The evaluation of the participating teachers' team was very high due to the results and the constructive interaction between the two universities.

Regarding the survey to the students allows the following data to be shown:

100% of the participants assert that their innovation proposal was the result of teamwork, and 86% considered that it exceeded their initial expectations.

83% of the participants considered that working with roles stimulated the homogeneous participation of all the members of the team, although only 48% considered them relevant in their product innovation proposal.

Almost 70% of the participants said that the activity of Technical Product Innovation carried out, showed them a possible professional leave-taking for architects.

74% considered that the structure of the activity was important in the good result, but, half of them, place it only in third out of six place. In the usual ToSCA UPC surveys, this assessment is mostly placed first or second. The shortened workshop schedule may have impacted on a lower perception of the ToSCA dynamic.

The students qualify teachers as "companions" in 54%, as "catalytic agents" in 24%, and as "leaders" in 22%, qualification of leaders, which barely appears in the ToSCA UPC surveys.

In spite of not having days between the proposition phase and the presentation of results before the jury, the presentations were all of great image quality and elaboration.

5. Conclusion

The specific and transversal competences acquired during the Design Lab II have been similar to those of any ToSCA ETSAV workshop, despite the socio-cultural change that internationalization entails and in spite of the modifications in the structure of the subject.

Therefore, we conclude that this experience of ToSCA Education for Innovation, within a framework of higher technical studies, achieved to motivate in a different socio-cultural environment and that is quite possible to approach the observation phase of the workshop under a self-managed tutored format, but then certain conditions are necessary. In particular:

The coordination for the workshop adaptation, as well as the observation phase in autonomous tutored format, should be carried out by local teaching staff of the University where the activity takes place, in order to answer the doubts and stimulate the students in front of the uncertainty that implies starting an unknown teaching experience, directed from another university and in the absence of any representative of it.

For the correct development of the proposal phase, it is necessary to add to the framework one or two activities to share and debate among students the results of the autonomous observation phase, in order to establish links between these two stages.

It seems essential for the correct international transfer of the Innovation Product Design ToSCA workshop, the local teacher's active involvement, for their exhaustive knowledge of the physical, economic and socio-cultural conditions of the place, and in proportion to the duration of the face-to-face activity in order to give personal assistance to the student teams, equivalent to that of a four-day intensive workshop.

These two factors seem to induce some devaluation of students' own perception of autonomy of learning and leadership.

It should be noticed that in this case, the Design Lab II module was integrated into a semester course of deepening in architectural ceramics. In addition, the higher-level student profile participants. These two facts can generate some distortion in our assessment of the results from the Workshop the observation phase as an autonomous supervised activity and on the high level of results despite the schedule difficulties.

Finally, the internalisation experience shows that it is a great opportunity to verify and improve our understanding of one of the high school 21st century challenge: education for innovation.

References

- Zamora, J.L. (2014) *ToSCA, a workshop on architectural building solutions: changing the way building product innovation is taught*. JIDA'14: Jornadas sobre Innovación Docente en Arquitectura. Stracted 04/02/2018 https://upcommons.upc.edu/bitstream/handle/2099/14592/16_Zamora.pdf?sequence=8&isAllowed=y
- Ulrich, K.T. and Eppinger, S.D., (2012). *Product design and development*. 5th ed. New York: McGraw Hill.
- Pujolàs, P. & Lago, J.R. (coords.) (2011). *El programa CA/AC ("Cooperar para aprender / aprender a cooperar") para enseñar a aprender en equipo. Implementación del aprendizaje cooperativo en el aula*. Barcelona: Universitat Central de Catalunya. Stracted 04/02/2018 from: www.elizalde.eus/wpcontent/uploads/izapideak/CA-ACprograma.pdf

- Sánchez, J. (2004). *Diagnóstico de la situación de los artesanos de la arcilla del área metropolitana de Cúcuta*. Grupo GITEC. Universidad Francisco de Paula Santander.
- Sánchez, J. (2008). *Conformación e implementación del clúster de la cerámica de Norte de Santander*. Grupo de investigación en tecnología cerámica. Editorial Universidad Francisco de Paula Santander.
- OCyT (2012): *Indicadores de Ciencia y Tecnología*. Observatorio Colombiano de Ciencia y Tecnología.
- PEDCTI, 2014-2024. *Plan estratégico departamental de ciencia, tecnología e innovación. Gobernación de Norte de Santander*, Colciencias. 5.6. Plan de acción clúster industria cerámica en Norte de Santander, pg-1468.
- Ministerio de Vivienda , Republica de Colombia. *Plan de Acción Sectorial de Mitigación*. Stracted 30/01/2018 <http://www.minvivienda.gov.co/Cambio%20climatico/Presentación%20Desarrollo%20Territorial%20y%20Vivienda.pdf>

Content review using *Kahoot!* with aeronautical engineering students

Albero, Vicente^a; Ibáñez, Carmen^b

^aDepartment of Continuum Mechanics and Theory of Structures, Universitat Politècnica de València, Spain, ^bDepartment of Mechanical Engineering and Construction, Universitat Jaume I, Spain

Abstract

In the framework of the subject “Analysis of aeronautical structural components” included in the Master of Science of Aeronautical Engineering at the Universitat Politècnica de València, the application Kahoot! is employed in order to review the technical content and obtain feedback of the level of knowledge acquired by the students. Kahoot! allows developing multiple choice interactive quizzes that are solved in the classroom.

Using this type of tools enhances the attention of the students and helps to create interesting discussions making the students be part of the teaching-learning process. Besides, the platform allows analyzing the results of the technical content reviewed which, in turn, permits the lecturer to adapt the didactic material to a real scenario. Furthermore, the results obtained from the assessment survey show the high level of satisfaction of the students with an activity which allows them to learn in a fun way. In conclusion, the application of Kahoot! for content review helps to perfect the teaching-learning process and improves academic performance in an attractive and engaging environment.

Keywords: *apps; gamification; quiz; game; smartphone; Kahoot!*

1. Introduction

In these days, as a result of the European Higher Education Area (EHEA) harmonization process, more flexibility on the learning-teaching process is required. This is necessarily linked to the development of new methodologies to both improve the continuous progress of students and, not less important, enhance the motivation and professionalism of teachers. These goals can be accomplished with the integration of electronic learning and mobile learning strategies inside the educational scenario (Jin, 2009).

Although educational professionals have traditionally shown a great inertia against the change from traditional teaching methodologies (as classical theory lessons) to new classroom techniques, in the last decades, the use of the Information and Communication Technologies (ICT) in higher education has increased and currently they constitute new channels of information transmission (Fructuoso, 2015, Serrano y Fajardo 2017).

New generations of students have already interiorized in their daily life the dynamic of digital games which are characterized, among others, by the speed on making decisions or the immediacy of response. The incorporation of this technique based on game dynamics is known as gamification and has already proved to have positive effects in the development of the courses (Labrador et al. 2016, Sánchez 2015).

A very useful format for the gamification of content review sessions is the use of real time quizzes. The advances in technology have simplified the way in which quizzes can be applied in the classroom and implementing these techniques is even simpler when students can use personal devices capable of connecting to the web such as laptops, tablets or smartphones. Besides, students will feel more comfortable and confident with their own electronic device when dealing with a learning task. Also the fact that no clickers have to be purchased in order to carry out the activity facilitates its management and preparation, and at the same time, makes this technique a really economical option (Shea 2016, Lee et al. 2013, Grinias 2017).

One of the online systems which allows the possibility of performing these quizzes at the classroom is *Kahoot!* (2013). This application enables, in an easy and quick manner, the creation of real time quizzes based on speed scoring and board rankings. It helps to gamify the activity since the quiz is solved in an interactive way. On the screen, the answers given by the students are displayed immediately and this real time feedback may encourage them to improve in the next questions of the quiz. After each question, the application creates a leaderboard classification. Some works can be found describing the positive influence on the student's motivation of showing the scores of the classroom games in the same way that it is done in video games (Mauricio 2015, San Miguel et al. 2017).

In the same line, there are other online applications, such as Socrative (2013), used by lecturers for the implementation of quizzes in the classroom. In this case, Socrative permits also the preparation of open short answer questions contrarily to *Kahoot!*, where only the classical multiple choice questions can be implemented. Although this fact multiplies the design possibilities of quizzes, in this case of study, *Kahoot!* was chosen in order to enhance the dynamism of the activity. Besides, it must be highlighted that at Universitat Politècnica de València already exists a platform available for students and lecturers called *PoliformaT* which also allows the implementation of tests. However, the application where these tests are developed obliges the students to answer all the questions of the quiz in a given period of time, being possible only to know the correct answers once the test is finished. This dynamic does not permit to generate a discussion with the students after each question.

Thus, *Kahoot!* is a very intuitive application which can be used in the classroom and has important advantages, as the real time feedback. Besides, it permits to evaluate previous knowledge if the quiz is performed at the beginning of a lesson or even at the opening of the course, so the lecturer can have information about the initial level of knowledge of the students. Also, since it is an activity quick and easy to be developed, it can be considered a good tool to use for the continuous evaluation of the subject along the academic year.

This paper presents a new experience of the implementation of *Kahoot!* in higher education designed for students of the Master of Science of Aeronautical Engineering at the Universitat Politècnica de València (Valencia, Spain). The methodology is applied in the framework of the subject “Analysis of aeronautical structural components”. In this case, the activity consists of solving a series of questions of a quiz developed in order to review the contents already taught in previous lessons of the subject and prior to the final standardized exam. Besides, the results of the quiz can be used not only for the students to review those aspects where they found more difficult but also for the lecturers to review their educational material and adapt it for the next lessons to the level and progression of the classroom.

The main aspects of the experience developed and its assessment are described in the next sections. They can be used in the design of a similar activity, but, since the project presented has been performed in the framework of a Master of Science of Aeronautical Engineering, some issues may need to be adapted for another different context.

2. Methodology description

2.1. Preparation of the activity

The development of the activity starts previously to the opening of the course, when the lecturer is defining the learning outcomes of the subject. Focused on the evaluation of the student’s achievement of these outcomes, some quizzes are previously prepared by lecturer. They are going to be used at the end of some lessons to evaluate in an attractive

environment the students learning progress. Therefore, these quizzes should be short, clear and developed in a very direct way.

As it was explained above the online platform *Kahoot!* provides an excellent web-based context to develop this assessment methodology. It uses colourful graphics and interactive displays to transform temporally the classroom in a gaming show. In order to facilitate the quiz creation, a specific *Kahoot!* web site is available for lecturers. Thus, multiple choice quizzes can be created very easily and additional options as time limit, award points or attached media file (image or video) can be included.

However, before implementing the activity, it is necessary to take into account that the students know how to use the application. In order to avoid problems during the quizzes, some proofs were done previously. Besides, due to the necessity of having a permanent and good internet connections, it was really important to assure that all the participants could have access to the internet and so, to the application.

2.2. Context

The assessment methodology described in this paper was developed during the academic year 16/17 for the subject “Analysis of aeronautical structural components” of the first course of Master of Science of Aeronautical Engineering at the Universitat Politècnica de València. The students enrolled in this course have previously obtained a Bachelor Degree in Aerospace Engineering. However, it has been noticed during the last years that they come from a variety of different Aerospace Engineering Schools from several cities as León, Madrid or Valencia, among others. Therefore, the background knowledge of these students about aeronautical structural component analysis is not exactly the same. This is one of the most important reasons why the methodology explained in this paper for the formative assessment of the student’s outcome progress was implemented. In previous courses, the lecturers found out that students had different learning progressions and they realized that it would be necessary to have real time feedback to adapt the didactic material to the classroom real scenario.

The teaching plan of this course is divided into 9 general units, which match with the learning objectives of the subject. Each of these units is developed through two or three lessons. The first lesson of each unit consist of an initial classical theory lesson while the second and third one are based on problem solving lessons where key problems are proposed to the students to be solved with the lecturer guidance. The *Kahoot!* quizzes prepared previously by lectures are conducted at the end of the first lesson of each unit, just after the theory explanation. It takes only a few minutes and provides important information to the lecturer about the student’s learning outcome achievement. Additionally, this assessment methodology encourage them to promote their learning progress in a gaming context.

2.3. Lecturer role

In this student-centered activity, the lecturer assumed a secondary role. Specifically, the lecturer acts as the gaming show host while the students are the competitors.



Figure 1. Lecturer quiz description.

The activity is introduced by a brief description of the *Kahoot!* platform and all students are invited to join the quiz session through their laptops, class computers or mobile devices. The platform flexibility allows that all students can be ready to start the assessment activity in only a few seconds.

Before the quiz starts, to encourage the student participation, the lecturer describes some important aspects about the dynamic of the quiz as the time limit and score of each question. Thus, the students are introduced in a competition context. During the quiz, the lecturer should be acting as a controller because each question should be submitted step by step from the main computer, taking into account that all scores are processed.

After each question, the lecturer has the chance of involving the students in a discussion. Besides, the most usual mistakes are reviewed and the lecturer has feedback in order to adapt the material. Therefore, in the next lessons more emphasis can be put on the explanation of those concepts which appeared to be the most difficult.

2.4. Activity progress

In the activity, each question is launched by the lecturer and the students have 30 seconds to answer. In this case, multiple choice questions were created with four possible answers. For the sake of clarity, each question can be accompanied of figures or pictures. The students should answer the question through their smartphones. The platform shows a very colorful and clear answer screen to encourage competition, see Fig. 2.

When the question time is finished, and previously to launch the following question, the students receive an automatic personal feedback to know if the answer was correct or wrong. In addition, the correct answer and the partial score are provided to the students.

The system considered how fast the question is answered, increasing the score of those with the fastest rates. This procedure allows a motivational and formative assessment. At the end of the quiz, the student nickname with higher score is displayed in the main screen.



a) Question launched.

b) Answer device.

Figure 2. Question progress

Besides, the students can send to the lecturer a blind rate, in a 1-5 rating, about the activity. This last rating provides proper feedback about the opinion of the students. The results of this survey will be analyzed in the next section.

2.5. Results

Once the activity is finished, the results can be downloaded in a very detailed format from Kahoot! platform. This information can be processed to provide conclusions. In this experience, a diagram was prepared for each unit, where percentage of correct and wrong answer is displayed for each question. In Fig. 3, the results of two of the quizzes are shown.

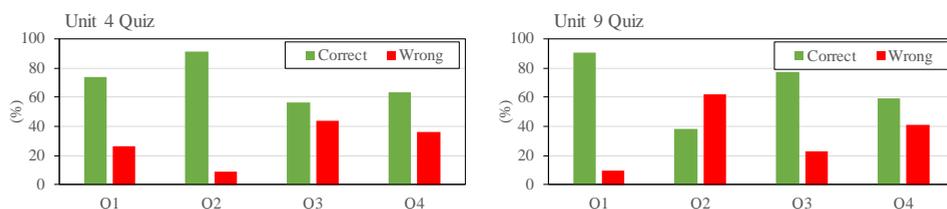


Figure 3. Quiz results

Through these diagrams it can be observed, for instance, that Q2 in unit 9 had a very low percentage of correct answers. It means that the learning outcome “Warping of open thin-walled sections” has not been reached properly. Therefore, this content is deeply prepared in the following problem solving sessions in order to fix this deficiency. Besides, this indicator will permit, at the end of the course, to improve both the didactic material and the lecturer explanations regarding this concept.

3. Assessment

Additionally, Kahoot! permits the student to express their satisfaction with the activity by means of a brief survey. This survey consists of two simple questions, one focuses on the engaging character of the technique and the other on the level of knowledge acquire or reinforced with the activity. Thus, the lecturer has immediate feedback and can act to make more dynamic the session. In table 1, the mean rating for the quizzes of all units is shown.

Table 1. Overall activity rating

Id	Value
How fun was it?	4.53 (1-5 rating)
Did you learn something?	0.90 (0-1 rating)

As can be observed, the results were satisfactory. In fact, the response of the students when new technique is introduced in the classroom tends to be positive. In this case, a mark of 4.35 over 5 was obtained related with the implementation of the activity, which encourage the lecturer to carry out the same type of game in next academic years. Also it is important to note that most of the students (90%) consider that they have learnt through these quizzes, which demonstrates the value of the tool in the teaching-learning process.

4. Conclusions

In the framework of the subject “Analysis of aeronautical structural components” of the Master of Science of Aeronautical Engineering, the application Kahoot! was employed for content review by means of multiple choice interactive quizzes. This tool helps to make the students be part of the teaching-learning process by creating interesting discussions and enhancing their attention. Besides, the lecturer can adapt the didactic material to a real scenario since the application allows analyzing the results of the technical content reviewed. Furthermore, the results obtained from the assessment survey show the high level of satisfaction of the students with this activity which allows them to learn in a fun way.

In conclusion, the application of Kahoot! for content review helps to perfect the teaching-learning process and improves academic performance in an attractive and engaging environment. However, it is really important and necessary to explain carefully to the students which is their role in the activity and the mission of the game. As other authors have pointed out (Kapp, 2012) overusing this type of activities in the framework of a university classroom may have the opposite effect. Gamification must be used with moderation so the objective of the subject and the goal of learning and achieving certain competences and skills is never missed.

References

- Fructuoso, I.N. (2015) How Millennials are changing the way we learn: the state of the art or ICT integration in education. *RIED. Revista Iberoamericana de Educación a Distancia*, 18(1), 45-65.
- Grinias J.P. (2017) Making a game out of it: using web-based competitive quizzes for quantitative analysis content review. *Journal of Chemical Education*, 97, 1363-1366.
- Jin, Y. (2009). Research of one mobile learning system. *Proceedings of the International Conference on Wireless Networks and Information Systems*, 1, 28-29.
- Kahoot! Wang, A.I., Brand, J., Brooker, J., Versvik, M. (2013). Norwegian University of Science and Technology (NTNU). Trondheim, Norway (Høgskolerigen 1, 7491, Trondheim, Norway)
- Kapp, K.M. (2012). *The gamification of learning and instruction: game based methods and strategies for training and education*. Pfeiffer: New York.
- Labrador, E. y Villegas, E. (2016). Unir gamificación y experiencia de usuario para mejorar la experiencia docente. *RIED. Revista Iberoamericana de Educación a Distancia*, 19(2), 125-142.
- Lee, A., Ng, J., Wong, E., Tan, A., Lau, A., Lai, S. (2013) Lecture Role No.1: Cell phones ON, Please! A low-cost personal responses system for learning and teaching. *Journal of Chemical Education*, 90(3) 388-389.
- Mauricio, M.D., Serna, E., Valles, S.L. (2015) Experiencias en la aplicación de la gamificación en 1º curso del Grado de Ciencias de la Salud. *Congreso de Innovación Educativa y Docencia en Red*. Universitat Politècnica de València.
- San Miguel, T., Megías, J., Serna, E. (2017) Gamificación en la universidad II: aprendemos a divertirnos enseñando. Se divierten aprendiendo. *Congreso de Innovación Educativa y Docencia en Red*. Universitat Politècnica de València.
- Sánchez, F.J. (2015). Gamificación. *Education in Knowledge Society*, 16(2), 13-15.
- Serrano, J.J. y Fajardo, F. (2017). The ICT and gamification: tools for improving motivation and learning at universities. *3rd International Conference on Higher Education Advances*, 540-548.
- Shea, K.M. (2016). Beyond clickers, next generation classroom response systems for organic chemistry. *Journal of Chemical Education*, 93(5), 971-974.
- Socratic. MasteryConnect. Salt Lake City, UT (222 South Main, Suite 200. Salt Lake City, UT 84101, USA)

The MEM project: experiences, challenges and outcomes of an international double master-level degree

Montanari, Roberto ^a; Abdel-Malek^f, Layek; Andrei Paolo ^b; Ferretti, Gino^a, Valenti, Simonetta^c; Maria Mancinelli, Luca^e; Bernazzoli, Alessandro ^d; Bottani, Eleonora^a, Bloom, Joel S.^h; Deek, Fadi P.^g

^aDepartment of Engineering and Architecture, ^bDepartment of Economics and Management, ^cDepartment of Humanities Social Sciences and Cultural Industries, ^dInternational Division ^eUniversity of Parma, Italy. ^fDepartment of Industrial and Manufacturing Engineering, ^gDepartment of Informatics, ^hNew Jersey Institute of technology, USA.

Abstract

Educating the workforce of the future to perform adeptly in the global environment as well as to surmount cross cultural boundaries is of a paramount necessity in today's technologically advanced and complex settings. This environment has led institutions of higher education to seek international collaborations to face these challenges. Building on experiences and successes gained from a nearly decade long project entitled UMANE that was jointly supported by both the US Department of Education and the EU for undergraduate double/triple Bachelor's degrees, this paper reports on an extension of the earlier partnership, to include a graduate level partnership that offers a double master degree between New Jersey Institute of Technology (NJIT) and University of Parma (UNIPR) that was put in place in 2015.

In this work, we present the developed framework of this international cooperation, report on its challenges, and share our experiences. Specifically, the framework of the agreement establishes guidelines and course of study leading to double master degrees in the area of Engineering Management, one from NJIT and another from Parma University. Students in this program, usually, start their studies in Italy, attending the classes at their home Institution and then move to Newark, New Jersey, during the spring/second semester (6 months) of their first year, to attend NJIT classes. At the end of their studies, students will be awarded two master's degrees in Engineering Management from the partnering universities.

Keywords: *Double Degree, Internationalization, Engineering Management Education*

Literature Analysis

By doing a search on the Scopus database, using the keyword "Double degree", and including: only articles written since 2014, and having the main focus of the field of engineering; only 6 articles are considered that deal with initiatives aimed at achieving different Master Degrees in collaboration with different universities (Bakholdin et al., 2015; Biesenbach et al., 2016; Gnatov et al., 2017; Ishikawa et al., 2016; Bernabeu et al., 2016; Rawashdeh et al., 2014). It follows that the initiatives aimed at achieving double degrees at different universities are currently pioneering activities. Therefore, since the literature is lacking in contributions, it would be necessary to commit more resources towards the development and implementation of these programs, since the benefits deriving from them benefit both universities and students.

1. Introduction

Today, graduating engineers have to work and interact in a global environment. Cognizant of this fact, many institutions of higher education offer study abroad programs, joint undergraduate degrees, as well as dual or double degrees. One of the major goals of such programs is to expose graduating students to different educational, cultural, linguistic, managerial, and operational environments. Nevertheless, some of these programs are easier to implement than others (Malek et al., 2014). Although the undergraduate programs are less accommodating than their graduate counterparts, because of accreditation concerns, UNIPR and NJIT have had a long-standing cooperation since 2010. Through an award from Erasmus and the US Department of Education, these two institutions, in addition to Valencia Polytechnic University, developed double and triple degree bachelor's programs where they have graduated around 50 students that enjoy successful careers. Capitalizing on the experiences gained from this award a new collaborative project has been launched to focus on a graduate education, a Master in Engineering Management (MEM). In this paper, we discuss the development, evolution, and challenges of the MEM international program. The organization of this work includes, in addition to this introduction, several sections such as the project's Memorandum of Understanding (MoU) among the participating institutions, the study plan, benefits and difficulties that had been faced and overcome, and concluding remarks.

2. MEM Proposal and Memorandum of Understanding

The MEM project provides students with an opportunity to receive double master degrees from the University of Parma (UNIPR) and New Jersey Institute of Technology (NJIT). The participating institutions are collaborating with one another on a non-exclusive basis in the development of several master-level degrees in engineering, starting with a Master of

Engineering Management (MEM) dual degree program (MoU, 2015). The sending institution is primarily responsible for the recruitment, selection, and academic advising of its exchange students. Moreover, it currently assists in their cultural and language preparation. The sending institution also assesses and transfers courses taken at the receiving institution by the exchange students. These credits are used toward satisfying the sending institution's degree requirements. Exchange students from the sending institution normally study at the receiving institution for a period not to exceed two semesters (one year). The receiving institution also works reciprocally toward recognizing courses taken at the sending institution by the exchange students and assigning transfer credits to such courses taken. Similarly, these credits are counted toward satisfying the receiving institution's degree requirements. To be clear, while exchange students are physically at the receiving institution, satisfying requirements for their sending institution's degree, they are considered enrolled at the receiving institution and considered as non-enrolled but maintaining registration at the sending institution and vice versa. The aim of this project is to launch and advance academic exchange and cooperation in the general field of engineering, starting with Engineering Management. Students participating in the Program complete at least 30 semester credit hours, obtaining minimum of fifteen (15) of the required course credits for the degree from their home institution and at least fifteen (15) credits from the other institution. Upon successful completion of the remaining host institution courses, the credits from each participating institution are transferred to the other participating institution to satisfy the degree requirements at each institution. Among other goals of this collaboration are improving the level of transnational expertise and competences of European and American students, enhancing job opportunities, competitiveness, cultural exposure, and language skills (Malek et al., 2014). Moreover, the MoU includes the objectives:

- Develop an institutional basis for cooperation and exchanges.
- Develop Master of Science in Engineering degree programs, starting with the field of Engineering Management. These programs would advance the expertise and competences of participating students from both the EU and the US.
- Increase employment opportunities for graduates of the joint degree programs, due in part to global exposure, industrial participation, and the content of courses from different and high-specialized programs in multiple universities.
- Improve the proficiency of students in foreign language(s) and their appreciation of multiple cultures.
- Facilitate operation of participating students and faculty in different international environments.
- Exchange students between the participating institutions.
- Exchange faculty members between the participating institutions to facilitate the programs as well as enhance research collaborative efforts.

Monitoring students' progress is of paramount importance to the program. There are at least two advisors attending to each of the participating students advancement. Among others, their main tasks are to coordinate the institutions' requirements both technically and administratively. The technical and administrative coordination addresses and resolves pertinent issues that may arise during the term of this project. The advisors also facilitate supervision and reporting on the activities conducted within the framework of the double master. The project is currently in its second year. Students that join the program are motivated by the fact that they graduate with two master's degrees from both countries almost at the same time period. To be selected, exchange students must meet several criteria such as academic record; language fluency as determined per the circumstances and needs of each program; financial means of support available while taking courses at the receiving institution; relevant and appropriate curricular interests; and other criteria that the participating institutions may mutually require.

3. The Study Plan

Naturally, students in the program take courses at both institutions (See Figure 1).

Mobility:	UNIPR students		Main activities
Year 1	Semester 1: (October- December)	Learning at home institution	<ul style="list-style-type: none"> Learning EN language training
	Semester 2: (January- May)	Learning at NJIT	<ul style="list-style-type: none"> Learning Class assignments
Year 2	Semester 1: (October- February)	Learning at home institution	<ul style="list-style-type: none"> Learning Finals Exams
	Semester 2: (March- June)	Learning at home institution	<ul style="list-style-type: none"> Learning Joint Thesis Project Finals Exams Graduation Award of Master's Degree

		UNIPR students	USA	Main activities
Year 1	Sem. 1	Departure required early January	NJIT	<ul style="list-style-type: none"> Learning EN language courses for IT students
	Sem. 2	Repatriation expected by the end of May	NJIT	<ul style="list-style-type: none"> Learning Finals exams at NJIT and Finals exams at UNIPR after repatriation
Year 2	Sem. 1			<ul style="list-style-type: none"> Learning Finals exams at UNIPR
	Sem. 2		Possibility to join Commencement Ceremony at NJIT	<ul style="list-style-type: none"> Learning Joint Thesis Project Finals Exams at UNIPR Dissertation Award of Master's Degree

Figure 1. Mobility Program

However, due to the different educational systems, the number of academic credits must be converted from US program to the EU program and vice versa. It is therefore important to coordinate an academically balanced program, including the length of the courses offered by the different universities and the workload of the programs. There are some established patterns to follow regarding degree equivalencies:

- In Italy, master's studies are 120 credits for 2 years, 60 per year. Exchange students have to complete 90 European Credit Transfer System (ECTS) credits for one year and a half to earn the degree. ECTS credits in Europe correspond to 24 hours of a student's work; one third of these hours (8 hours) are covered in class.
- In the US, a conventional master's degree is approximately 30 credits earned typically over a year and a half. A one credit corresponds to one hour/week of in-class lessons for roughly 15 weeks. Hence, approximately 1 credit in the US system corresponds to about 15 in-class hours of a student's work.

Thus, the equivalence between the US credits and the European credits is 3 US credits = 6 ECTS (Mora & Montaner, 2014). In this way, 90 ECTS plus 30 American credits make a full 120 ECTS. However, it is important to note that cases are also addressed on individual basis. Another factor considered is the difference in the grading system. In the US, grades are specified using letters (A, B, C, ...). In Italy, grades are out of 30-point total of, and the minimum grade required for passing is 18 points. In addition, attendance is not required to pass the courses. That may differ from the US where class attendance may be required. There are concordance tables to transfer the grades among the universities (see Figure 2).

GRADES CONVERSION TABLE AMONG ITALY AND U.S.A.														
ITA	30	29	28	27	26	25	24	23	22	21	20	19	18	
U.S.A	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E+	E	

Figure 2. Conversion table of academic grades among the countries

To achieving the degree, specific core courses for each degree are need to be taken in addition to electives one. Due to natural overlap in these courses, and because some courses may not be offered when the students need them, one challenge in this project is to carefully plan the students' academic path at both institutions to achieve both degrees' requirements. To facilitate this, the receiving institution identifies a set of courses that may be taken by exchange students during their period of mobility. Defining a set of courses instead of establishing a specific study plan has allowed for more flexibility and has ensured that students can attend courses which are appropriate for their specific background (Malek et al., 2014). However, the sending institution also puts in place a first-year study plan to include that set of courses for the students. The equivalence and the validity of the study plan are checked and verified between universities using the existing administrative procedures, and formally evaluated by specific advisors at each institution. Needless to say, to award students their degree, each student must satisfy the core and elective courses and earn the number of credits necessary set by both the institutions.

4. Tuition, Scholarships and Loan of Honor

According to the project's MoU, students participating in the dual degree program pay tuition in both institutions, depending on their current matriculation. Exchange students bear tuition and fee costs at the receiving institution while physically attending there, and also pay tuition and fees at the sending institution while attending it. To facilitate the implementation of this project and encourage students to pursue such opportunities, NJIT offers a reduced tuition for the Italian exchange students. Participating students are charged tuition and fees at the in-state level. This reduction in cost has been cited as a major driver to the success of the program. This contribution of NJIT has been crucial to achieving project objectives. In addition to NJIT's favorable tuition policy, to help and boost the students' mobility further, the sending institution every year offers several scholarships

(between 2,400 up to 4,000 €) exclusively related to MEM project, to the top performing applicants. The eligibility criteria for this scholarship are:

- Language skills (English level B1); the knowledge of English is preliminary tested through a written exam.
- Academic excellence. The academic carrier of students is evaluated by examining the number of exams passed and the score reported of the undergraduate degree.
- Personal motivation and commitment. The personal motivation of students applying for the project is evaluated through a written letter.

In addition, UNIPR partner Bank, Banca Popolare di Sondrio offers a Loan of Honor up to 15000 € exclusively for students applying to the MEM project to cover students' tuition and housing expenses. The interest rate is much more advantageous compared to rates of competitors. In fact, in Italy, usually, such loans are not offered at all. Banca Popolare di Sondrio extended this unique offer to MEM students as per special agreement between the parties.

5. Challenges and Advantages

In addition to the advantages already described, these types of collaborative programs present challenges, both logistical and academically. The following are some examples:

- 1) As in any international collaboration, the institutions and all involved parties need to communicate effectively to avoid misunderstandings.
- 2) Administrators at all levels have to be made aware of the complexities of such projects, particularly issues that may arise regarding credits equivalencies and each institute transfer credit requirements.
- 3) Flexibility of the institutions involved is a major challenge particularly in recognizing the equivalency of the other university's courses. Often, it is not one-to-one correspondence. Therefore, program advisors should be intimately aware of course contents in order to determine equivalency for each student and identify the remaining requirements to fulfill to earn the degree in the most efficient manner.
- 4) Online registration is also a challenge. Unless already coded, the computer will not recognize that a student has taken a certain prerequisite course elsewhere. So, it will not allow online registration to proceed requiring for a manual intervention. When European students arriving in the US face such delays some courses they need may be closed causing disruptions for students and faculty alike.

None of these challenges were insurmountable and, in fact, most are successfully and quickly overcome. Of course, being as flexible as possible is key to dealing with these and other such challenges. At the same time, it is worth iterating the opportunities that the

MEM program offers to the exchange students. First, students involved benefit significantly by having an international experience during their studies. This means that they could interact with others in distinct cultural, social, linguistic, and educational environments, and experience different teaching and learning methods, thus improving their entrepreneurial skills. Consequently, students are prepared to work as part of an international workforce, coping with the challenges of our modern global economy and industry. In addition, students have the chance to improve their ability to think laterally. Ideally, students can become mature, inquisitive, analytical, and organized. Approaching their vocations from different points of view and learning new ways to solve problems help to develop their passion for engineering. Experiences like these represent a path to discovery and innovative ideas. Placed in different environments, students can meet new people and build their own networks. Communication is another important aspect where the student develops new skills. Communication abilities are increasingly becoming important as engineers frequently interact with specialists in a wide range of fields outside their domains. Another personal asset is for students to develop the ability to work in groups, typical of the American contemporary learning style, where large projects and workgroups are frequently required. Becoming part of a larger group, an individual has a chance to become a team player by working together with others having different characteristics. Finally, other skills are acquired due to the different environments where the student develops knowledge of different countries, the capacity to be self-sufficient, and develop leadership traits. (Mora & Montaner, 2014).

6. Conclusion

No matter where it is taught, force is equal to the mass times acceleration. But among the many value-added are cultural, linguistics, modes operandi, and pedagogic approaches. These attributes significantly add to the educational experiences gained from international collaborative projects to the benefits of both for students and faculty.

At the present time, there are 27 graduate students involved in these double degree programs of Engineering Management (three of them are in the newly developed double degree in Mechanical Engineering.) While no students have graduated yet from these double masters degree programs, our prior collaborative joint projects at the undergraduate level leading to approximately 50 double and triple bachelor's degrees granted to students from the University of Parma, Polytechnic of Valencia, and NJIT (the outcome of an Erasmus and US Department of Education award) demonstrate the values of such international degrees as evident by the successful employment of these graduates. Nevertheless, for this project, initial feedback from participating graduate students is quite positive.

Our experience in this space shows that for these types of programs to be successful, it is of utmost importance that certain components have to be present. Among the most important ones are higher administrative support and some flexibility in the curricula. Top administrative support is necessary to advance programs and enable navigation through institutional complexities. As for the flexibility aspect, no two programs are exactly congruent. Therefore, when transferring courses between programs, graduate advisors should exercise their judgments, owing to the fact that only main concepts of the subjects are learned and not the weekly course syllabi.

References

- Bakholdin, A., Kujawinska, M., Livshits, I., (...), Romanova, G., Tolstoba, N., (2015). Double degree master program: Optical Design Proceedings of SPIE. *The International Society for Optical Engineering* 9793.
- Biesenbach, R., Schillo, H., (2016). JIM2L-Development and Implementation of a MSc Double Degree Programme in Mechatronics for Egypt, Jordan and the European Union. 16th International Conference on Research and Education in Mechatronics, REM 2015 – Proceedings 7380392, pp. 197-202.
- Gnatov, A., Argun, S., Ulyanets, O., (2017). Joint Innovative Double Degree Master Program «energy-saving technologies in transport». 2017 IEEE 1st Ukraine Conference on Electrical and Computer Engineering, UKRCON 2017 – Proceedings 8100442, pp. 1203-1207.
- Ishikawa, T., (2016). Textile Engineer Training Program in France through the Double Degree Program. *Journal of Fiber Science and Technology*, Vol.72, Issue 1, pp. P16-P17.
- Malek, A. L., Montanari, R., Bernazzoli, A., Bottani E., & Rinaldi, M. (2014). Experience and Challenges of International Dual and Joint Degrees. *Eighteenth International Working Seminar on Production Economics. 24-28 February 2014. Innsbruck, Austria.*
- Malek, A.L., Ballester E., Bernazzoli A., Montanari R., & Sánchez Ruiz, L.M., (2014). Towards the Global Engineer: a triple degree approach. *4th Valencia Global 2014, 19-20 June 2014, Valencia, Spain.*
- Mora, L. M. & Montaner, J.J. (2014). International Education, UMANE Atlantis Program, EU/US International Bachelor's Degree. *ASEE 2014 Zone I Conference, April 3-5, 2014, University of Bridgeport, Bridgeport, CT, USA.*
- Parma University, & NJIT (2015). Memorandum of Understanding among UNIPR and NJIT. *Official agreement held by the participating institutions; Version 015, 6 July 2015.*
- <http://www.unipr.it/overworld20162017>

- Pérez-Bernabeu, E., Sellés, M.A., Sánchez-Caballero, S., Pla-Ferrando, R., (2016). Improving International Manufacturing Projection: Double Degree with a German University. *Materials Science Forum* 853, pp. 42-47.
- Rawashdeh, N.A., Tutunji, T.A., Younis, M.B., (2014). Development of a Jordanian-European Double Degree Master Program in Mechatronics Engineering. *15th International Workshop on Research and Education in Mechatronics, REM 2014*.

Why students travel abroad (and so many others do not): Exploring predictors and decision-making processes in study- related student travel

Ahlgrimm, Frederik^a; Westphal, Andrea^a; Heck, Sebastian^a

^aDepartment of Education, Potsdam University, Germany

Abstract

Over the past few years, studying abroad and other educational international experiences have become increasingly highly regarded. Nevertheless, research shows that only a minority of students actually take part in academic mobility programs. But what is it that distinguishes those students who take up these international opportunities from those who do not? In this study we reviewed recent quantitative studies on why (primarily German) students choose to travel abroad or not. This revealed a pattern of predictive factors. These indicate the key role played by students' personal and social background, as well as previous international travel and the course of studies they are enrolled in. The study then focuses on teaching students. Both facilitating and debilitating factors are discussed and included in a model illustrating the decision-making process these students use. Finally, we discuss the practical implications for ways in which international, study-related travel might be increased in the future. We suggest that higher education institutions analyze individual student characteristics, offering differentiated programs to better meet the needs of different groups, thus raising the likelihood of disadvantaged students participating in academic international travel.

Keywords: *internationalization; international academic mobility; study-related student travel; study abroad; teaching students; teacher education*

1. Introduction

According to the latest surveys, roughly a quarter of students enrolled in German universities take part in academic international travel during their studies. This includes studying abroad, internships, excursions, summer schools, projects and other study-related foreign stays. And yet, the vast majority of students in higher education do not take up these opportunities (Middendorf et al., 2017; Woisch & Willige, 2015). The questions is: What is it that distinguishes those students who do take up these international opportunities from those who do not? Which factors facilitate or debilitate the decision to travel abroad for academic reasons? And is it true—as is frequently presumed in Germany—that teaching students are academically less mobile than peers who are not studying to become teachers?

A desire to address the challenges of a pluralistic, globalized society have resulted in calls for advanced internationalization in higher education in the European Union and in many countries, including Germany. Some studies, however, have warned against the danger of overestimating the positive effects of academic mobility. That being said, many empirical studies show that international travel often leads to positive outcomes. The range of studies on the effects of study-related stays abroad can be roughly categorized into three areas: General personality traits; foreign-language skills; and intercultural competencies and sensitivity (Streitwieser, Le, & Rust, 2012).

2. Empirical findings

When German students travel abroad as part of their studies, the reasons for their trips breakdown as follows: Studies abroad (58%), internships (30%), excursions (10%), language courses (6%), summer schools (4%), and projects (4%) (Woisch & Willige, 2015). What are the reasons for students to opt in or out of academic mobility? German and international studies have tackled this question using either qualitative approaches, such as interviews, or quantitative ones, mainly surveys. While some studies have looked into students' motives and perceived barriers (e.g. Cao, Zhu & Meng, 2016), others have concentrated on personality traits (Zimmermann & Neyer, 2013) or socio-economic characteristics (Finger & Netz, 2016). These were used to predict the likelihood of students becoming academically mobile. Other studies examined how students with international experience differed from peers who were not academically mobile. This approach should be handled with caution, however, as it does not take into account whether disparities between the groups of mobile and non-mobile students existed before moving abroad or if those disparities emerged as a result of international travel.

2.1. Reasons for going: Students' motives for travelling abroad

Why do students travel abroad as part of their studies? When asked to describe their motives, they emphasize positives such as encountering a different culture, improving their language abilities, and gathering new experiences, often referred to collectively as intercultural competence or intercultural sensitivity. The majority of students also mention that they believe it will have a positive effect in advancing their careers and will bring about gains in their subject field. In addition, many students see personal development as an important factor, believing it will lead to greater independence, as well as higher self-esteem and self-awareness (Woisch & Willige, 2015). Only a small percentage indicate that they had to go abroad as a mandatory part of their studies (Heublein et al., 2008; Middendorf et al., 2017). In her qualitative study, based on 38 interviews with internationally mobile students, Ernlund (2014) developed a typology of four ideal types (Adventurer, Knowledge-Seeker, Escapee, and Cautious Academic), showing that mobile students' reasons for studying abroad differ significantly according to their motivations.

2.2. Reasons for staying: Perceived obstacles to travel

What keeps university students from travelling abroad, or even wanting to travel abroad in the first place? The most frequently mentioned reason is funding. Losing time and prolonging their studies is another apprehension. In addition, social reasons like a long separation from a partner, friends, or family are often noted (Heublein et al., 2008; Middendorf et al., 2017; Souto-Otero, Huisman, Beerkens, de Wit & Vujić, 2013; Woisch & Willige, 2015). Many students in Germany, as well as a number of other countries, cite the fact that academic achievements in foreign countries are not recognized by their home institutions. Further hurdles mentioned include lacking foreign language skills and a lack of information and support from the home institution (Woisch & Willige, 2015; Souto-Otero et al., 2013). Notably, students who wish to travel abroad perceive obstacles differently than those who do not wish to leave. The latter see much less sense in time spent abroad and are more likely to perceive losses through long separations from partners and friends. They also give their own laziness as a reason that they have not travelled abroad (Woisch & Willige, 2015). Overall, both a lack of motivation to move abroad and a sense of the perceived hurdles can lead to students deciding against international academic mobility.

2.3. Who stays and who leaves? Differences between students who stay and those who go

By taking individual and contextual characteristics into account, empirical studies can predict how likely a student will be to travel abroad as part of their studies. It is notable that female students are academically much more mobile than their male peers (Luo & Jamieson-Drake, 2015; Stroud, 2010). This discrepancy cannot be fully explained by the fact that more females are enrolled in study courses with higher international exchange rates, such as economics or modern languages. Even within the same subjects, women tend

to strive for international experiences more than men (Salisbury, Umbach, Paulsen & Pascarella, 2009; Stroud, 2010).

Besides gender, family background is another important predictor of one's likelihood to travel. It is much more likely that students with an academic family background will travel abroad than students from non-academic families (Finger & Netz, 2016; Lörz, Netz & Quast, 2016; Salisbury et al., 2009). It would appear that economic concerns are not the only reason for this, with students from non-academic backgrounds unlikely to even consider the option of international study, as Salisbury et al. (2009) point out:

Our exploration of predisposition to study abroad reveals a complex interplay between socioeconomic status, social and cultural capital cumulated before college, and social and cultural capital gained. (p. 137)

Markers for this predisposition to study abroad can include previous international experiences, such as school exchanges and family trips abroad, as well as foreign language skills (Lörz et al., 2016). Students who spend more time with friends are more likely to plan to study abroad (Luo & Jamieson-Drake, 2015), especially if those friends are from other countries or intend to travel abroad themselves (Van Mol & Timmermann, 2014). Parental support seems matter, too, in the decision-making process (Petzold & Peter, 2015).

2.4. Do trainee teachers take up less international opportunities than other students?

Because students in Germany have to choose a teacher-education track as soon as they enroll for their Bachelor program, the country's cohort of teaching students are often considered to be a special subgroup. In some circles, this subgroup is regarded as being less ambitious and risk-taking, thus resulting in less academic mobility. This is backed up by international research indicating that teacher candidates in other countries are also less likely to be academically mobile (Netz (2015). A closer look at German data samples, however, reveals that students enrolled for upper secondary teaching degrees (*Gymnasium*) travel abroad just as often as their peers in the same subjects who are not studying teaching – about 18% in 2009. In contrast, teaching students studying to become elementary, lower secondary, or special educational teachers are less likely to take part in international activities. There are indications that this might be explained by a weaker socio-economic background of students enrolled in elementary education, though more research is needed to understand the differences properly. Students' teaching specialties also appear to be of great importance. We find high rates of academic mobility in students enrolled in economics (41%) and in modern languages, cultural subjects and sports (31%), but not in science subjects and mathematics (23%) (Woisch & Willige, 2015).

Overall, teaching students seem not to differ significantly from their peers when it comes to academic mobility. Not surprisingly, their decision to travel is influenced by the same

mechanisms of selection and self-selection as other students. The differences between higher secondary candidates and other pre-service teachers might be explained by the higher percentage of students from non-academic backgrounds in the latter group. In addition, the extremely detailed and inflexible curricula in German teacher education—and the resulting issues with the recognition of international qualifications—may also lead to lower participation rates in international academic mobility.

3. Phases in decision-making

Some authors posit that the decision to take part in international activities is a result of rational choice (Lörz et al., 2016), others (Carlson, 2013; Netz, 2015; Wernisch, 2016) believe that it is the result of a decision-making process. As Carlson (2013) states:

[We take] a processual perspective by asking how students become geographically mobile, thus perceiving studying abroad not as the result of a one-time choice but as the outcome of different long-term biographical and social processes and events. (p. 168)

Netz (2015) proposes a model with three phases, based on Gollwitzer’s classic Rubicon model of action phases. We have augmented this approach, taking into account Wernisch’s concept of thresholds that have to be crossed (2016) (see Figure 1).

Figure 1. Phases and thresholds in the decision-making process

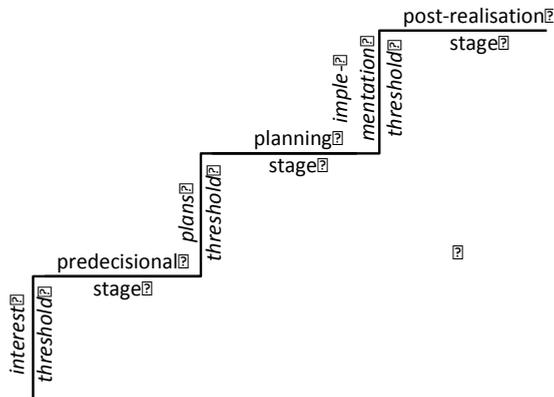


Figure inspired by Netz (2015) and Wernisch (2016)

After learning about existing opportunities, a student might become interested in academic mobility, developing a desire to take part in an initial, predecisional stage. In this very first phase, the individual’s social background plays a key role (Lörz & Krawietz, 2011; Netz, 2015). If someone decides to pursue the matter further and “their prior deliberation is

replaced by a sense of determination to actually realize the former wish or desire that is now experienced as a firm goal” (Achtziger und Gollwitzer, 2007, p. 769), they find themselves in a planning stage, which is primarily shaped by practical considerations regarding applications, funding etc. Only if they succeed in finding solutions to these issues, will they finally implement their plan and travel abroad, thus finding themselves in a (post-)realisation stage. Wernisch’s recent thesis (2016) describes in detail how different aspects shape the decision-making process during these stages.

4. Discussion

As described above, participation in academic mobility is highly selective and socially determined. In order to raise the share of students travelling abroad and make exchange programs not only available, but also attractive, to students from less privileged backgrounds, universities need to diversify their programs. It seems that programs such as Erasmus+ appear too requiring or risky for students who haven’t or have hardly travelled abroad before. Thus we see a need for easily available, low-risk, low-stake programs, such as short-term excursions, as part of a student’s study program, that could raise interest in and reduce the fear of international travel in those who have never been abroad before. The use of ICT to allow for virtual mobility should be a very good starting point to render international experiences possible without risks of financial or time losses. In addition, the mindsets and concerns of students with little or no previous international experience should be addressed when informing and advising them about academic mobility programs, possibly through peer reports from students with similar backgrounds. As financial reasons are often mentioned as reasons not to travel abroad, funding issues should also be addressed in early phases of information, as many students lack knowledge about scholarships and other sources of financial support. Finally, future research should aim to shed light on the potential advantages of academic mobility and highlight the outcomes, so that more students know what they can expect when travelling abroad—and what they will miss if they do not.

References

- Achtziger, A. & Gollwitzer, P. M. (2007). Rubicon model of action phases. In R. F. Baumeister & K. D. Vohs (Hrsg.), *Encyclopedia of social psychology* (Bd. 2, S. 769–770). Thousand Oaks, CA: Sage.
- Cao, C., Zhu, C. & Meng, Q. (2016). A survey of the influencing factors for international academic mobility of Chinese university students: International academic mobility of

- Chinese students. *Higher Education Quarterly*, 70(2), 200–220.
<https://doi.org/10.1111/hequ.12084>
- Carlson, S. (2013). Becoming a mobile student: a processual perspective on German degree student mobility. *Population, Space and Place*, 19(2), 168–180.
<https://doi.org/10.1002/psp.1749>
- Ernlund, M. (2014). La rencontre avec l'inconnu: Une enquête sur les motivations et les expériences des étudiants en mobilité. *Journal of International Mobility*, 2(14), 7–21.
https://doi.org/10.3726/81704_7
- Finger, C., & Netz, N. (2016). Neue Ungleichheiten im deutschen Hochschulsystem? Internationale Studierendenmobilität zwischen 1991 und 2012. *WZBrief Bildung*, (34). Retrieved from <https://www.wzb.eu/de/publikationen/wzbrieft-bildung>
- Heublein, U., Hutzsch, C., & Lörz, M. (2008). Auslandsmobilität deutscher Studierender. Ausmaß, Motive und Gründe des Desinteresses. *Bildung und Erziehung*, 61(4), 437–450. <https://doi.org/10.7788/bue.2008.61.4.437>
- Leutwyler, B. & Lottenbach, S. (2011). Reflection on normality: The benefits of international student exchange for teacher education. In T. Goetz, G. Jaritz & F. Oser (Hrsg.), *Pains and gains of international mobility in teacher education* (S. 59–77). Springer. Fassung vom 2011.
- Lörz, M. & Krawietz, M. (2011). Internationale Mobilität und soziale Selektivität: Ausmaß, Mechanismen und Entwicklung herkunftsspezifischer Unterschiede zwischen 1990 und 2005. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 63(2), 185–205.
<https://doi.org/10.1007/s11577-011-0134-5>
- Lörz, M., Netz, N. & Quast, H. (2016). Why do students from underprivileged families less often intend to study abroad? *Higher Education*, 72(2), 153–174.
<https://doi.org/10.1007/s10734-015-9943-1>
- Luo, J. & Jamieson-Drake, D. (2015). Predictors of study abroad intent, participation, and college outcomes. *Research in Higher Education*, 56(1), 29–56.
<https://doi.org/10.1007/s11162-014-9338-7>
- Middendorff, E., Apolinarski, B., Becker, K., Bornkessel, P., Brandt, T., Heißenberg, S. & Poskowsky, J. (2017). Die wirtschaftliche und soziale Lage der Studierenden in Deutschland 2016: 21. Sozialerhebung des Deutschen Studentenwerks – durchgeführt vom Deutschen Zentrum für Hochschul- und Wissenschaftsforschung. Berlin: Bundesministerium für Bildung und Forschung [BMBF].
- Netz, N. (2015). What deters students from studying abroad? Evidence from four European countries and its implications for higher education policy. *Higher Education Policy*, 28(2), 151–174. <https://doi.org/10.1057/hep.2013.37>

- Petzold, K., & Peter, T. (2015). The social norm to study abroad: Determinants and effects. *Higher Education*, 69(6), 885–900. <https://doi.org/10.1007/s10734-014-9811-4>
- Salisbury, M. H., Umbach, P. D., Paulsen, M. B. & Pascarella, E. T. (2009). Going global: Understanding the choice process of the intent to study abroad. *Research in Higher Education*, 50(2), 119–143. <https://doi.org/10.1007/s11162-008-9111-x>
- Souto-Otero, M., Huisman, J., Beerkens, M., de Wit, H. & Sunčica Vujić. (2013). Barriers to international student mobility: Evidence from the Erasmus program. *Educational Researcher*, 42(2), 70–77. <https://doi.org/10.3102/0013189X12466696>
- Streitwieser, B. T., Le, E., & Rust, V. (2012). Research on study abroad, mobility, and student exchange in comparative education scholarship. *Research in Comparative and International Education*, 7(1), 5–19. <https://doi.org/10.2304/rcie.2012.7.1.5>
- Stroud, A. H. (2010). Who plans (not) to study abroad? An examination of U.S. student intent. *Journal of Studies in International Education*, 14(5), 491–507. <https://doi.org/10.1177/1028315309357942>
- Van Mol, C. & Timmerman, C. (2014). Should I stay or should I go? An analysis of the determinants of intra-European student mobility. *Population, Space and Place*, 20(5), 465–479. <https://doi.org/10.1002/psp.1833>
- Wernisch, D. V. (2016). Internationalization and student mobility in teacher education: Internationalization models, diffusion barriers, and recommendations for policy and higher education institutions (Dissertation). Pädagogische Hochschule Freiburg, Freiburg.
- Woisch, A. & Willige, J. (2015). Internationale Mobilität im Studium 2015. Ergebnisse der fünften Befragung deutscher Studierender zur studienbezogenen Auslandsmobilität. (Projektbericht). Hannover: Deutscher Akademischer Austauschdienst [DAAD].
- Zimmermann, J. & Neyer, F. J. (2013). Do we become a different person when hitting the road? Personality development of sojourners. *Journal of Personality and Social Psychology*, 105(3), 515–530. <https://doi.org/10.1037/a0033019>

***'I use my time more wisely...'* The implications for learning and teaching in higher education of more 'commuter students'**

Thomas, Liz^a

^aFaculty of Education, Edge Hill University, UK

Abstract

In the UK students have traditionally moved away from home to study in higher education (HE), but this is changing as a consequence of greater participation rates, and higher tuition fees – and student loans - which may influence the behavior of lower-income students. This research undertook 60 qualitative interviews with students of all ages who defined themselves as 'commuters', who continue to live at home whilst studying. The study found that while the students largely viewed themselves as 'good students' aiming to engage fully in their academic studies, the stresses and strains – and cost and time – involved in travelling - resulted in students evaluating the utility of a trip to campus, considering whether their resources would be better spent studying at home. In addition, these students tended to be less engaged in 'enhancement' activities, and had very little social engagement with HE peers. Nationally commuter students achieve less good outcomes, being more likely to withdraw early, achieve lower attainment and less likely to secure graduate employment on completion. This paper considers the implications for student engagement and teaching and learning of a larger commuter student population, in an effort to achieve greater equity in student outcomes in UK HE.

Keywords: *Commuter, live-at-home, student engagement, academic engagement, learning and teaching, equity*

1. Introduction

1.1 Context

In the UK there is a long tradition for higher education (HE) students to move away from the family home and live in scholarly communities within or close to the academic institution. This however is changing, as a consequence of the expansion of the sector, which is approaching a mass HE system with around 50% of young people progressing into HE, including more from lower socio-economic groups. In addition, and arguably more significantly, changes to the funding of HE have shifted responsibility from the State to individual students and their families making HE more expensive; living at home may offer substantial savings on accommodation costs.

The Higher Education Funding Council for England (HEFCE, 2013) identified four types of student outcomes: achieving a degree (retention and completion); achieving a first or upper second-class degree (attainment); achieving a degree and continuing to employment or further study (employability); and achieving a degree and continuing to graduate employment or postgraduate study (graduate progression). Live-at-home, or 'commuter students', have less good outcomes than other, non-commuter students against each of these measures. One possible explanation is that commuter students have lower levels of engagement in their HE experience (Social Market Foundation, 2017). This paper explores commuter students' perceptions and experiences of engagement, and the implications for learning and teaching.

1.2 About the empirical study

The study was commissioned by The Student Engagement Partnership (TSEP), a cross-sector entity in England which champions and develops student engagement in HE. The aim was to explore the 'engagement' experiences of commuter students, and how institutions respond to them. The study used a multimethods research design, combining a review of institutional documentation, collating further examples from across the sector, and nine institutional case studies comprising data analysis, student interviews, staff discussion groups and student workshops. This paper draws on the 60 student interviews undertaken by trained and supported student-peer-researchers in each university. The interview schedule covered: information about the student; details of their commute; discussion of their engagement in HE; barriers to engagement; and ways of improving commuter student engagement.

1.3 Student engagement

Student engagement is a widespread and popular concept in UK HE, but it does not have an agreed meaning (Trowler, 2010). Each institution has its own interpretation of student

engagement, and the extent to which meanings are shared across an institution is questionable. Coates (2007, p122) describes engagement as “a broad construct intended to encompass salient academic as well as certain non-academic aspects of the student experience”, comprising of: active and collaborative learning; participation in challenging academic activities; formative communication with academic staff; involvement in enriching educational experiences; feeling legitimated and supported by university learning communities. In this study we developed the concept of different sites of engagement, and focused on commuter students’ experiences in the academic, enhancement and social spheres. ‘Academic’ refers to students’ active involvement in their learning; ‘enhancement’ relates to participation in co-curricular and enrichment activities which contribute to personal and professional development; and ‘social’ engagement includes informal peer interactions and participation in more formally organized sport, social and leisure activities with peers.

1.4 Commuter students

Commuter students is a widely used and understood term in the US where the majority of students (more than 85%) are commuters (Horn and Berkold 1998), but there is not an explicit or shared definition in the UK. In this study, interview participants self-identified themselves as ‘commuters’ based on whether or not they travel to their place of study from their family home which they lived in prior to entering HE (although for institutional data analysis a comparison of home and term-time postcodes was used). The study included undergraduates and postgraduates; full and part-time students; and mature and young students.

2. Findings and discussion

2.1 Commuting to study

The experience of commuting was, on the whole - although not universally - experienced negatively. Students found commuting time consuming, tiring, expensive and stressful. None of this is especially surprising, what is remarkable however is that students reported having little or no idea before deciding to be a commuter how much time they would spend travelling or how much it would cost. For example, some students talked about commuting to save money, but they had not factored in the cost of travel – or the other disadvantages (i.e. time). Once at their place of study, commuter students found other practical challenges relating to their lack of a physical space on campus to store belongings and spend time (compared to residential students who have access to their rooms and shared living spaces). Commuter students were forced to carry their possessions with them, which is not only inconvenient, but it reduced the activities they engaged in on campus. Furthermore, they

had no informal space in which to meet peers, eat food from home and relax; they tended to be forced to use study spaces or cafeterias – requiring them to either be studying or spending money. These practical issues served to mark commuter students out as different to the norm or the expectation of the institution, and contributed to a feeling of not fitting in or 'belonging'.

2.2 Academic engagement

The students we spoke to generally saw themselves as good students, who were academically motivated and engaged, (indeed, this is a limitation of our methodology, as we necessarily interviewed the more engaged students). Students discussed their academic aspirations of achieving a good degree, and their commitment to attending the compulsory taught sessions and accommodating other academic requirements, such as course-related group work activities. However, the majority of interviewees qualified their academic engagement to some extent, recognizing that the practical challenges of the commute could result in them not attending everything. In short, a trip to the institution needed to be worthwhile – as is reflected in the title of this paper. Students identified a range of factors that contributed to their decision about whether or not it was worth attending, for example, the quality of the teacher (including classroom management and disciplinary issues); the number of academic sessions during the day; the perceived value of different sessions; and the structure of the day including duration and gaps between taught sessions.

Students identified academic staff attitudes as being problematic. Students felt there was an assumption that they should live near to the institution, and a preference for face-to-face communication, when other methods could work just as well. Students who were delayed travelling could experience humiliation on entering a lecture late, or even be excluded. Students were frustrated by a requirement to submit work in person and late notice about cancelled sessions, they were docked marks for arriving late for assessed sessions, and found professional placements took no account of their home location, sometimes making travel impractical or very costly. In most institutions it was frowned upon if students tried to re-arrange their timetable to facilitate travel arrangements. Staff in some institutions were perceived to be reluctant to make course content (including lectures) available digitally, were slow at answering emails, or encouraged students to come in to see them, and generally prioritized face-to-face engagement and made it difficult for students to engage in other ways.

2.3 Enhancement engagement

'Enhancement' refers to engagement in opportunities to develop personal and professional capabilities, and which contribute to graduate outcomes. Our respondents reported lower rates of engagement in enhancement activities compared to academic engagement – despite

indicating they were aspiring to graduate jobs – but their effort centred on the successful completion of their academic tasks. Those enhancement activities that commuter students did engage in were ambassadorial and mentoring roles, which were more closely aligned to their academic departments, and which typically took place during the day.

The reasons for lack of engagement in other enhancement activities included events taking place in the evening, which required students to hang about, make additional travel arrangements and sometimes to bring additional clothing or equipment on to campus. Leadership and representative roles within the Students' Union were also problematic due to practical challenges associated with commuting, especially late at night. In addition, however, students seemed to not value and therefore prioritise enhancement activities. For example, there seemed to be a widespread lack of awareness of the premium prospective employers place on extracurricular activity and the development of graduate attributes. Some mistakenly believe that academic success is sufficient to realise their graduate career ambitions, and they therefore explicitly prioritized their academic engagement over enhancement activities. This suggests students lack a more complex understanding of the more implicit aspects of HE success and progression into the graduate labour market.

2.4 Social engagement

Our commuter students had significantly lower levels of social engagement than the student population more generally. The disadvantages of commuting - time, cost, effort, transport limitations – were the main barriers to greater social engagement. Thus, commuter students only tended to get to know other students on their courses, as they were not generally engaged with other activities and groups in the wider institution. Opportunities for engagement within an academic programme are strongly influenced by course type (including number of contact hours), learning and teaching styles and how many other students are on the course. The lack of a social network could subsequently make it difficult for commuter students to participate in other social activities (as they had no one with whom to attend events). These problems were compounded by the lack of formal social activities available during the day, which appeared to be at least in part due to a lack of institutional space. And the lack of space places further constraints on informal socialization. This reflects institutional assumptions that socialization can occur in the evening, in students' unions and accommodation facilities. It must also be noted however that many commuters accorded low priority to socialising with HE peers, preferring to meet friends nearer to where they lived. Some students explicitly restricted themselves to engagement in the academic sphere, as they did not want social engagement to have a negative impact on their academic effort and achievement. This indicates a lack of appreciation of the educational value that peer networks may have on student engagement, belonging, retention and success in HE (Thomas 2012).

3. Implications for learning and teaching in higher education

The curriculum – incorporating organizational issues, contents and design, and pedagogy and assessment - could be used to address many of the engagement challenges students experience as a consequence of being a commuter student. The curriculum is, as Kift *et al* (2010) note, 'within our institutional control'. This is not to suggest that the curriculum can overcome the practical challenges of commuting *per se*, but organization, design and pedagogy could support students to use their time more wisely by reducing the need for unnecessary travel, increasingly the value of time spent on campus, and facilitating wider student engagement. This needs to be underpinned by the development of staff understanding of, and attitudes towards, commuter students, and the development amongst commuter students of an appreciation of the contribution of engagement in the wider student experience to academic success and progression to graduate employment.

3.1 Organisational issues

Organisation refers to the practical ways in which the curriculum is organised and delivered, and for example, the extent to which this takes into account the complexity of (commuter) student lives. Consideration of the experiences of commuter students suggests that decisions might be made regarding whether delivery is online, or face-to-face, or another hybrid or blended approach. It might also be considered whether material is offered in different formats, including for example lecture capture, allowing students the option of attending in person or viewing the lecture remotely. Another practical issue relates to how the face-to-face sessions are timetabled, for example whether teaching is 'blocked' into a reduced number of days, whether the start and finish times are considered in relation to the travel issues faced by commuter students, or whether there are opportunities to personalise the timetable (e.g. through a choice of seminar groups, or labs etc). Curriculum organisation can also be used to facilitate engagement in enhancement and social activities, for example, by timetabling co-curricular enhancement activities, and providing explicit time within the days on campus for formal and informal socialising with peers, both during induction and beyond.

3.2 Contents and design

The engagement of all students should be planned into the curriculum design and contents, to ensure the offering is as inclusive as possible. This includes planning feasible and relevant opportunities for engagement and by providing opportunities for real-world and authentic learning informed by student interests – which may occur in the communities students live rather than within or local to the university. The curriculum can extend staff and students' knowledge of each other's interests, aspirations and circumstances, and be used to develop understanding of the contribution of enhancement and social engagement

to academic achievement and graduate employment outcomes. With this in mind the contents can be designed to provide opportunities for students to spend time with each other – and with staff – to enable them to develop a network of social enrichment and support, and participation in enhancement activities. In addition the development of academic and professional skills can be embedded into the core curriculum to facilitate engagement.

3.3 Pedagogy and assessment

Pedagogy and assessment can be used to enable all students – including commuter students - to engage. For example, more active learning strategies (e.g. peer learning or problem-based learning) provide opportunities for students to get to know each other and develop learning communities or support networks. The pedagogy should avoid making assumptions about students and provide opportunities for staff and student interaction. Inclusive learning employs a variety of learning, teaching and assessment approaches, and students may have choices (e.g. whether to study on campus or remotely). Commuter students can be encouraged to set up study groups in local neighbourhoods, or to use technology and social media to facilitate collaborative learning beyond the classroom. With regards to assessment it can be helpful to build different assessment methods into the programme, provide choices about the method of assessment, and use formative approach to help students explore assessment requirement and to improve their assessment skills. A simple assessment ‘unpacking’ task within a taught session (see Cureton, 2017) can provide all students with greater understanding of what is required, and reduce the frustration students experience when they are undertaking independent learning in isolation, as will be the experience of many commuter students.

4. Conclusions

There are growing numbers of commuter students in HE in the UK. These students have lower outcomes – completion, attainment and (graduate) employment, which could be explained by lower academic, enhancement and social engagement. Interviews with commuter students suggested that they prioritised academic engagement, as they were highly committed to achieving a good academic outcome, which in turn was anticipated to result in graduate employment outcomes – but students made value judgements about what to attend and engage with. Commuter students seemed to under-value the importance of engagement in enhancement and social activities, and may have had less than optimum engagement in academic activities (e.g. collaborative learning with peers outside of the classroom). Learning and teaching in HE have the potential to transform the engagement – and potentially the outcomes – of commuter students. This involves raising awareness of the wider value of engagement, i.e. in enhancement and social activities, and providing more accessible and flexible opportunities to help students make the best decisions about

effective ways to use their time wisely. In the above some practical suggestions of the implications for learning and teaching are noted, in relation to curriculum organisation, curriculum contents and pedagogy and assessment. Comparable engagement by commuter students in all spheres however, requires commuter students to be recognised as legitimate and equal members of the HE community. This must be reflected in, for example, staff attitudes and institutional spaces, and requires wider cultural change in many HE providers in the UK. Otherwise commuter students will continue to make individual and potentially poorly informed decisions about engagement which may impact negatively on their outcomes.

References

- Coates, H. (2005) The Value of Student Engagement for Higher Education Quality Assurance. *Quality in Higher Education*. 11 (1), pp. 25–36.
- Cureton, D. (2017) *What works? Student retention and success report*, University of Wolverhampton. Wolverhampton: University of Wolverhampton
- HEFCE (2013) Higher education and beyond. Outcomes from full-time first degree study. 2013/15. Bristol: HEFCE
- Horn, L. and Berkold, J. (1998) *Profile of Undergraduates in U.S. Postsecondary Education Institutions: 1995-96*. Washington, DC: Office of Educational Research and Improvement, U.S. Department of Education (NCES 98-084).
- Kift, S., Nelson, K. & Clarke, J. (2010). Transition Pedagogy: A third generation approach to FYE – A case study of policy and practice for the higher education sector. *The International Journal of the First Year in Higher Education*, 1(1), 1-20.
- Social Market Foundation (2017) *On course for success? Student retention at university*. London: UPP Foundation <http://www.smf.co.uk/wp-content/uploads/2017/07/UPP-final-report.pdf> (accessed 12/1/18)
- Thomas, L. (2012) *Building student engagement and belonging in Higher Education at a time of change: final report from the What Works? Student Retention & Success programme*. London: Paul Hamlyn Foundation.
- Trowler, V. (2010) *Student engagement literature review*. York: Higher Education Academy

Procrastination: the poor time management among university students

Naturil-Alfonso, Carmen^{a*}; Peñaranda, David S.^a; Vicente, José S.^a and Marco-Jiménez, Francisco^a

^aLaboratorio de Biotecnología de la Reproducción, Department of Animal Science, Universitat Politècnica de València, Spain.

Abstract

Academic procrastination is a fact related to the delay or postpone of academic work until last minute. This phenomenon is evident in a vast majority of university students, and its occurrence is increasing. In order to analyse possible causes and/or solutions, we studied if longer time for accomplishing an assignment incentives or avoids procrastination among university students. Results showed that both short and long time-frame groups tended to procrastinate in the same way. Additionally, academic grades did not revealed differences between groups, as the procrastination was the same between groups. Thus, this study shows that even with longer period of time to accomplish a task, university students tend to procrastinate, and thus seem to have a negative effect on their assignment grades. Therefore, it seems a current problem and measures should be developed in order to solve it.

Keywords: Time management; Procrastination; assignments; educational outcomes.

1. Introduction

Procrastination has been considered a dysfunctional behaviour or an irrational delay of behaviour (Ellis & Knaus, 1977; Silver & Sabini, 1981) associated with negative outcomes. Academic procrastination was defined as: “to leave academic tasks (preparing for exams and doing homework) to the last minute and to feel discomfort out of this (Slomon & Rothblum, 1984). Academic procrastination is estimated to occur in 80-95% of college students (O’Brien, 2002) or at least half of the students (Ozer et al. 2009). Interestingly, this phenomenon seems to be growing (Steel, 2007). Also, procrastination has been negatively correlated with academic performance (Ariely & Werntrnrich, 2002; Wong, 2008; Kim & Seo, 2015). Negative effects have been traditionally related to students’ grade point average (GPA), assignment grades, quiz scores and course grades (Steel et al. 2001; Kim & Seo, 2015).

In academic context, procrastination trait includes achievement motivation or hope for success, planning and time manage skills, work discipline, study motivation, and self-control and cognitive study-skills (Schouwenbrug, 1995). Therefore, it has particularly important consequences for university students, such as waste of time, poor performance, increased stress, anxiety and depression (Chu & Choi, 2005, Essau et al. 2008). These factors led to an increase in pressure due a time reduction which reduces accuracy and consequently a reduction in academic performance (Van Eerde, 2003).

Previous studies have suggested that the relationship between procrastination and academic performance is influenced by the ability of the students. Previously, Ferrari (1991) showed that students with greater ability tend to procrastinate more tan those with lower ability. However, it has been recently published that these students with high cognitive abilities may obtain worse educational outcomes or fail to accomplish the educational program if they procrastinate (De Paola & Scoppa, 2015).

The study was conducted with the objective of analyzing the time management in deferring academic activities among university students.

2. Methods

2.1. Context

The present study was delimited to the School of Agricultural Engineering and Environment of The Universidad Politécnica de Valencia, Spain. The population of the study consisted on undergraduated students. The samples of the study involved 106 students divided in two different classroom groups named A and B.

2.2. Procrastination trial: indices of academic performance

The day of the subject presentation (26/01/15), both groups of students were told about the assignment which would count as a 5% of the final grade of the subject. The assignment was a bibliographic report in the topic of animal models in biological and biomedical research. Table 1 shows the guidelines of the assignment provided for both groups of students.

Table 1. Guidelines for the Animal Model assignment

Assignment: Animal Model	Bibliographic report about the appliance of an animal specie as animal model
Type	Work in pairs
Structure	Title & authors Abstract & keywords Body text (including figures and tables) Conclusions References
Format	A4 size Paper length: 5 pages Font: arial, 11, 1.5 spacing

In order to evaluated the time management between students of both groups, different deadlines were established. In group A deadline was the 15/03/2015 (1 month and a half after the communication), while group B deadline was 31/05/2015 (almost 3 months later)(figure 1). The number of weeks a student takes to accomplish the enrollment procedure after notification was considered as a proxy of individual procrastination. The theoretical estimation of an average student to accomplish the task was within 10 hours.

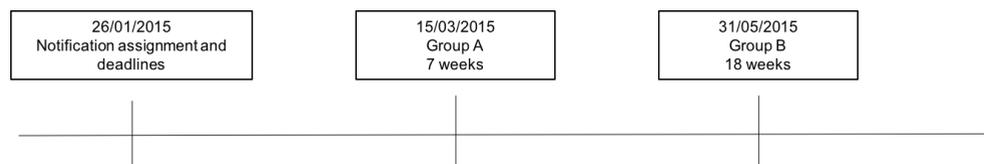


Figure 1. Timeline of the assignment

Additionally, the students' assignment grades was analysed in order to analyse the effect of procrastination in academic outcomes. A scoring guide was used to evaluate the quality of students' assignments (table 2). This rubric was communicated to the students the first day of lessons.

Table 2. Animal Model Assignment Rubric

Content	70
Model originality (mouse=5, horse=20)	20
Physiological description of the specie	20
Model appliance	20
Scientific quality and depth	10
Formal aspect	30
Compliance with the guideline (deadline, length, etc.)	10
Figures and tables	10
Reference	10

Finally, the numer of consultations about the task of each group were recorded.

2.3. Data analysis

We recorded the week on which students accomplished their assignment and we built a measure of procrastination by considering how close this date was to the deadline. To be more precise, the main variable procrastinatin took values from 1 to 5 depending on the week the students submitted with their assignment (Table 3).

Table 3. Procrastination variable distribution

Group	Week of accomplishment	Procrastination variable
A	3	1
	4	2
	5-6	3
	7	4
	Out of time	5
B	1-5	1
	6-10	2
	11-16	3
	17-18	4
	Out of time	5

To measure the level of procrastination among these students, a descriptive analysis by a chi-square test was performed. To compare assignment grades among groups a General Linear Model was performed. The consultations during the assigment duration were analysed using a probit link function. Differences of $p < 0.05$ were considered significant. All analysis were performed with a SPSS 21.0 software package (SPSS In., Chicago, IL, USA, 2002).

3. Results

Firstly, the number of consultations revealed no differences between groups (0.17 ± 0.07 and 0.29 ± 0.093 consultations for the A and B groups, respectively). As indicate in table 4, students on average accomplished their assigment on the last period. The mean procrastination variable for both groups was 4 (4.0 ± 0.09 and 3.9 ± 0.09 , for the A and B groups, respectively), with the 78.8% of students submitting the assignments on the last week. None of teams among different groups were non-procrastinators, as there were no assignments submitted in the procrastination variable 1 and 2. Slight procrastinators would be those submitting in procrastination variable 3, with only 11.5% of students. Additionally, it should be highlighted that no team of B group students submitted the assigments after the deadline, while almost 10% of the students from the A group submitted their work late.

The mean grade in assigments neither reported differences between groups. The A group reported an average grade of 6.4 ± 0.29 , while the B group average grade was 6.2 ± 0.31 .

Table 4. Descriptive analysis

Groups	Procrastination variable (%)				
	1	2	3	4	5
A	0	0	7.7 (4)	38.5 (20)	9.6 (5)
B	0	0	3.8 (2)	40.4 (21)	0
Total	0	0	11.5 (6)	78.8 (41)	9.6 (5)

(n): number of assignments for each %

4. Discussion

In education, the term academic procrastination is commonly used to denote a postpone in students' academic work. It has been widely reported that academic procrastination produces negative effects on students' performance (Ariely & Wertenbroch, 2002; Wong, 2008; De Paola & Scoppa, 2015; Kim & Seo, 2015). In fact, high levels of procrastination make students unable to regulate and organize them achieve their academic goals (Essau et al. 2008). Different factors appear to contribute towards procrastination among university students as lack of commintment, lack of encouragement or inappropriate time management skills (Hussain & Sultan, 2010).

The overall results of our study showed no differences neither in procrastination nor in assignments' mean grade between both groups. Although it has been previously reported that longer times for completing a task promote procrastination (Goode, 2008), we

observed similar tendency to procrastinate between both groups of students. Thus, the tendency to procrastinate between B group students could be explained by the longer time to accomplish with their assignment (18 vs 7 weeks for the B and A groups, respectively). Nevertheless, it is interesting to highlight that none of the B group students submitted the assignment out of time, while almost 10% of the A group students did. Another point to consider is if B students deliberately decide to procrastinate (Kim et al. 2017). Nonetheless, this may not be the case, as the deadline for B groups students coincided with the final term exams. In fact, this could explain two of the studied factors: on the one hand, B students tend to procrastinate as much as A students in spite of the length of the deadline and the proximity of final exams; on the other hand, procrastination may be the consequence of the low assignment grade of groups, and determines the harmful effect of delaying on academic achievements.

Tuckman (2002) proposed a long time for accomplishing a task as a measure to battle procrastination. That work suggested that tasks far away in time may reduce procrastination. However, our study shows that even longer time for accomplishing (almost 4 months) and the proximity of the final exams did not persuade students to procrastinate. Therefore, as independently of the time task all students seem to procrastinate, measures against procrastination between university students should be carried out by the academic institutions. Previous studies have proposed some remedial measures such as guidance and counselling services (Hussain & Sultan, 2010).

In addition, we studied if procrastination was correlated with educational performance. We determined that no differences exist on assignment average mark between groups, being the same mean grade for A and for B groups. Although De Paola & Scoppa (2015) described that students who procrastinate may obtain a low academic outcome, the lack of differences observed in our study could be explained based on the similar mean procrastination variable observed for both groups.

In conclusion, this study shows that even with longer deadline times and the proximity of the deadline to their final term exams university students tend to procrastinate.

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References

- Ariely, D., & Wertenbroch. (2002). Procrastinations, deadlines, and performance: self-control by precommitment. *Psychol.*, 13(3), 219-224.
- Chu, A.H., & Choi, J.N. (2005). Why not procrastinate? Development and validation of a new active procrastination scale. *The Journal of Social Psychology*, 149, 195-211.
- De Paola, M., & Scoppa, V. (2015). Procrastination, academic success and the effectiveness of a remedial program. *Journal of Economic Behaviour & Organization*, 115, 217-236.
- Ellis, A., & Knaus, W.J. (1977). *Overcoming procrastination*. New York: Institute of Rational Living.
- Essau, C.A., Ederer, E.M., O'Callaghan, J., Aschemann, B. (2008). Doing it now or later? Correlates, predictors and preventions of academic, decisional and general procrastination among students in Austria. Presentation at 8th Alps-Adria Psychology Conference, October 2-4, Ljubljana, Slovenia.
- Ferrari, J.R. (1991). Self-handicapping by procrastinators: Protecting self-esteem, social-esteem, or both? *Journal of Research in Personality*, 25, 245-261.
- Goode, C. (2008). Effects of academic procrastination: Students procrastination affects more than grades. <http://homeworktree.com/media/news-releases/academic-procrastination>.
- Hussain, I., & Sultan, S. (2010). Analysis of procrastination among university students. *Procedia Social and Behavioural Sciences*, 5, 1897-1904.
- Kim, K.R., & Seo, E.H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences*, 82, 26-33.
- Kim, S., Fernandez, S., Terrier, L. (2017). Procrastination, personality traits, and academic performance: When active and passive procrastination tell a different story. *Personality and Individual Differences*, 108, 154-157.
- O'Brien, W.K. (2002). Applying the trans-theoretical model to academic procrastination. *Dissertation Abstracts Internationals: Section B: The Sciences and Engineering*, 62(11-B), 5359.
- Ozer, B.U., Demir, A., & Ferrari, J.R. (2009). Exploring academic procrastination among Turkish students: Possible gender differences in prevalence and reasons. *Journal of Social Psychology*, 149, 241-257.
- Schouwenburg, H.C. (1995). Academic procrastination: Theoretical notions, measurements, and research. In J.R. Ferrari, J.L. Johnson, & W.G. McCown (Eds.). *Procrastination and task avoidance: Theory, research, and treatment* (pp. 71-96). New York, NY: Plenum Press.

- Silver, M. & Sabini, J. (1981). Procrastinating. *Journal of the Theory of Social Behaviour*, 11, 207-221.
- Solomon, L.J., & Rothblum, E.D. (1984). Academic procrastination: frequency and cognitive-behavioral correlates. *J. Couns. Psychol.*, 31(4), 503-509.
- Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quitessential self-regulatory failure. *Psychological Bulletin*, 133(1), 65-94.
- Steel, P., Brothen, T., Wambach, C. (2001). Procrastination and personality, performance, and mood. *Personality and Individual Differences*, 30(1), 95-106.
- Tuckman, B. (2002). The relationship of academic procrastination, rationalizations and performance in a web course with deadlines. *Annual Meeting of the American Psychological Association: Chicago*.
- Van Eerde, W. (2003). A meta-analytic derived nomological network of procrastination. *Personality and Individual Differences*, 35, 1401-1418.
- Wong, W.K. (2008). How much time-inconsistency is there and does it matter? Evidence of self-awareness, size and effects. *Journal of Economical Behaviour and Organization*, 68(3), 645-656.

Nursing Relational Laboratory: Educational, dialogical and critical projet

Torres, Ana^{a,b}; Soares, Sérgio^{a,c} and Carvalhais, Maribel^a

^aNorth Health School of Portuguese Red Cross, Portugal, ^bCenter for Health Technology and Services Research - CINTESIS, Portugal ^cResearch Centre on Didactics and Technology in the Education of Trainers - CIDTFF, Portugal.

Abstract

Nursing is a relational profession and communication is the basic instrument in its practice. The Nursing Relational Laboratory aims to collaborate in the development of communication skills of students of the Nursing, using Portuguese sign language, dramatization and emotional facial expression. 73 students participated (Experimental group; EG; n=38; Control group; CG; n=35). General self-efficacy scale(GSES), the Patient Health Questionnaire-9 Depression Module(PHQ-9), Assertiveness Questionnaire(ASS), Emotional Thermometer(ET), Inventory of Barrett-Lennard interpersonal relations(OS-M-40), and autoscopies, are used. The main results were as follows: a) better outcomes of EG on final autoscopy; b) significant reduction of the levels of assertiveness and revolt from the beginning to the end in EG; c) lower levels of emotional distress and need for help of EG, compared with CG at the beginning; d) lower levels of emotional distress, anxiety, need for help, empathy and congruence, and higher levels of revolt and unconditionality in EG, at the end; e) teachers recognize the high potential of the LRE. The LRE allowed the development of communicational skills of GE students through sign language, drama and emotion analysis. It is incentivized the development of projects in the area and reinforces the importance of this skills training in health professionals.

Keywords: *Communication; Skills; Teaching and learning strategies; Nursing students; Dramatization; Portuguese Dign Language; Emotional facial expression .*

1. Introduction

Nursing, besides being a scientific corpus, is, in essence, a profession of relation. In this way, communication is a basic tool of nursing care. It is present in all actions taken with the patient, either to guide, inform, support, comfort or meet their basic needs (Pontes, Leitão & Ramos, 2008).

Communication is the subject of multiple approaches that focus on the perspective of the relationship between two people, that is, who cares and who is cared for. According to Leopardi (1999), interpersonal communication, as a dimension of relational competence, corresponds to the relationship between at least two people who interact, share ideas and feelings, exchange information, and influence each other in order to establish levels of trust and relationship with a common goal. Communication is one of the tools nurses use to develop and improve professional know-how (Cianciarullo, 2003). According to Pontes, Leitão and Ramos (2008), the use of communication should be a basic tool of the nurse, being a means used to meet the needs of the patient.

Benner (2001), in this context, refers to the creation of an environment favourable to the therapeutic relationship, ensuring comfort, confidence, tranquility and effective presence, respect for personality and dignity of the person, encouraging him to use his own resources. Meleis (2007) specifies some attitudes that best fit the art of caring, such as: simplicity in language, subtlety (skilful acumen), active listening, respect and consideration for the other, and subtle forms of humor without neglecting looking after themselves. This challenge contributes to the empowerment of self-confidence, as well as its autonomy, commitment and responsibility for its own decisions. This process makes a person be open to development, positive learning, the potential for self updating of his feeling and acting (Fernandes, 2007). The helping relationship is a form of intervention guided by knowledge and techniques, manifested in the professional's behavior and attitudes (Hesbeen, 2000), and as consequence it is a dynamic process that develops in a given time and space. It is also an experience, or a series of unique experiences, between the person who facilitates the help and the one who desires and needs help. It therefore assumes a special way to act within the framework of interpersonal relationships in which each person needs to be looked at, listened to, embraced, understood and recognized in its identity and uniqueness. Chalifour (1989) refers to several categories of skills developed during contact between two individuals who exert a mutual influence on each other through verbal and non-verbal communication. In the context of the helping relationship model, one can conclude that they empirically support the fact that the helping relational skills are organized as a multidimensional constructor, differentiating themselves into four dimensions (), called generic competences (show how the nurse understands the other, the work and the person), empathic skills (, communication skills and contact skills

In this way, this project intends to collaborate in the development of relational skills of the students of the Nursing Degree Course (CLE) through an active educational action centered on instrumental and interactionist communication. This project has the following specific objectives: to develop relational strategies used by the student in the context of interaction between nurse / patient / family and multidisciplinary team; to develop strategies to mobilize knowledge about: Portuguese sign language, voice intonation, drama, analogue and digital language, and to resort to hetero and self-evaluation of performances using autoscopia and to analyze the effects of this strategy on relational performance.

2. Method

2.1. Participants

The sample of the present study was made by nursing students of the Nursing School of the Portuguese Red Cross of Oliveira de Azeméis (ESEnfCVPOA). The sample consisted of 73 students, aged 17-37 years ($M = 19.77$, $SD = 3.66$). There were no significant differences in age distribution by experimental design [$U = 540.50$, $p > .05$]. The sample is divided into two groups, the experimental group (GE) and the control group (GC) with 38 and 35 students, respectively.

2.2. Materials

In this work, the following assessment tools were used: the Perceived Self-Efficacy Scale (EAGP; Schwarzer & Jerusalem, 1995; Nunes, Schwarzer & Jesusalem, 1999), the depression module of the Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001; Torres, Pereira, Monteiro, & Albuquerque, 2013); Assertiveness Questionnaire (ASS); Emotional Thermometers (TE, Mitchel, Baker-Glenn, Granger, & Symonds, 2009; Pereira & Teixeira, 2009); Barrett-Lennard Interpersonal Relations Inventory (OS-M-40; Marques-Teixeira et al. (1996)), to evaluate perceived self-efficacy, depressive symptomatology, assertiveness, emotional indicators (emotional distress, anxiety, depression, anger and need for help) and interpersonal relationships, respectively.

EAGP is a self-report instrument that seeks to assess the general sense of personal competence to deal effectively with a variety of stressful situations. Interpersonal and communication process can be stressful for unexperienced students of 1st year degree.

The PHQ-9 consists of nine questions that assess the presence of each of the symptoms for the episode of major depression. The nine symptoms consist of depressed mood, anhedonia, sleeping problems, fatigue or lack of energy, change in appetite or weight, feeling guilty or worthless, concentration problems, feeling slow or restless, and thoughts of suicide (Santos et al. ., 2013). The evaluation of depression symptoms is important in order to control the

mood influence in relational and communication processes, because generally mood disturbance lead to isolation (depressive mood) or to externalization (elevated mood).

The SSA consists of 15 items, answered on a Likert scale from 1 to 5. 1 corresponds to "Never" and 5 to "Always". The quotation is the sum of the total values. It evaluates the assertiveness level.

The TE is a combination of five visual analogue scales in the form of four domains (distress, anxiety, depression, anger) and a domain result (need help). Each domain is evaluated on a Likert scale of 11 points (0-10), in a visual thermometer format. The evaluation of emotional states is important in order to control its influence in relational and communication processes.

The OS-M-40 consists of 40 items that constitute 4 subscales: "respect", "empathy", "unconditionality" and "congruence". Of the total number of items, half are listed positively and the other half are listed negatively. It evaluates interpersonal relation qualities.

In this work we also used autoscropy, which allows us to evaluate the observation of relational skills of the students involved during the simulation of nursing scenarios.

2.3. Procedures

The distribution of the participants was not random, it was made based on the school year, that is, the GC is made up of the students of the 2nd year of CLE, who was subject to a usual teaching during the 1st year, while the GE corresponds to the 1st year of CLE, which was subject to the activities of the LRE (Portuguese sign language, dramatic art and facial expression of emotions). The preparation of the Nursing Relational Laboratory (LRE) contains several phases. Initially we carried out a study of what existed as scientific evidence about the difficulties of communication of nursing professionals. Next, we defined the scientific areas that are favorable to develop the relational communication skills of students. Thus, it was set three areas of knowledge, i.e., sign language, drama and analysis of emotional facial expressions. Partners related to these fields were established: Deaf Association in Porto; the Porto Theater Academy; FEELAB (Fernando Pessoa University) and Metropolitan Manchester University.

The present study includes an evaluation and an intervention phase. In this way, the evaluation phase consists of the pre and post-test sessions. In these sessions the evaluation tools previously described were used. These tools were applied prior to initiating the LRE and at the end to measure the differences in assertiveness, depressive symptoms, interpersonal skills, satisfaction and emotional indicators (emotional distress, anxiety, depression, anger and need for help). In the first application of the instruments, participants were explained the objectives of the study, the informed consent form was provided, and consequently obtained (in a letter of commitment format). It should also be noted that the

confidentiality of all the information collected from the self-reporting instruments was ensured and the possibility of withdrawing the study at any time during the investigation was provided, in order to guarantee the ethical treatment of the participants. (APA, 2010).

The intervention phase consists of the application of the LRE activities. The LRE is the programmatic introduction of themes in the curricular units of the Nursing Degree Course as: voice and communication; digital and analogue language; Portuguese sign language to speaking community; art and drama; body language; emotions and facial expression analysis. The students had scenarios with story creation and characters living in health-disease situations. The mentioned techniques laid also, in the application of autoscopies, both at the beginning of the LRE, and at the end of it.

2.4. Data analysis Procedure

In this study we chose a research paradigm with a mixed approach, using quantitative and qualitative data. Statistical analysis was performed in the Statistical Package for Social Science (SPSS 21.0), with non-parametric tests, due to a none normal distributed results. The level of statistical significance was set at $p < .05$. According to Cohen (1992), the values of .10, .30 and .50 are considered small, medium and high effect sizes, respectively. Regarding the qualitative analysis, it was applied in the content analysis of the following variables: initial and final autoscopies; open questions about teachers' satisfaction with LRE.

3. Results

As for the results obtained by qualitative analysis, it is possible to say that during the viewing, analysis and synthesis phases, the students showed expressive motivation in their participations proving they were prepared for the sessions, bringing their notes about the reflections they had already done. The testimonies during the sessions are assertive about the efficacy of autoscopia in the comprehension they sought about the diversity of relationship and communication behaviors present in their practices,

The main results are expressed by the increase of the first to the final autoscopia in the following dimensions under analysis: effects for relational commitment, voice projection, articulation and pronunciation, use of expressive facial and body skills, posture of fitness, instant improvising, construction and use of the imaginative process, articulation of scenography and spatial elements, as well as integration and relational dynamics.

Regarding the evolution of the quantitative variables evaluated through the self-report instruments completed at the beginning and at the end of the project, the GE from the 1st semester to the 2nd semester presented statistically significant differences, that is, a

decrease in the levels of assertiveness and revolt between the 1st and the 2nd semesters, both with a mean statistical effect size.

Regarding the comparison between the EG and CG, the Mann-Whitney test was applied to compare the groups at the beginning (1st semester), and median differences were observed between the two groups in Emotional Suffering and Need for Help (variables for Emotional Thermometers). In this way, the students of the GE presented lower levels of emotional distress (Mdn= 1.50) compared to the CG at the beginning (Mdn= 4.00), differing significantly between them, $U = 326.50$, $z = -3.10$, $p < .01$, $r = -.38$, with an average effect size. It was also verified that 1st year students (Mdn= 1.00) presented lower levels of need for help compared to 2nd year students (Mdn= 3.00), differing significantly between them, $U = 343.00$, $z = -2.77$, $p < .01$, $r = -.34$, with an average effect size.

In order to verify the results obtained from the intervention, we applied again the Mann-Whitney test to compare the groups after the intervention of the LRE project, at the end (2nd semester), comparing with the beginning of the CG, and there were differences of averages between the two groups in Emotional Suffering, Anxiety, Revolt and Need for Help (variables related to Emotional Thermometers), as well as Empathy, Unconditional and Congruence (variables referring to OS-M-40).

It was observed that 1st year students presented lower levels of emotional distress (Mdn = 2.00) compared to 2nd year students (Mdn = 4.00), differing significantly between them, $U = 246.00$, $z = -2.87$, $p < .01$, $r = -.55$, with a high effect size. It was verified that 1st year students presented lower levels of anxiety (Mdn = 4.00), differing significantly from 2nd year students (Mdn = 6.00), $U = 264.00$, $z = -2.58$, $p < .05$, $r = -.50$, with a high effect size.

The results related to relational ability are less clear, showing that 1st year students (GE) initially present a perception of relational skills equivalent to the 2nd year (GC) students. The results show equivalence of the perception of these competences also at the end of the project in the "Level of respect" and show better levels of "unconditional" of the 1st year students (GE) at the end of the project intervention than those of the 2nd year (GC), showing a potential perceived improvement with the project.

The opinions of the teachers about the operation of the intervention sessions of the LRE project were also collected, such as: "articulate these contents with the first clinical teaching and translate these competences into the clinical teaching evaluation document".

4. Discussion and conclusion remarks

Nursing is a relationship profession and its professionals are prepared in this context, in an ecological and brofrenberniana view of their development. The quality in the production and effectiveness of nursing care depends on the interaction between the professional and the care recipient, being the communication an important intervention strategy of this

interaction. Thus, considering the communication is crucial in the establishment of the human relationship, as well as the determinant role of the School in the training of future nurses regarding the teaching-learning of relational skills, it was pertinent to adapt innovative educational strategies. The results obtained show that the implementation of the LRE contributes to the development of communicational skills of 1st year students of CLE using strategies based on Portuguese Sign Language, Drama and the analysis of emotional facial expressions. Autoscopy allowed us to improve students' communication and relational skills.

The results suggest that 1st year students (GE) revealed better emotional functionality than 2nd year (GC) students presented at the beginning and at the end of the project intervention, highlighting the results of emotional functionality with the intervention project. The results related to relational ability are less clear, showing that 1st year students (GE) initially present a perception of relational skills equivalent to 2nd year (GC) students. The results show better levels of "unconditionality" as well as lower levels of "empathy" and "congruence" at the end of the educational intervention. Equivalence of the perception of these competences at the end of the project in the factor "level of respect" was also emphasized. This may be due to different factors, such as the fact that by acquiring representation / dramatization skills, control over facial and body expression, may evaluate that they are less empathetic and congruent with their emotions, feeling a greater control in the expression of their emotions and not being so driven by them, but by what is desirable to show therapeutically. Another possible explanation may be related to the increase of students' demands for their behaviour, since having more knowledge about the importance of communication and relation, it is possible to be more critical and demanding in the self-assessment of their behaviours. Decrease in assertiveness levels was not also expected and can be explained by the increased knowledge. Decrease of the revolt, another interesting result, may be associated with less resistance/opposition to the exposure in the innovative activities (dramatization, voice intonation, and others).

Limitations

As obstacles, among others not so important, we have to mention the fact that it was not proceeded to random assignment. It is also important to mention that the theoretical modules are taught over the semesters and with a short weekly classroom hours. We considered that it would be more beneficial if the theoretical modules were taught in a summed up way so as not to lose information.

Current Implications

The clinical experience and the development of projects represented a great moment of construction, maturing, and personal and professional learning, essential to the teaching practice among students who develop their skills to be nurses.

The results express the need to introduce into the school curricula these activities that can be continuously developed in the following years and semesters during the CLE. Finally, we would like to reinforce the importance of the development and dissemination of this type of projects for the development of Nursing as a profession and as a discipline. Future studies with random assignment would be an important contribution to knowledge in this field.

References

- APA, A. P. A. (2010). *Publication Manual of the American Psychological Association* (6a ed.). Washington DC: American Psychological Association.
- Benner, P. (2001). *De iniciado a perito* (2ª ed.). Coimbra: Quarteto.
- Chalifour, J. (1989). *La relation d'aide en soins infirmiers. Une perspective holistique-humaniste*. Montréal: Gaëtan Morin.
- Cianciarullo, T. I. (2003). *Instrumentos básicos para o cuidar – um desafio para a qualidade de assistência* (1ª ed.). São Paulo: Atheneu.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155–159.
- Hesbeen, W. (2000). *Cuidar no hospital: Enquadrar os cuidados de enfermagem numa perspectiva do cuidar*. Loures.
- Fernandes, O. (2007). *Entre a teoria e a experiência. Desenvolvimento de competências de enfermagem no ensino clínico, no hospital, no curso de licenciatura*. Loures: Lusociência.
- Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A New Depression Measure. *Psychiatric Annals*, 32(9), 509–515. doi:170553651
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606–613. doi:10.1046/j.1525-1497.2001.016009606.x
- Leopardi, M. (1999). *Teorias em enfermagem: instrumentos para a prática*. Florianópolis: Papa-livros.
- Mitchell, A. J., Baker-Glenn, E. A., Granger, L. & Symonds, P. (2010). Can the Distress Thermometer be improved by additional mood domains? Part I. Initial validation of the Emotion Thermometers tool. *Psycho-Oncology*, 19, 125–133
- Pontes, A. C., Leitão, I. M. T. A., & Ramos, I. C. (2008). Comunicação terapêutica em Enfermagem: instrumento essencial do cuidado. *Revista Brasileira de Enfermagem*, 61(3), 312-318.
- Santos, I., Tavares, B. F., Munhoz, T., Almeida, L. S., Silva, N. T., Tams, B., ... Matijasevich, A. (2013). Sensibilidade e especificidade do Patient Health Questionnaire-9 (PHQ-9) entre adultos da população geral. *Cadernos de Saúde Pública*, 9(8), 1533–1543. doi:10.1590/0102-311X00144612
- Stefanelli, M.C. (2005). Conceitos teóricos sobre comunicação. In M.C. Stefanelli & E.C. Carvalho, *A Comunicação nos diferentes contextos da enfermagem* (pp. 28 - 46). São Paulo: Manole.

Torres, A. C. S., Pereira, A., Monteiro, S., & Albuquerque, E. (2013). Preliminary validation study of a portuguese version of the patient health questionnaire (PHQ-9). *European Psychiatry*, 28(1), 1. doi:10.1016/S0924-9338(13)76982-7

Preparing students for service-learning and social entrepreneurship experiences

Chung, He Len^a; Taylor, Kayla^a and Nehila, Caitlin^a

^aPsychology Department, The College of New Jersey, United States of America.

Abstract

A critical feature of contemporary models of civic engagement is mutually-beneficial collaboration between campus and community partners, in which all members contribute skills and experience to co-create knowledge. At any given time, multiple relationships require attention – for example, triadic relationships between students, faculty, and staff of community organizations. This model is relevant for both service-learning (SL) and social entrepreneurship (SE), as both seek to work with community partners or in the community to address challenges facing the community. To date, research involving students has focused on the impact of these learning opportunities on student development (e.g., academics, civic participation). For students to be true partners in SL and SE projects, however, we need to understand the reciprocity of these interactions, particularly how to prepare students can become collaborators in developing campus-community partnerships (i.e., participatory readiness). To promote participatory readiness among students, we argue for a competency-based framework that integrates research and recommendations from the fields of service-learning, social entrepreneurship, and educational leadership. Throughout the article, we discuss similarities and differences in SL and SE practices and draw attention to the implications of the work for community engagement and pedagogy in higher education.

Keywords: *service-learning; social entrepreneurship; community-engaged learning; competency framework; student leadership.*

During the last decade, a number of landmark statements have called for investing in higher education's public purpose to promote civic and social responsibility (e.g., Campus Compact, 2017). Specifically, two pedagogical approaches have gained increasing support as a way for higher education to pursue its public purpose: service-learning and social entrepreneurship. For this article, service-learning includes community engagement, civic engagement and other terms used on campuses; social entrepreneurship includes social innovation, social enterprise, and other terms used on campuses. With respect to service-learning, Campus Compact has grown its membership since 1985 to nearly 1,100 colleges and universities that have made an institutional commitment to promoting responsible citizenship (2015). With respect to social entrepreneurship, Ashoka U has documented marked growth of curricular and co-curricular offerings in social entrepreneurship courses and related activities (Ashoka U, 2013).

Service-learning and social entrepreneurship, while distinct practices, share important similarities: both focus on experiential education, and both seek to work with community partners to address challenges facing the community. Programmatically, however, the two approaches often operate independently with limited exchange between them regarding learning goals, curricular content, and pedagogical strategies (Enos, 2015). Researchers in both fields have argued that their efforts can be improved by sharing knowledge, perspectives, and resources across boundaries (Enos, 2015; Jacoby, 2015; Janus, 2015; McBride & Mlyn, 2015). Specifically, critics in both areas have suggested that we can better prepare our students to make meaningful contributions to community life if we build on the respective strengths of service-learning and social entrepreneurship practices. To address this recommendation, the current article considers “participatory readiness” (Allen, 2016) that targets students’ role as important stakeholders in campus-community partnerships. Central to this notion is the belief that students need the knowledge, skills, and values to advance social change efforts in authentic ways. We draw specific attention to implications for the larger field of study of higher education, community engagement, and pedagogy.

1. Challenges of Service-Learning and Social Entrepreneurship

Although service-learning has been defined in various ways, there is general consensus that this form of experiential education engages students in activities that address human and community needs by integrating academic material, service activities that benefit the community, and critical reflection that allows students to connect academic material to broader issues (Jacoby, 1996). Course development focuses on helping students develop the knowledge, skills, values, and motivation to make a difference in the civic life of communities. Proponents of service-learning agree that the integrity of the work starts with

reciprocity – that we relate to communities in the spirit of partnership. In their SOFAR model, Clayton and colleagues (Bringle & Clayton, 2012) identified at least five important campus and community stakeholders: Students, staff of community Organizations, Faculty, Administrators on campus, and community Residents. In this model, each stakeholder brings a different perspective, and it is important that all partners contribute knowledge, skills, and experience to determine issues to address, questions to ask, problems to resolve, strategies to use, desired outcomes, and indicators of success (Bringle & Clayton, 2012).

Although social entrepreneurship is defined in various ways, there is general consensus that the primary mission of this approach is to create social value by providing solutions to social problems (Dacin, Dacin, & Tracey, 2011). While service-learning, as a pedagogical approach, developed inside higher education, social entrepreneurship developed outside of academia as an approach to solve problems in the “real world” (Enos, 2015). Despite initial resistance to it in higher education, social entrepreneurship found a home in graduate schools of business and, now, is steadily moving into other disciplines at both the undergraduate and graduate level, including engineering, law, public policy, psychology and social work. This shift makes pedagogical sense, as teaching social entrepreneurship requires striking a balance between both hard and soft skills, utilizing skills that can be found in both business and liberal arts schools (Dees, as quoted in Worsham, 2012). Education in these programs focus on teaching students the steps to organize resources around solving social problems, particularly business management skills and performance measures to develop sustainable solutions.

Service-learning and social entrepreneurship projects involving campus-community collaborations present significant educational opportunities, as well as challenges. One particular challenge is how to prepare students for these complex experiences that involve real-world stakeholders and real-world consequences. Developing collaborative relationships between campus and community partners is equally important for both types of projects (Clayton et al., 2010; Dees & Anderson, 2006), but research suggests that authentic campus-community reciprocity is difficult to achieve in practice (Bortolin, 2011; Chung, Nordquist, Bates, & Donohue, 2016; Cruz & Giles, 2000; Stoecker, 2016). According to Stoecker (2016), a long-time service-learning educator, the current state of campus-community partnerships reflects how service-learning has become institutionalized in higher education. Specifically, service-learning practice on most campuses seems to emphasize (in order of importance) student learning, followed by service, community, and then change. He argues that if we truly want to achieve the goals of service-learning – conducting meaningful work with community partners to address challenges facing the community – we need to change our priorities: change should be the most important, following by community, then service, and then learning. He recommends this shift in priorities not because student learning is less important, but because the primary goal of

service-learning should shape the pedagogical activities. This recommendation is in line with the proponents of critical service-learning (see Daigre, 2000; Mitchell, 2008) who caution that any time we engage with constituency members we are ultimately influencing all relationships, sometimes with unintended negative outcomes for community stakeholders. For example, if a service-learning class tests a town's water and it turns up lead contamination, and the property values fall and the town's tax base declines, the project ultimately has worked against, rather than benefitted, community goals (Stoecker & Tryon, 2009). To make change the priority in service-learning, we must emphasize authentic student preparation (Stoecker, 2016).

The field of social entrepreneurship has identified similar challenges. Researchers agree that students could benefit from a more critical analysis of root causes of social problems and an improved understanding of the process of social change within the field, including how to develop authentic campus-community reciprocity (Dacin et al., 2011; Janus, 2015). Similar to their service-learning colleagues, some social entrepreneur educators worry that viewing the work as "charity" can reify negative stereotypes of "others" and reinforce power imbalances in society, which can have unintended negative consequences (Morton, 1995; Dacin et al., 2011; Dees as quoted in Worsham, 2012). This is especially challenging for social entrepreneurship projects because students often have to balance social and commercial objectives (i.e., managing a double bottom line), which can create tensions across stakeholders (Pharoah, Scott, & Fisher, 2004). Dacin et al. (2011) note a "dark side" to social entrepreneurship: that as the stakes increase and rewards are greater, exploitation and competition for resources come to the forefront. In some cases, broader and deeper awareness of social contexts within which change is proposed takes a back seat to notoriety and showcasing the change agent as a heroic individual.

2. Toward a Unifying, Competency-Based Framework of Participatory Readiness

Dostilio and Perry (2017) describe social entrepreneurship and service-learning (and other forms of community-campus engagement) as siblings, separated at birth, raised by two different sets of parents. Although they were "raised" in different contexts, both fields are interested in community and student impact and believe that interdisciplinary collaboration is essential if students are to be engaged with communities in productive and sustained ways (Schnaubelt and Rouse, 2013). In addition, both fields share a concern about addressing root causes that contribute to social problems and aim to develop students' capacity for public action. These similarities between service-learning and social entrepreneurship suggest that the two fields have complementary learning goals for its students, and integrating pedagogical strategies across fields has the potential to yield

benefits for all stakeholders involved (Dees as quoted in Worsham, 2012; Dostilio & Perry, 2017; Enos, 2015; Jacoby, 2015; McBride & Mlyn, 2015).

In addition to integrating research from the fields of service-learning and social entrepreneurship, recent publications have linked the theory and practice of leadership and service-learning. Specifically, Wagner and Pigza (2016) argue that addressing 21st century problems effectively requires 21st century notions of leadership and social responsibility. With respect to service-learning and social entrepreneurship, the Social Change Model (SCM) of Leadership Development (HERI, 1996) provides a useful theoretical framework that can guide how we prepare students to engage with community partners and other stakeholders. The SCM of Leadership was created specifically for college students and defines leadership as a purposeful, values-based, collaborative process to achieve shared goals, rather than the characteristics or actions of one member (HERI, 1996). The model suggests that strong leadership skills are developed through collective action, shared power, and commitment to social change (Dugan & Komives, 2007), all of which align with current calls in the fields of service-learning and social entrepreneurship education.

In general, competencies are understood as “integrated pieces of knowledge, skill, and attitude” that are common among a particular group of individuals working toward a goal (Lizzio & Wilson, 2004). Knowledge involves knowing facts, knowing particular procedures, or having awareness of a process itself; skills are concerned with constructing, organizing, manipulating, sequencing, directing action toward goals; attitudes/values influence one’s choice of actions, be they conscious or unconscious, implicit or explicit (Baartman & de Bruijn, 2011). There is a valid concern that establishing a list of competencies promotes a singularly defined system of competence, which is defined in a particular cultural context and by those who are privileged to hold authority within a field of study or practice (Dostilio, 2017). This can be detrimental to those whose success is defined differently than the dominant worldview in which the competencies were developed or to those who are already marginalized within today’s higher education environment (Jeris & Johnson, 2004). Despite this concern, we believe that the word competency is a useful term for summarizing the knowledge, skill, and attitudes/values that we want to develop in our students.

Service-learning and social entrepreneurship education – somewhat independently – have already developed tools that can inform the development of a competency-based framework for participatory readiness. Most important, social entrepreneurship can benefit from service-learning’s emphasis on campus-community reciprocity, while service-learning can benefit from social entrepreneurship’s emphasis on impact assessment and sustainability (Dolgon, 2014; Jacoby, 2015). Specifically, the field of service-learning has presented models for identifying and understanding relationships between campus and community stakeholders (e.g., SOFAR model, Clayton et al. 2010), and the field of social

entrepreneurship has presented models for understanding and assessing different levels of impact across all stakeholders, as well as social transformation (e.g., Ashoka's "Four Levels of Impact" framework, Kim 2015).

Finally, research in the field of leadership offers guidance about developing a model of student participatory readiness. Seemiller (2016) has described 60 student leadership competencies to consider for service-learning experiences and recommends narrowing the list to competencies most critical to the purpose of a specific activity or project. These competencies are organized into eight conceptual categories: learning and reasoning; self-awareness and development; group dynamics; interpersonal interaction; civic responsibility; communication; strategic planning; and personal behavior. Although these competencies were developed specifically with service-learning projects in mind, they provide a general framework for conceptualizing the knowledge, skills, and attitude/values that can prepare our students to conduct meaningful work with community partners that address shared goals.

3. Conclusion

Social interventions, whether promoted by service-learning, social entrepreneurship, or another type of initiative, most often fail because of a lack of attention to the context in which the work takes place, a failure to consider the concerns of stakeholders involved, and/or a failure to integrate feedback from individuals and groups who might be affected by the interventions (Enos, 2015). Co-collaboration between stakeholders is an essential key to a socially meaningful project, and if we want to help our students develop this type of "participatory readiness" (Allen, 2016), they must understand the dynamics of the community context in which they will be acting, as well as have the knowledge and skills to achieve their intended outcomes.

Both service-learning and social entrepreneurship education strive to prepare students to engage with communities in productive and sustained ways. Researchers in both fields have made significant advances toward helping students become stakeholders in campus-community partnerships; at the same time, many researchers agree that the work would benefit from building upon each field's respective strengths. Integrating knowledge across the two disciplines to develop a competency-based framework of participatory readiness has the potential to have meaningful impacts on all stakeholders involved.

References

- Allen, D. (2016). The future of democracy: The future of the humanities. *Humanities*, 37, 6-7.
- Ashoka U. (2013). *How do you know when you've revolutionized an industry? Ashoka's approach to assessing impact*. <https://www.changemakers.com/learning-lab/326891> (accessed March 26, 2017)
- Baartman, L. K., & de Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review*, 6(2), 125-134.
- Bortolin, K. (2011). Serving ourselves: How the discourse on community engagement privileges the university over the community. *Michigan Journal of Community Service Learning*, 18(1), 49-58.
- Bringle, R. G., & Clayton, P. H. (2012). Conceptual framework for partnerships in service learning. In P. H. Clayton, R. G. Bringle & J. A. Hatcher (Eds.), *Research on service learning: Conceptual frameworks and assessment* (pp. 539-572). Arlington, VA: Stylus.
- Campus Compact. (2015). 2015 annual membership survey: Executive summary. Retrieved from http://kdp0l43vw6z2dlw63l1if5c5.wpengine.netdna-cdn.com/wp-content/uploads/2008/11/CC_AnnualSurvey_ExecutiveSummary_FINAL.pdf (accessed March 15, 2017).
- Campus Compact. (2017). Thirtieth anniversary action statement of presidents and chancellors. Boston, MA: Campus Compact.
- Chung, H. L., Nordquist, M., Bates, D. C., & Donohue, P. (2016). Partnerships in civic engagement: Cultivating transformational campus-community relationships built to last. *Social Behavior Research and Practice – Open Journal*, 1(1), 22-33. doi:10.17140/SBRPOJ-1-105
- Cruz, N., & Giles, D. (2000). Where's the community in service-learning research? *Michigan Journal of Community Service Learning*, 7, 28-34.
- Dacin, M. T., Dacin, P. A., & Tracey, P. (2011). Social entrepreneurship: A critique and future directions. *Organization Science*, 22(5), 1203-1213.
- Daigre, E. (2000). Toward a critical service-learning pedagogy: A Freirean approach to civic literacy. *Academic Exchange*, 4(4), 6-14.
- Dees, J. G., & Anderson, B. B. (2006). Framing a theory of social entrepreneurship: Building on two schools of practice and thought. In Mosher-Williams (Ed.), *Research on social entrepreneurship: Understanding and contributing to an emerging field* (pp. 39-66) Association for Research on Nonprofit Organizations and Voluntary Action.
- Dolgon, C. (2014, April 11). Social enterprise and social justice in civic engagement. Email message to HE-SL Listserv.
- Dostilio, L. D., & Perry, L. G. (2017). An explanation of community engagement professionals as professionals and leaders. In L. D. Dostilio (Ed.), *The community engagement professional in higher education: A competency model for an emerging field*. Boston, MA: Campus Compact.

- Dugan, J. P., & Komives, S. R. (2007). Developing leadership capacity in college students: Findings from a national study: A report from the Multi-Institutional Study of Leadership. College park, MD: National Clearinghouse for Leadership programs.
- Enos, S. (2015). *Service learning and social entrepreneurship in higher education: A pedagogy of social change*. New York: Palgrave Pivot.
- Higher Education Research Institute [HERI]. (1996). *A social change model of leadership development: Guidebook version III*. College Park, MD: National Clearinghouse for Leadership Programs.
- Jacoby, B. (1996). Service-learning in today's higher education: An overview. In B. Jacoby (Ed.), *Service-learning in higher education: Concepts and practices*. San Francisco, CA: Jossey-Bass.
- Jacoby, B. (2015). *Service-learning essentials: Questions, answers, and lessons learned*. San Francisco, CA: John Wiley & Sons.
- Janus, K. K. (2015). Bringing social entrepreneurship into the classroom. *Stanford Social Innovation Review*, June (1-3).
- Jeris, L., & Johnson, K. (2004). Speaking of competence: Toward a cross-translation for human resource development (HRD) and continuing professional education. *Proceedings of Academy of Human Resource Development Annual Conference*, 7(2) 1103-1110.
- Kim, M. (2015). Rethinking the impact spectrum. Retrieved from <https://ashoka.org/story/rethinking-impact-spectrum> (accessed March 10, 2017).
- Lizzio, A., & Wilson, K. (2004). Action learning in higher education: An investigation of its potential to develop professional capability. *Studies in Higher Education*, 29(4), 469-488.
- McBride, A. M., & Mlyn, E. (2015). Innovation alone won't fix social problems. *The Chronicle of Higher Education*, February (1-2).
- Mitchell, T. D. (2008). Traditional vs. critical service-learning: Engaging the literature to differentiate two models. *Michigan Journal of Community Service Learning*, 14(2), 50-65.
- Morton, K. (1995). The irony of service: Charity, project and social change in service-learning. *Michigan Journal of Community Service Learning*, 2(1), 19-32.
- Pharoah, C., Scott, D., & Fisher, A. (2004). *Social enterprise in the balance*. Glasgow: Charities Aid Foundation.
- Pigza, J. M. (2016). Community partnerships: POWERful possibilities for students and communities. In W. Wagner, & J. M. Pigza (Eds.), *New directions for student leadership* (pp. 49-59). New York: Wiley Periodicals.
- Seemiller, C. (2016). Complementary learning objectives: The common competencies of leadership and service-learning. In W. Wagner, & J. M. Pigza (Eds.), *New directions for student leadership* (pp. 23-35). New York: Wiley Periodicals.
- Stoecker, R. (2016). *Liberating service learning and the rest of higher education civic engagement*. Philadelphia: Temple University Press.
- Stoecker, R., & Tryon, E. A. (Eds.). (2009). *The unheard voices: Community organizations and service learning*. Philadelphia: Temple University Press.

- Wagner, W. (2006). The social change model of leadership: A brief overview. *Concepts & Connections, 15*(1), 9.
- Wagner, W., & Pigza, J. M. (2016). The intersectionality of leadership and service-learning: A 21st-century perspective. In W. Wagner, & J. M. Pigza (Eds.), *New directions for student leadership* (pp. 11-22). New York: Wiley Periodicals.
- Worsham, E. L. (2012). Reflections and insights on teaching social entrepreneurship: An interview with Greg Dees. *Academy of Management Learning and Education, 11*(3), 442-452.

Deconstruction of prior knowledge and visual narratives in Computing pedagogy

Jamil, Md Golam^a and Isiaq, Sakirulai Olufemi^b

^aSolent Learning and Teaching Institute, Solent University, UK, ^bSchool of Media Arts and Technology, Solent University, UK.

Abstract

Evaluating students' prior knowledge, particularly in higher education, has been a difficult task due to lack of any known reliable technique. This paper describes a research that involved a technology-enhanced approach for collecting prior knowledge data and presented those through visual narratives. The use of visual narratives is new in the research within engineering discipline, particularly in Computing. The study took place at a British university where forty five Computing students participated in the data collection process. The students were asked questions about their concepts around certain topics, academic interests, and assessment preferences. Data were collected using an online audience reply and analysis tool, Mentimeter, which also generated real time visuals, such as word clouds and graphs, based on the student responses. Several narratives were composed upon the findings depicted through the visuals. The key contribution of the research is a unique prior knowledge data analysis procedure which is convenient and effective in deciding pedagogic principles.

Keywords: *Prior knowledge; Deconstruction; Visual narrative; Computing; Technology-enhanced*

1. Introduction

Historically, higher education is dominated by conventions (Gibbs, 2015). Many higher educational institutions follow top-down approaches where students' knowledge, experience and expertise are bypassed in the planning and delivery of teaching (Henderson & Dancy, 2008). Besides, teachers are often led by personal learning experiences and workplace mentors, which compel them to continue the ongoing teaching tradition without any modification (Sugrue, 1997). Insufficient professional training and limited teaching preparation time also force them to blindly follow conventional content choices and pedagogic approaches (Johnson et al., 2012). As a result, teaching and assessment often do not reflect students' prior knowledge. However, learning, particularly in higher education, is a dynamic journey that requires an amalgamation of students' educational experience, motivation, and prior and new knowledge (Kolb & Kolb, 2005).

2. Importance of linking prior knowledge

Prior knowledge is the learners' knowledge base at the time of new and relevant knowledge acquisition (Biemans & Simons, 1996). A knowledge base may include learning strategies, known concepts, learning related expectations, and interaction with surrounded environment (Nasir & Hand 2006). In higher education, learners' prior knowledge of academic concepts and learning strategies that were developed in their early educational stages play an important role (Schmidt et al., 2017).

Importance of linking prior knowledge with teaching and learning is twofold. First, it can help determine students' learning achievements and shape their learning strategies (Hailikari et al., 2007). Second, it can capture students' learning behaviours and processes which educators may use to design suitable pedagogic plans (Schoenfeld, 2000). However, prior knowledge can accelerate or hinder new knowledge and learning, thus failing to evaluate its quality may result into unsuccessful instructional designs (Ambrose et al., 2010).

3. Problems of assessing prior knowledge

Researchers acknowledge the importance of prior knowledge, but any viable measuring approach has not been extensively discussed (Oleson & Hora, 2014). Although standardised assessment and self-evaluation techniques are used in formal education to evaluate students' prior knowledge, often they fail to provide a holistic scenario of learner groups (Posselt, 2016). Therefore, educational researchers suggest for new assessment methods (Anderson, 1995). This study involved a unique technology-enhanced approach to collect prior knowledge data and deconstructed those through visual narratives.

4. The study

Our study took place at a British university that prioritises student engagement, learning experience and employability. A representation of working class is high in the student population and many students are the first from their family to attend a university.

We explored prior knowledge of the students studying in an undergraduate Computing course. The key learning areas were computing fundamentals, software engineering and software project management. The students came from different academic backgrounds, for example some with low grades from previous educational stages, some with industry experience, and a high number of students from other countries.

We followed a qualitative approach involving visual narratives where we collected data using Mentimeter (www.mentimeter.com), an online audience reply and analysis tool. ‘Narratives’ are the explicit stories of human experiences, objects or cultural contexts (Clandinin & Connelly, 2000). Visual narratives are the narratives based on pictorial depiction or references, such as historical records, films and photographs (Cobley, 2013).

4.1. Research questions

The overarching aim of our research was to explore the viability of visual narrative approach in analysing students’ prior knowledge. We also studied the feasibility of technology-supported data collection technique from students in traditional university classes.

- RQ1 To what extent do visual data illuminate students’ prior knowledge?
- RQ2 To what extent is the quality of prior knowledge classifiable?
- RQ3 How does students’ prior knowledge help decide pedagogic principles?

4.2. Methodology

Narrative research is common in social sciences and humanities (Squire et al., 2014), but the approach is yet to be adopted in engineering disciplines. In this study, we composed several narratives based on visuals, such as word clouds and graphs. We asked the students questions about their concepts around certain topics, academic interests, and assessment preferences. The importance of addressing these areas of prior knowledge has been discussed in the educational literature including Rodger et al. (2015) and Kahu et al. (2015).

Research participants: Forty five Computing students participated in the data collection process. All of them gave consent for voluntary participation in the research and we obtained an ethics approval from the University. We collected data in regular weekly sessions across the semester and student participation varied in different sessions.

Data collection procedure: The students responded to questions and provided short answers via online system, Mentimeter, from their personal computer or smartphones. We, the researchers, retrieved the responses in real time in the form of visuals. Finally, we

deconstructed the visuals and narrated them explicitly. The validity and reliability of the data were high as they were anonymous and real time. Additionally, the possibility of human errors in data processing was minimum because the data were automated.

5. Findings

For a prior knowledge specific discussion, we considered three relevant areas of focus, namely students' academic interests, conceptual understanding, and assessment experience. We are including the relevant visuals in the first narrative as an example in Figure 1.

5.1. Visual Narrative: academic interests

a) Questions

- In no more than three words, what are the attributes/skills of a good learner?
- What methods of learning are you aware of, maximum three words?
- State any three skills required for a quality final year project.
- In no more than three terms, give your understanding of a quality final year project.

b) Visuals: word clouds

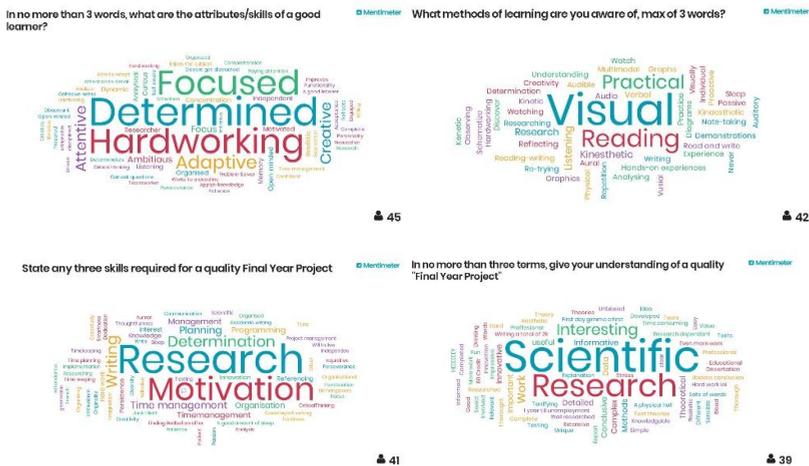


Figure 1. Visuals (word clouds) of students' academic interests

The responses of the questions reflected the students' views on learning strategies and associated skills necessary for becoming a successful learner. The opinions were diverse and thus indicated varied perceptions about effective learning skills and strategies. First, the majority of the students considered that a successful learner needs to be determined, hardworking and focused. Some students also mentioned creativity, adaptiveness and alternative thinking as essential attributes for learning effectively. Second, the most popular learning strategies among the students were visual, practical and reading activities. Preferences for reflection, research, demonstration and hands-on experience were also

mentioned in this aspect. Regarding the final year project, the students believed they would require research skills and higher motivation to effectively perform in this module. A few students also stated the importance of task-organisation, time management and writing for projects. Finally, while expressing opinions about the quality of final year project the students mentioned that the work needs to be scientific, research-based and interesting. Some students also suggested for informative, complex, and theoretical features to enhance quality of work.

c) Pedagogic guidelines

The students of the Computing course are generally well aware of the requirements of a university level academic programme. They seem to be well prepared for complex and challenging teaching/ learning activities. As many of them emphasised the need for including research elements in the project work; exploratory, experimental and critical analysis based activities will be suitable for them. The students will enjoy multimedia and reading based learning activities. A few practical sessions can also be arranged to enhance their learning. Consequently, it is indicative (for tutors and learners) that teaching materials and pedagogic activities should harmonise multiple learning strategies to carry along all students, particularly for a specific cohort.

5.2. Visual Narrative: conceptual understanding

a) Questions

- Computers only perform calculations and nothing else, True, False or Unsure?
- If computer performs only calculations and nothing else, how is it done?
- If computer perform other activities apart from calculations, what are these activities and how is it done?

b) Visuals: word clouds and graphs

Developing computer programs requires a higher understanding of computer fundamentals and principles. Not only does this guide the students in knowing how to prepare codes in a computer relatable manner but help with informed decisions and actions in terms of components and processes of computing devices. Knowing the breadth of students' requisite knowledge guides tutors on how best to introduce intended topics. The aims of the aforementioned questions in this case were to check the students' knowledge about the definition of a computing device, and if their answers were just assumptions or constructed upon pertinent prior knowledge. More than three-fourth of the students gave a wrong answer of the first question whereas a very small number was unsure. While responding to the second question most of the students mentioned 'do not know' and 'unsure'. There were some explanatory answers, such as 'calculating data through binary code', 'using binary to code and break down into a language it can understand and then figure it out', and 'computer does not only perform calculations' for this question. A particular response was 'if all data is processed in binary, we could say manipulating these numbers, computer only

performs calculations'. This confirmed the respondent's proper understanding of the topic. There were a variety of student answers for the question three, which include 'do not know how it is done', 'rendering video', 'process memory cache', 'read and write from disk' and 'editing, storing pictures'. Similar to question two, there was a single correct response which is 'they do not perform other activities'.

c) Pedagogic guidelines

Concepts about computing devices and types may seem trivial particularly for Computing students who have a common belief that they already know everything about these devices at higher level. Additionally, they may have an enhanced confidence about these concepts as they make use of these devices on daily basis. However, in this particular cohort, a significant proportion of students do not have a concrete understanding of the intended subject matter, particularly on how computer operations are being carried out. Therefore, at the initial stage, it is imperative for tutors to systematically evaluate students' knowledge and facilitate adequate understanding of the definitions of computing devices including how operational activities are carried out.

5.3. Visual Narrative: assessment experience

a) Questions

- In no more than three words, why is assessment necessary in this unit?
- In no more than three words, when does an assessment activity help you learn better?
- Choose three assessment techniques that you consider the most effective.

b) Visuals: word clouds and graphs

Students gave varying opinions about the necessity of assessment, qualities of assessment tasks, and the assessment schemes they prefer. There are several comparable and distinct perceptions describing their prior knowledge and experience with assessment techniques. First, there were dissimilarities in the students' perceptions about the necessity of assessment. Many of them considered assessment as a means of gaining knowledge for understanding certain topics, while some considered it as an enabler to progress in their higher education journey. Interestingly, a few students mentioned teamwork indicating the need for promoting collaboration between peers, and tutors. Second, in terms of the useful qualities of assessment tasks, both independent and team efforts were mentioned as requirements. Surprisingly, some students shared that challenging and stressful assessment tasks helped them learn better. Third, students reflected on their preferences about effective assessment tasks. They generally considered project, portfolio, group presentation and short essays as most effective. Some students mentioned their preference for quiz/test. However, long essay and individual presentation were not in their preference list.

c) Pedagogic guidelines

Assessment schemes in this module will require combining both collaborative and independent tasks. Students will positively accept challenging assessments if they provide rich and dynamic learning experience. However, many students may not find the commonly used assessment techniques, such as long essay and individual presentation worthwhile. Therefore, if tutors plan to use these assessment schemes (should it be most suitable), they will have to equip and motivate students with the benefits of these type of assessment.

6. Lessons learned

a) Methodology transfer provides new insights into disciplinary research

The use of visual narratives to identify educational perspectives in engineering discipline is unique. Narrative research methodology detailed in this study shows potentials in evaluating the quality of students' prior knowledge in computing subjects. This demonstrates a successful transfer of methodological paradigm to an unexplored academic discipline.

b) Use of technology is viable in collecting prior knowledge data

Collecting and analysing students' prior knowledge data are complex and time consuming tasks. An appropriate systematic application of technology can enhance the narrative approach of deconstructing visuals which has been found convenient, reliable and effective.

c) Quality of questions may determine the breadth and depth of narration

Student responses were based on the tutor's questions, thus may have been guided. Therefore, the construction of these questions requires following careful and effective approaches. Considering the volume of students' contribution and its relevance to understanding prior knowledge, the questions may need to be simple and communicative. Two types of questions have been adopted in this research: (i) direct questions, for example 'computer only performs calculations, true, false or unsure?' to know students' levels of conceptual knowledge, and (ii) probing questions, for example 'why is assessment necessary in this unit?' to understand logics and opinions of the students.

d) Deconstruction of prior knowledge can help decide pedagogic principles

A careful composition of visual narratives can provide an in-depth orientation to students' learning capacity, interests and attitudes. The visuals are based on quantitative data, thus it is possible to classify the levels of students' prior knowledge. This detailed information can help tutors consider pedagogy and assessment related decisions in a holistic manner. The data collection and visual generation are prompt, so any rapid pedagogic change or modification may be possible in the approach. A follow up of this research is the development of a 'technology-enhanced and prior knowledge informed pedagogic framework' which can potentially improve teaching and learning experiences.

References

- Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C., & Norman, M. K. (2010). *How learning works: Seven research-based principles for smart teaching*. John Wiley & Sons.
- Anderson, J.R. (1995). *Cognitive psychology and its implications* (5th ed.). New York: Wroth.
- Biemans, H. J., & Simons, P. R. J. (1996). CONTACT-2: A computer-assisted instructional strategy for promoting conceptual change. *Instructional Science*, 24(2), 157-176.
- Clandinin, D. J., & Connelly, F. M. (2000). *Narrative inquiry*. Wiley.
- Cobley, P. (2013). *Narrative*. Routledge.
- Gibbs, G. (2015). 53 Powerful Ideas. Retrieved on 16 January 2018 from <https://www.seda.ac.uk/53-powerful-ideas>
- Hailikari, T., Nevgi, A., & Lindblom-Ylanne, S. (2007). Exploring alternative ways of assessing prior knowledge, its components and their relation to student achievement: A mathematics based case study. *Studies in Educational Evaluation*, 33(3-4), 320-337.
- Henderson, C., & Dancy, M. H. (2008). Physics faculty and educational researchers: Divergent expectations as barriers to the diffusion of innovations. *American Journal of Physics*, 76(1), 79-91.
- Johnson, S. M., Kraft, M. A., & Papay, J. P. (2012). How context matters in high-need schools: The effects of teachers' working conditions on their professional satisfaction and their students' achievement. *Teachers College Record*, 114(10), 1-39.
- Kahu, E., Stephens, C., Leach, L., & Zepke, N. (2015). Linking academic emotions and student engagement: Mature-aged distance students' transition to university. *Journal of Further and Higher Education*, 39(4), 481-497.
- Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of management learning & education*, 4(2), 193-212.
- Nasir, N. I. S., & Hand, V. M. (2006). Exploring sociocultural perspectives on race, culture, and learning. *Review of Educational Research*, 76(4), 449-475.
- Oleson, A., & Hora, M. T. (2014). Teaching the way they were taught? Revisiting the sources of teaching knowledge and the role of prior experience in shaping faculty teaching practices. *Higher Education*, 68(1), 29-45.
- Posselt, J. R. 2016. *Inside Graduate Admissions: Merit, Diversity, and Faculty Gatekeeping*. Cambridge, MA: Harvard University Press.
- Rodger, S., Turpin, M., & O'Brien, M. (2015). Experiences of academic staff in using threshold concepts within a reformed curriculum. *Studies in Higher Education*, 40(4), 545-560.
- Schmidt, H. K., Rothgangel, M., & Grube, D. (2017). Does prior domain-specific content knowledge influence students' recall of arguments surrounding interdisciplinary topics?. *Journal of adolescence*, 61, 96-106.
- Schoenfeld, A. H. (1999). Models of the teaching process. *The Journal of Mathematical Behavior*, 18(3), 243-261.

Squire, C., Andrews, M., Davis, M., Esin, C., Harrison, B., Hyden, L. C., & Hyden, M. (2014). *What is narrative research?*. Bloomsbury Publishing.

Sugrue, C. (1997). Student teachers' lay theories and teaching identities: Their implications for professional development. *European Journal of Teacher Education*, 20(3), 213-225.

Integration of gamification in a traffic education platform for children

Riaz, Malik Sarmad; Cuenen, Ariane; Janssens, Davy; Brijs, Kris and Wets, Geert
Transportation Research Institute (IMOB), Hasselt University, Belgium

Abstract

Children are highly represented in injuries and fatalities caused by road accidents. The major reasons are children's lack of ability to scan the environment, inconsistent behavior, distraction in traffic situations, ability to estimate speed and distance, and less developed hazard perception skills. Therefore, traffic education for children is very important. This study will look at a platform about traffic education for children including gamification elements. Gamification is a relatively new concept which has gathered a lot of attention over the last few years with its application in many diverse fields. Gamification is defined as the application of game mechanics to non-game activities in order to change behavior. The education community has discovered the power it has to increase students' performance and engagement. The current study focuses on educating school going children on traffic safety in Flanders (Belgium). We expect the platform to be effective in increasing traffic knowledge, situation awareness, risk detection and risk management among children and a positive change in (predictors of) behaviors of children who will be using the platform. To investigate the effect of the platform, a pretest-posttest design with an intervention group and a control group will be used. Data will be collected and analyzed in the spring of 2018 and results, limitations and policy recommendations will be provided during the conference in June 2018.

Keywords: *E-learning; Gamification; traffic; education; children.*

1. Introduction

Road traffic accidents have been described as the leading cause of death among 0-19 year olds by the World Health Organization (WHO, 2014). In Europe, road traffic accidents still account for 1 in 5 fatalities (WHO, 2004). School going children have the highest injury rates if adjusted for miles ridden. The major reasons are children's lack of ability to scan the environment, inconsistent behavior, distraction in traffic situations, ability to estimate speed and distance, and less developed hazard perception skills (Connely, Conaglon, Parsonson, and Isler, 1998; Scialfa et al., 2012). Most of these accidents happen at intersections and crossings (Scialfa et al., 2012).

The three types of factors that can lead to a road traffic accident are human factors, environmental factors and vehicle factors according to the Haddon matrix. The research conducted by Treat, Tumbas, and McDonald (1977) found out from the crash data that human factors (i.e., error or lack of judgement) can contribute to 95.4% road traffic accidents. These human factors can involve not having the right skills to cross a road or wrong attitude to traffic laws. There are three interventions to improve road user safety which are known as the 3 E's of traffic safety: Engineering, Enforcement and Education. Engineering aims to improve the existing transportation infrastructure. Enforcement, on the other hand, is related to the monitoring of violations like speeding, distracted driving, and impaired driving. Education involves making each individual familiar with traffic rules and motivate them to follow these rules as breaking these may results in an increased chance of crash. Traffic education is important for all road users as all the participants of the road are equally responsible for traffic safety. Therefore, the present study will focus on traffic education. Applying the rules of the road, searching for potential hazards, remembering where they are, reacting quickly to emergency situations and choosing safe gaps to cross or turn can decrease the number of accidents children are involved in as pedestrian and cyclist.

1.1. Traffic Education

Traffic education for children is vitally important to help children understand the traffic rules, and improve their attitude towards road safety, as it gives them a great chance of keeping safe while they are young. Ben-Bassat and Avnieli (2016) have shown that there is a positive impact of traffic education on children's behavior and attitudes. There have been many bicycle safety programs, as bicycling involves the use of both motor skills and scanning the environment for threats (Ducheyne, De Bourdeaudhuij, Lenoir, & Cardon, 2014; Lachapelle, Noland, & Von Hagen, 2013; McLaughlin & Glang, 2010; Zeuwts, Vansteenkiste, Cardon,

& Lenoir, 2016) There is a lot of literature on children hazard perception evaluation and training with children as pedestrians (Meir, Oron-Gilad, and Parmet, 2015; Rosenbloom,

Mandel, Rosner, and Eldror, 2015) and cyclists (Lehtonen, Havia, Kovanen, Leminen, and Saure 2016; Vansteenkiste, Zeuwts, Cardon, and Lenoir 2016).

Our study differs in the approach that it would be a course on traffic safety covering several aspects of traffic education by using an e-learning platform while the studies mentioned above were either conducted on solely hazard perception (risk detection) for pedestrians and cyclists for a limited time or on site for bicycle skills evaluation and training. To our knowledge, this platform is the first platform which makes use of context relevant footage for the traffic education training. The first half of the training will include pictures from the children's own city followed by the pictures and movies from other towns in Belgium, to see how they react to familiar and unfamiliar traffic situations. Extending what has been learned in familiar situations can help in reacting safely to a traffic situation in a different location. This would also help us in recognizing any transfer effects using context relevant data. In addition, the platform also differs in the approach compared to other studies since it uses embedded gamification elements.

1.2. Gamification

There are many definitions available on gamification. Werbach and Hunter (2012) define gamification as “embedding game features into activities which are not games themselves”. The concept of gamification in education is not new, with students awarded with badges for performing well in classes. Now with the advent of technology, it is being used in e-learning, and has been providing favorable results regarding better academic outcomes and engagement (Çakıroğlu, Başibüyük, Güler, Atabay, & Yılmaz Memiş, 2017). Gamification works as it focuses on reinforcements. Reinforcements encourage repetition of the behavior (Skinner, 1938). The reinforcements can be extrinsic or intrinsic. In the education domain, the rewards can be prizes/money (extrinsic) or enjoyment/fun (intrinsic). As Skinner (1938) has mentioned that only those behaviors are repeated which have satisfying outcomes. Gamification focuses on the repetition of the desired outcomes, so the required behavior becomes a habit.

Sailer, Hense, Mayr, and Mandl (2017) have discussed the game elements and their effect on psychological needs. Some of the gamification elements that can be applied in any e-learning platform are points, badges, leaderboards, performance graphs, avatars and groups. The need for competence is fulfilled by points, badges, leaderboards and performance graphs. Choosing avatars can give the students a sense of autonomy and what they want to do next, while doing tasks together in groups can have a sense of social relatedness (Sailer et al.,

2017). Krause, Mogalle, Pohl, and Williams (2015) have shown that adding gamification elements like points and progress bars increased retention of students and performance in an e-learning platform. Facey-shaw, Borner, Specht, and Bryan (2015) described the

positive effect of digital badges being incorporated in an e-learning platform with increased user engagement and performance.

2. Traffic Education Platform

The present study will be conducted on pupils of primary school in Flanders (Belgium). The goal of this study is to increase knowledge, situation awareness, risk detection and risk management among users of the platform. For the current study, gamification elements like points (granular feedback), performance graphs (sustained feedback), and badges are incorporated. We expect that these gamification elements increase students retention, and enhance the experience which will help reach the targets set out in the project.

2.1. Methodology

After looking at literature in the field of traffic education, the platform was developed in four major modules: knowledge, situation awareness, risk detection and risk management. These four modules cover most of the issues with children in traffic. In the knowledge module, attention is given to what they need to know about traffic laws. In the situation awareness, attention is given to awareness of the traffic situation. Risk detection and risk management deal with hazard perception of the children by paying attention to the detection of hazards (risk detection) and then responding to that threat (risk management). After the user selects the response, it is followed by a detailed feedback for each question.

Footage for the platform was collected by capturing pictures and videos of traffic situations. A camera was mounted on the handlebar of the bicycle to have pictures and videos from a bicyclist perspective. The pictures and videos were further divided in categories based on the modules described above (i.e., knowledge, situation awareness, risk detection and risk management), and also based on context relevant data with familiar and unfamiliar traffic situations.

2.2. Participants

The study will be conducted among pupils of primary school in Flanders (Belgium). The intervention group and the control group, both consist of 70 pupils.

2.3. Study design and analysis

The study is a pretest-posttest design with an intervention group and a control group to check the effectiveness of the training program. A pre and post questionnaire will be filled by the participants before and after completion of the training. The questionnaire will involve demographic info, along with questions related to predictors of behavior from the theory of planned behavior. A process evaluation questionnaire will also be administered at

the end of the training for checking the overall satisfaction with the training, and the effect of gamification elements on learning. Data will be collected and analyzed with SPSS in the spring of 2018.

3. Results

The results of both the effect evaluation and process evaluation will be presented. Some of the results on the effect evaluation will provide us with the following results:

- a. Which traffic rules or laws are difficult to comprehend for children?
- b. Which traffic situations are difficult for children to comprehend?
- c. What sort of hazards are difficult for children to detect?
- d. What sort of hazards are difficult for children to manage?
- e. Effect on knowledge, situation awareness, risk detection and risk management?
- f. Effect on predictors of behavior i.e. intention, attitude, perceived behavioral control and subjective norm of participants towards traffic safety behavior?

We will also present the results of the process evaluation: users opinion about the platform and overall satisfaction with the platform, and which gamification elements were helpful in increasing children's engagement with the platform.

4. Discussion

After the study is conducted, the results, limitations and policy recommendations will be discussed. One recommendation could be that if results are positive, it would be important to investigate long-term effects of such an intervention and see if there is a necessity to have booster sessions periodically to reinforce the progress made by the intervention.

References

- Ben-Bassat, T., & Avnieli, S. (2016). The effect of a road safety educational program for kindergarten children on their parents' behavior and knowledge. *Accid Anal Prev*, 95(Pt A), 78-85. doi:10.1016/j.aap.2016.06.024
- Çakıroğlu, Ü., Başbüyük, B., Güler, M., Atabay, M., & Yılmaz Memiş, B. (2017). Gamifying an ICT course: Influences on engagement and academic performance. *Computers in Human Behavior*, 69, 98-107. doi:10.1016/j.chb.2016.12.018

- Connelly M.L, Conaglen H.M, Barry S. Parsonson, & Isler, R. B. (1998). CHILD PEDESTRIANS' CROSSING GAP THRESHOLDS. *Accident Analysis and Prevention*, 30(4), 443-453.
- Ducheyne, F., De Bourdeaudhuij, I., Lenoir, M., & Cardon, G. (2014). Effects of a cycle training course on children's cycling skills and levels of cycling to school. *Accid Anal Prev*, 67, 49-60. doi:10.1016/j.aap.2014.01.023
- Krause, M., Mogalle, M., Pohl, H., & Williams, J. J. (2015). A Playful Game Changer. 95-102. doi:10.1145/2724660.2724665
- Lachapelle, U., Noland, R. B., & Von Hagen, L. A. (2013). Teaching children about bicycle safety: an evaluation of the New Jersey Bike School program. *Accid Anal Prev*, 52, 237-249. doi:10.1016/j.aap.2012.09.015
- Lehtonen, E., Havia, V., Kovanen, A., Leminen, M., & Saure, E. (2016). Evaluating bicyclists' risk perception using video clips: Comparison of frequent and infrequent city cyclists. *Transportation Research Part F: Traffic Psychology and Behaviour*, 41, 195-203. doi:10.1016/j.trf.2015.04.006
- Lisa Facey-Shaw, Dirk Börner, Specht, M., & Bartley-Bryan, J. (2015). A Moodle-based Badge System for Evaluating the Motivational Levels of Introductory Programmers.
- Marie L. Connelly, Helen M. Conaglen, Barry S. Parsonson, & Isler, R. B. (1998). CHILD PEDESTRIANS' CROSSING GAP THRESHOLDS. *Accident Analysis and Prevention*, 30(4), 443-453.
- McLaughlin, K. A., & Glang, A. (2010). The effectiveness of a bicycle safety program for improving safety-related knowledge and behavior in young elementary students. *J Pediatr Psychol*, 35(4), 343-353. doi:10.1093/jpepsy/jsp076
- Meir, A., Oron-Gilad, T., & Parmet, Y. (2015). Can child-pedestrians' hazard perception skills be enhanced? *Accid Anal Prev*, 83, 101-110. doi:10.1016/j.aap.2015.07.006
- Rosenbloom, T., Mandel, R., Rosner, Y., & Eldror, E. (2015). Hazard perception test for pedestrians. *Accid Anal Prev*, 79, 160-169. doi:10.1016/j.aap.2015.03.019
- Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, 69, 371-380. doi:10.1016/j.chb.2016.12.033
- Scialfa, C. T., Borkenhagen, D., Lyon, J., Deschenes, M., Horswill, M., & Wetton, M. (2012). The effects of driving experience on responses to a static hazard perception test. *Accid Anal Prev*, 45, 547-553. doi:10.1016/j.aap.2011.09.005
- Skinner, B. F. (1938). *The Behavior of Organisms An Experimental Analysis*: New York : Appleton - Century.
- Treat, J. R., Tumbas, N. S., & McDonald, S. T. (1977). *Tri-level study of the causes of traffic accidents*. Retrieved from Institute for Research in Public Safety. :
- Vansteenkiste, P., Zeuwts, L., Cardon, G., & Lenoir, M. (2016). A hazard-perception test for cycling children: An exploratory study. *Transportation Research Part F: Traffic Psychology and Behaviour*, 41, 182-194. doi:10.1016/j.trf.2016.05.001
- Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business.*: Wharton Digital Press.

- WHO. (2004). *World report on road traffic injury prevention*. Retrieved from http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/en/
- WHO. (2014). *Children and road traffic injuries*. Retrieved from http://www.who.int/violence_injury_prevention/child/en/
- Zeuwts, L., Vansteenkiste, P., Cardon, G., & Lenoir, M. (2016). Development of cycling skills in 7- to 12-year-old children. *Traffic Inj Prev*, 17(7), 736-742. doi:10.1080/15389588.2016.1143553

Accessible C-programming course from scratch using a MOOC platform without limitations

Castelló, Adrián^a; Iserte, Sergio^a; Belloch, Jose A.^b

^aDpto. de Ingeniería y Ciencia de Computadores, Universitat Jaume I, Castelló (Spain).

^bDpto. de Tecnología Electrónica, Universidad Carlos III de Madrid (Spain).

Abstract

The C language has been used for ages in the application development in multidisciplinary environments. However, in the academia, this language is being replaced by other higher-level languages due to they are easier to understand, learn and apply. Moreover, the necessity of professionals with a good knowledge in those high-level languages is constantly increasing because of the boosting of mobile devices. This scenario generates a lack of low-level language programmers, required in other less trendy fields, but equal or more important, such as science, engineering or research.

To revive the interest in low-level languages and provide those minority fields with well-prepared staff, we present in this work a C-programming massive online open course (MOOC) that is addressed to any kind of people with or without IT background. A feature that differentiates this course from others programming online-based courses is that we mainly focus on the C language syntax providing, via a self-tuned virtual machine, an encapsulated environment that hides any interaction with the command-line of the underlying operating system. A secondary target of this work is to foster the computer science degree students to enrol the computer architecture specialization at the Universitat Jaume I (Spain). For this purpose, the High-Performance Computing and Architectures research group of that University has decided to use this C course as a tool to fulfill the gap of the current syllabus.

The results show that half of the participants that completed the first session of the course have satisfactorily finished the course, and the number of computer science degree students that chose the computer architecture specialization the following academic course was increment by 3x.

Keywords: MOOC; C language; Programming course

1. Introduction

Engineering students often have difficulties with learning a programming language. Programming difficulties were identified by Butler and Morgan (2007), and Bosse and Gerosa (2017). To the usual difficulties of learning programming for the first time (a slightly different way of thinking is required), we need to add that C is one of the most difficult programming languages to learn, requiring the knowledge of several new and unique to C concepts with a slow learning curve, meaning that before writing the first program, students have to learn and understand different concepts, such as types of variables, functions, memory allocation of variables, among others.

As a consequence, this language is being replaced in the academia by other higher-level languages due to they are easier to understand, learn and apply. Moreover, the necessity of professionals with a good knowledge in those high-level languages is constantly increasing because of the boosting of mobile devices. This scenario generates a lack of low-level language programmers, required in other less trendy fields, but equal or more important, such as science, engineering or research.

To revive the interest in low-level languages and provide those minority fields with well-prepared staff, we present in this work a C-programming MOOC that is addressed to any kind of people with or without IT background (see Klobas et al. (2015) and Guo et al. (2014)). Pawelczak and Baumann (2014) carried out a first approach by designing a Virtual-C IDE as programming environment for beginners. A feature that differentiates this course from others programming online-based courses is that we mainly focus on the C language syntax providing, via a self-tuned virtual machine, an encapsulated environment that hides any interaction with the command-line of the underlying operating system.

The course is aimed to the practice since the very beginning. It is composed of 5 sessions, each one containing a set of videos with the explanations, a self-contained hands-on activity, and an auto-evaluated test. The design of the course followed the guidelines of the works presented by Shyr (2010), Bonwell (1991) and McKeachie (1994), that indicate that students retain much more when they directly go to practice sessions in contrast to the traditional classroom lectures where they only see or listen concepts. Lahtinen et al. (2005) also find in their study, that most helpful for students' learning is writing programs on their own.

A secondary target of this work is to foster the Computer Science degree students to enrol the computer architecture specialization at the Universitat Jaume I (Spain). For this purpose, the High-Performance Computing and Architectures research group of that University has decided to use this C course as a tool for fulfill the gap of the current syllabus.

This article is structured as follows: Section 2 describes the concepts and the five sessions of the C-programming course. Section 3 offers the technical implementation of the MOOC. Section 4 offers statistical results attending that were collected from the participants. Finally, some conclusion remarks are devoted to Section 5.

2. Summary of the five sessions

We have divided our course in five sessions that cover all tools that a participant without any C-knowledge could require in order to quickly develop a simple program. Figure 1 shows the MOOC welcome page from the course where all the materials, including the links to the videos, are still available.

Nombre	Descripción	Publicación	Idioma	Acceder
Tema 1				
Transparencias del tema 1	Estructura del programa Tipos, Variables y Operadores...	31 mar 2017	Castellano	Descargar
Ejercicios del tema 1	Boletín Ejercicios Resueltos Fichero de Jupyter...	31 mar 2017	Castellano	Descargar
Video Tema 1 - Parte 1	...	31 mar 2017	Castellano	Acceder al enlace
Video Tema 1 - Parte 2	...	31 mar 2017	Castellano	Acceder al enlace
Video Tema 1 - Parte 3	...	31 mar 2017	Castellano	Acceder al enlace
Tema 2				
Transparencias del tema 2	Compilador Estructuras de control no iterativas...	31 mar 2017	Castellano	Descargar
Ejercicios del tema 2	Boletín Ejercicios Resueltos Fichero de Jupyter...	31 mar 2017	Castellano	Descargar

Figure 1: URL from the MOOC course: <http://ocw.uji.es/curso/1929169>

The five sessions of the course cover the following aspects of the C-programming:

Session 1: Data Types

We present in this session the four basic arithmetic type specifiers *char*, *int*, *float* and *double*, and the modifiers *signed*, *unsigned*, *short* and *long*.

Session 2: Non-Iterative control structures.

Session 2 is devoted to the sentences that allow to decide which part of the program must be executed in each moment. We focus mainly on the sentences *if-else* and *switch*.

Session 3: Iterative control structures.

Iterative control structures collect the group of sentences that allow to repeat different parts of the program. In case the number of iterations is known, we use the statement *for*. In other cases, we use the statements *while()*, and *do ... while ()*.

Session 4: Vector, Chains and Functions

Session 4 focuses on the definition of static memory arrays, such as: vectors, matrices and chains of characters. Moreover, the participants of the course will also learn how to design functions and how they interact with the rest of the code.

Session 5: Memory Issues

The last session is the most difficult one and describes the memory access when complicated data structures are used. Participants learn to deal with the complexity of pointers.

3. Workplace deployment

Aware that this course was addressed to people without any previous knowledge in programming, we decided to avoid any interaction between the participant and the system console or the command line. For this purpose, we deployed a ready-to-use virtual machine with all the needed software. Figure 2 illustrates the setup that participants were expected to have in their own workstations.

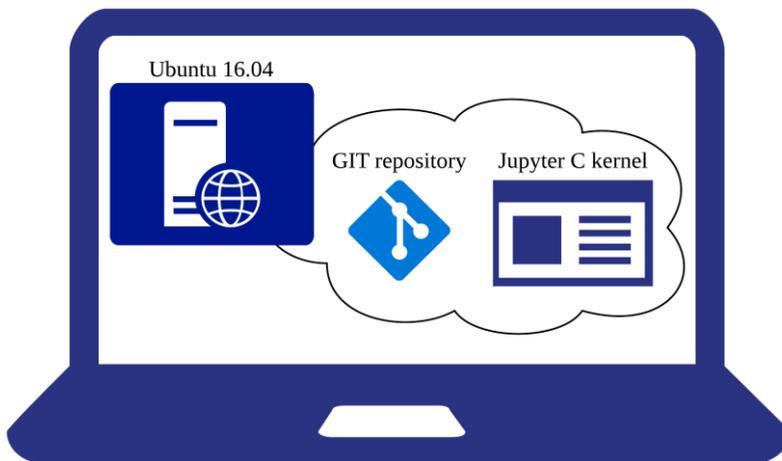


Figure 2: Setup that students were expected to have in their own workstations.

We based our platform on a GNU/Linux Ubuntu 16.04, installed in a VM. In order to handle the VM, we chose Oracle VM VirtualBox mainly because its acceptance in desktop environments and its easy installation, in any platform, for non-experienced users.

Apart from the native software included in Ubuntu, the VM came with a GIT repository of the course with the files loaded by Jupyter in each session. This local repository was weekly synchronized (when a new session was released) with one in BitBucket¹. A script automatically executed when the user logged in the system was in charge of this update.

The main tool for developing and executing the codes, was Jupyter. Particularly, a version of Jupiter that includes a C kernel² which allows the users to compile and execute with only pressing [Ctrl + Intro] in their keyboard.

4. Results

First result consists on evaluating the number of participants that completed each one of the sessions, see Figure 3. It is important to point out that half of the students that signed out for the first session finished successfully the course.

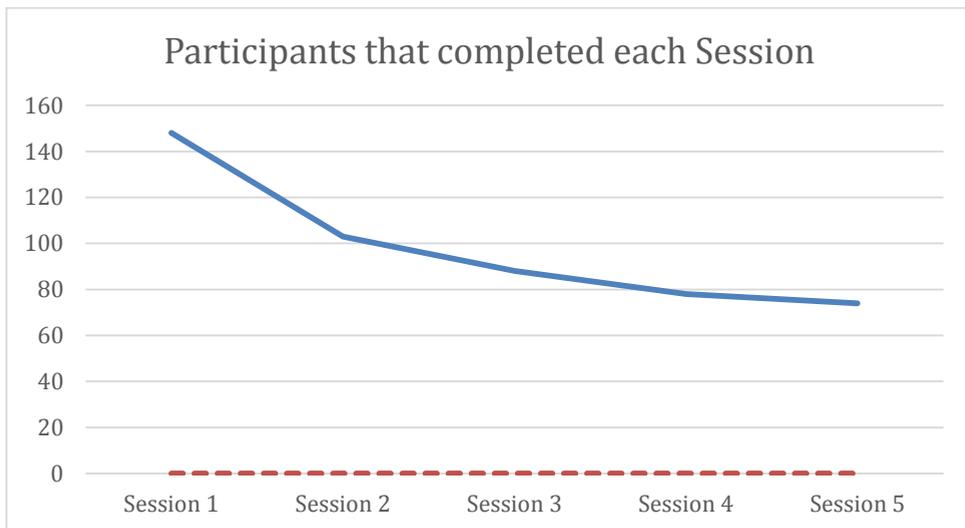


Figure 3: Number of participants that completed each session.

Afterwards, we ask the participants that assess the complexity of the sessions, as well as the number of hours that they required in order to complete each one of the sessions. Figures 4 and 5 collect information of this kind. As it is appreciated in Figure 4, the time employed

¹ <https://bitbucket.org/>

² <https://github.com/brendan-rius/jupyter-c-kernel>

by the participants for performing the first two sessions is around 1-2 hours, which is reasonable since they deal with the most basic concepts. As the course advances, the percentage of participants that require 3-4 hours increases, being the session 5 the one that agglutinates the most percentage of participants that require more than 5 hours. Note that in average, most of the participants require 3-4 hours to complete each session.

Regarding the complexity of the sessions that is shown in Figure 5, we appreciate that the first two sessions had a difficulty which could be *expected* by the participants, while sessions 3, 4 and 5 were considered as *difficult*, which is also a coherent result. It is important to highlight the low percentage of the participants that considered globally the sessions as *hard*.

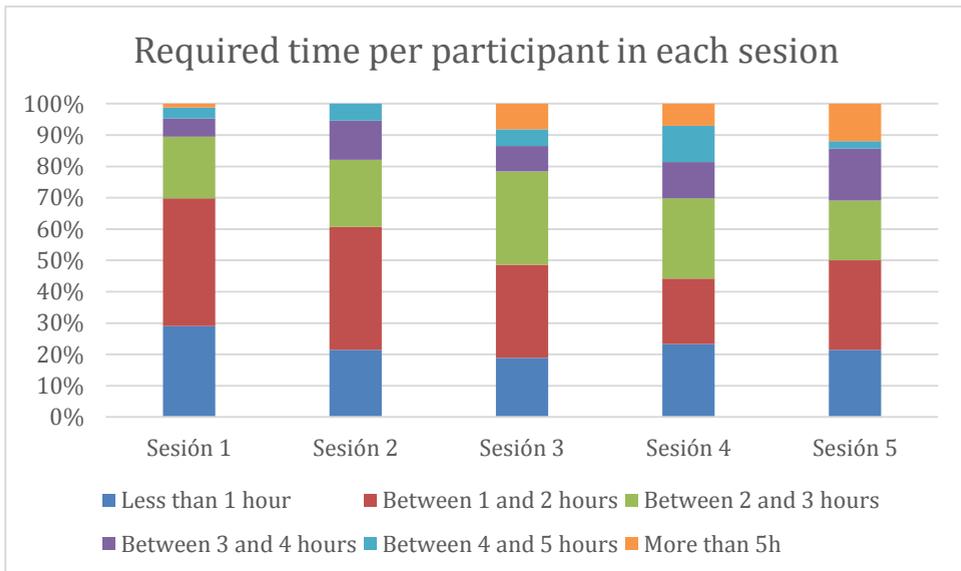


Figure 4: Percentage of participants together with the required time to complete each session.

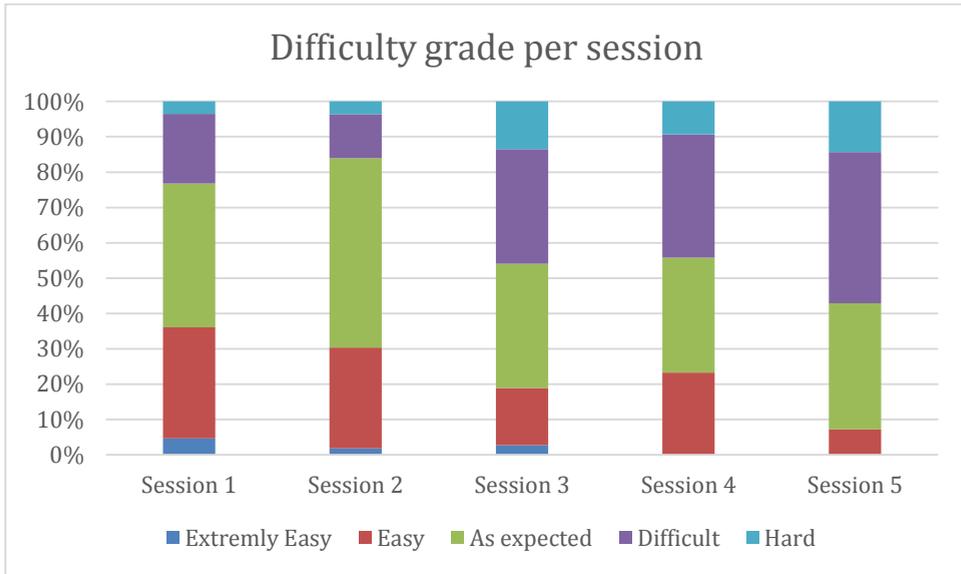


Figure 5: Percentage of participants together with the difficulty grade to complete each session.

Finally, this course aimed also to foster the computer science degree students to enrol the computer architecture specialization at Universitat Jaume I (Spain). As a result, we want to stand out that the number of computer science degree students that chose the computer architecture specialization the following academic after the first edition of the course was increased by three.

5. Conclusion

The first conclusion that we want to extract is that half of the participants that signed out for the first session finished successfully the course. Considering the surveys that were completed by the participants, we can consider that there is still features to improve but that there exists a global satisfaction for this course, which will continue being offered by the Universitat Jame I (Spain) for the following years.

Acknowledgements

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References

- Bosse, Y., & Gerosa, M. A. (2017). *Why is programming so difficult to learn? Patterns of Difficulties Related to Programming Learning Mid-Stage*. SIGSOFT Softw. Eng. Notes 41, 6 (January 2017), 1-6
- Butler M. & Morgen, M. (2007). *Learning challenges faced by novice programming students studying high level and low feedback concepts*. In ICT: Providing choices for learners and learning. Proceedings ascilate Singapore 2007, 99-107.
- Klobas, J. E., Mackintosh, B. & Murphy, J. (2015). *The Anatomy of MOOCS*. In: P. Kim (Ed.), *Massive Open Online Courses. The MOOC Revolution*. New York & London: Routledge.
- Guo, P. J., Kim, J., & Rubin, R. (2014). *How video production affects student engagement: an empirical study of MOOC videos*. Proc. of the 1st ACM Conference on Learning, Atlanta, Georgia, USA. doi:10.1145/2556325.2566239.
- Pawelczak, D. & Baumann, A. (2014): *Virtual-C – a programming environment for teaching C in undergraduate programming courses*. In Proc. of the IEEE Global Engineering Educ. Conf. (EDUCON), 3-5 April 2014, Istanbul, Turkey, 1142-1148
- Bonwell, C. C. & Eison, J.A. (1991). *Active learning: Creating excitement in the classroom*, Washington C. C. George Washington University
- Christensen, C. M., Horn, M. B. & Johnson, C. W. (2010). *Rethinking student motivation: Why understanding the 'job' is crucial for improving education*, Boston: Innosight Institute.
- Mckeachie, W. J. (1994). *Teaching Tips: Strategies, Research, and Theory for College and University Teachers, 9th ed*. Lexington, MA: Cengage learning.
- Lahtinen, E., Mutka, K. A., & Jarvinen, H. M. (2005). *A Study of the difficulties of novice programmers*. In Proc. of the 10th Annual SIGCSE Conf. on Innovation and Technol. In Comput. Sci. Educ. ITiCSE'05, 14-18

Non-Natural Born lecturers: How to survive teaching in Dutch higher education

Oude Alink, Charlotte^a; Martinetti, Alberto^b; Karahanoğlu, Armağan^b and Hahnen-Florijn, Marije^a

^aCentre of Expertise in Learning and Teaching, University of Twente, The Netherlands.

^bDesign, Production and Management, Faculty of Engineering Technology, University of Twente, The Netherlands.

Abstract

Teaching in Higher Education Institutions (HEI) requests training and skills as researching. Unfortunately, on an international level the teaching training programme is not always crystal and clear, or even worse, not requested. Often researchers are asked to provide lectures without receiving proper formation. This approach creates sensible depletion in the educational quality. Offering an overview on how the Dutch HEIs are tackling the problem, the aim of this study is twofold: (i) presenting the University Teaching Qualification (UTQ) from a career development perspective and (ii) giving a qualitative evaluation of the entire process from the point of view of UTQ supervisors and lecturers. Finally concluding the relevance of such a professionalization programme.

Keywords: *teaching qualification; non-natural born lecturers; professionalization; Dutch experience; Engineering Education*

1. Researchers are not necessarily natural born lecturers

Teaching, at every level, represents one of the most challenging and, at the same time, rewarding activity. Preparing students for living in the society, for being able to build a society and work in a multi-cultural team is both a responsibility and a pleasure. And, it requires never-ending efforts, in order to keep going to match the expectation of the society with the passions of the students. For this reason, skilled teachers are important for developing master courses based on Bloom's Taxonomy (Bloom, 1956) in order to be aligned with learning goals of the curricula and with the most recent innovations in terms of education.

As mentioned by Kelchtermans (2007), becoming a teacher is conceived of as a continuing process of professional development, resulting from the meaningful social interaction between the student teacher and his/her professional environment. However, it has to be said that, especially at higher education institutions as research universities, the path to become teacher or lecturer (or as academics like to be defined "professor") often begins with a strong research career orientation. As highlighted by Baume (2006) and confirmed by González-Geraldo & Monroy (2017) learning to teach in higher education is not a straightforward path; teaching in higher education may be one of the last "non-professions".

In a nutshell: when working on a university people are trained to do research, and will also be heavily involved in teaching tasks. However, being an outstanding researcher, does not imply being a "natural born lecturer". Using a sporty simile, being a star player does not ensure to become a winning team manager. Looking at the European scenario, few countries are properly tackling this issue trying to incorporate next to a research training also an efficient teaching training. Due to pressure by the government and thanks to the ambition of universities a serious look was taken at the quality of education (Keesen et al., 1996). In 2008 this resulted in the agreement that all new incoming researchers have to professionalise themselves by obtaining a University Teaching Qualification (UTQ), "conditio sine qua non" for proceeding with their academic careers (de Jong, Mulder, Deneer & van Keulen, 2013; Wiel et al., 2016).

Most lecturers who followed a teaching course to professionalize their teaching skills in higher education will experience positive effects in the long term (Stewart, 2013). Benefits that the lecturers experienced were more confidence in their teaching, a philosophy shift towards student-centred teaching, and an appreciation of getting in touch with another academic culture (Hanbury, Prosser & Rickinson, 2008). Consequently, it is not a strange phenomenon that there is an increase in (obligatory) teaching courses when looking at the global developments (Hanbury, et al., 2008; Parson, Hill, Holland & Willis, 2012). The success of a course depends on how the course is designed and implemented. A number of aspects that have a positive effect are: interventions spread over a longer time (Parson et al.,

2012), a connection to further professionalization/career perspective (Hanbury et al., 2008), and interaction with peers (Stewart, 2013).

Summarizing: it is important to professionalise researchers in their teaching, because these two different roles need two different skill sets. Several countries have adopted different rules about teacher professionalization and also universities within the same country have tackled this item differently. There are some success and failure factors known from literature. How does this knowledge influence the professionalization programmes available at Dutch Universities? And more important: does the UTQ help the lecturers in their teaching tasks?

2. How researchers can professionalize their teaching skills in the Netherlands

The most standardized Dutch professionalization programme for teaching in Higher Education is the UTQ. And in 2008 all universities in the Netherlands signed an agreement which stated that they would recognize the UTQ of each other (de Jong, et.al., 2013; Wiel et al., 2016). This meant that if a teacher completed his UTQ at for example the University of Groningen, this certificate would also be valid at the University of Twente. A pro is that all lecturers who have their UTQ have at least the same basic skills, a con is that it limits the amount of freedom a university has to set-up their professionalization programme.

Nevertheless it does not mean that all universities have the same criteria for the UTQ or is supervised in the same way. There are similarities, for example that all lecturers have to hand in a portfolio which will be assessed. And there are differences, such as which lecturers are obligatory to get their UTQ, when lecturers have to start, or if it is obligatory to follow the courses.

The four technical universities in the Netherlands, called the 4TU have an additional agreement (the technical universities are: Technical University Delft (TUD), Technical University Eindhoven (TU/e), University of Twente (UT) and Wageningen University & Research (WUR)) (van der Hulst et al., 2016). The TUD, TU/e and UT have this agreement since 2006 and WUR has joined this agreement since 2017.

The TUD, TU/e and UT already have the same criteria and WUR has the intention to join later on. Since 2017 new competences have been agreed upon by the 4TU, the universities have agreed to 5 different competences that lecturers have to obtain before receiving their UTQ (University of Twente, 2017). These competences are:

1. Designing or redesigning education
2. Teaching and Supervising
3. Assessment
4. Evaluating teaching
5. Professionalization

For each of these competences, additional criteria have been formulated. The process differs again per university; in figure 1 the process of obtaining a UTQ at the UT is shown.

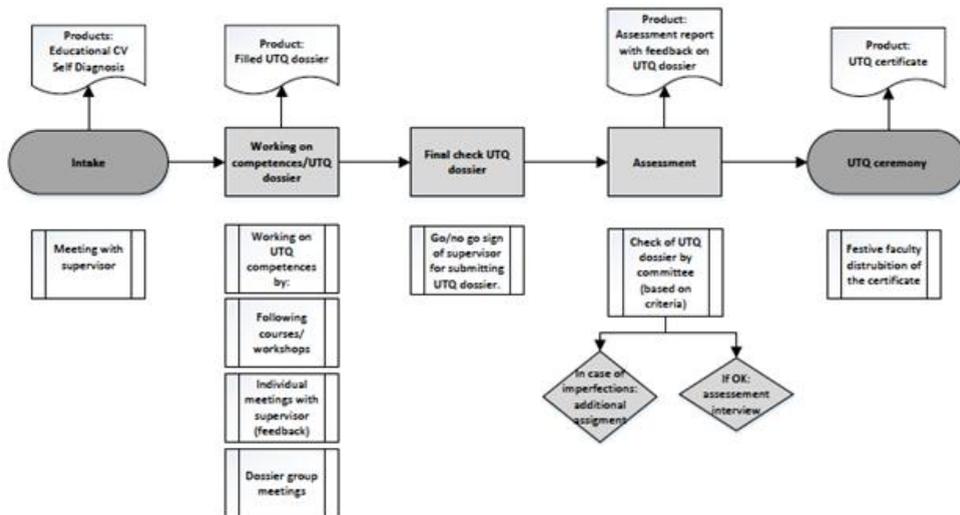


Figure 1. Process of the UTQ (University of Twente, 2017)

At the UT the estimated length of the process is set at 250 hours (University of Twente, 2017). The duration in which a lecturer finishes varies per person but in total the process should not take longer than three years. When a lecturer has received a positive result on the assessment, it is believed that the lecturer has shown that he has obtained the basic skills necessary to be a good lecturer in higher education. To make sure the quality of the portfolios are up to standard, the universities connected to the 4TU do random sample checks where they re-assess portfolios from the other universities once a year (van der Hulst et al., 2016).

On a national level, the quality of the lecturers is also monitored. Although lecturers are not obliged to get their UTQ by national law, at the 4TU universities most lecturers are “kindly” obliged to get their UTQ based on work experience and profile (van der Hulst, et al., 2016).

3. How the UTQ works in practice

a. The perspective from a UTQ supervisor at the University of Twente, faculty of Engineering Technology

The UT is divided into five faculties (1. Behavioural, Management and Social Sciences, 2. Electrical Engineering, Mathematics and Computer Sciences, 3. Engineering Technology,

4. Science and Technology, and 5. Geo-Information and Earth Observation). Each faculty has one or two UTQ supervisors. Within the faculty of Engineering Technology there are two UTQ supervisors, both with background in educational science, and currently there are 24 lecturers in the UTQ process.

Each process starts with an intake interview in which the supervisor and the lecturer discuss the approach to take, competences and the educational tasks of the lecturer. At the UT the choice has been made to let the lecturer in the lead; the lectures decide if and how often he wants to meet the supervisor, which courses he wants to follow and on which educational tasks he wants to base his UTQ on. The UTQ supervisor does play an advisory role in this decision making indeed. One obligatory aspect is that the assignments need to be fulfilled by the lecturers in order to be connected to their own educational tasks. This way the lecturers learn the basic skills of teaching and improve their courses at the same time.

In the beginning of the process the lecturer follows several courses which are directly related to the five competences. During this time the contact between the supervisor and the lecturer is usually limited. When the lecturer starts with the writing process the contact intensifies. The supervisor gives one on one feedback on the chapters written by the lecturer and discusses the feedback during individual meetings.

Next to these individual meeting, there are a number of other group meetings, such as writing sessions, where the lecturers being away from their offices and other obligations can write and simultaneously consult with the supervisor. An additional helping moment is the UTQ-day, which is scheduled once a quartile. These meetings start with discussing theoretical educational content and continues in a writing session.

When the lecturers are ready writing their portfolios they can ask their supervisor to perform a final check for completeness. Then, the lecturer hands in the portfolio for the assessment and the UTQ-coordinator assembles an assessment committee, consisting of the programme director of the programme the teacher is connected to, an educational advisor (other than the UTQ supervisor). The supervisor of the lecturer can clarify small things, but does not have an active role in the assessment. First the portfolio is read and the assessment is finalized with an assessment interview.

Table 1. Overview of the number of lecturers in the UTQ trajectory.

Position in the trajectory	Absolute numbers	Percentages
Certified	310	41,0%
Have an equivalent	118	15,6%
In the trajectory	121	15,9%
Still need to start	77	10,2%
Have an exemption	131	17,3%

At the moment, 26,1% of the lecturers are working on their UTQ or still need to start (see table 1). Since February 2018 a questionnaire was set out to the lecturers who finished their UTQ. In total 13 lecturers filled in the questionnaire. 76,9% of the lecturers evaluated the UTQ trajectory as 'good', the other 23,1% of the lecturers answered 'neutral'. Most lecturers indicated that the UTQ have contributed to their teaching skills to a large extent (53,8%). They state that the UTQ especially has provided them with tools/methods on how to educate. The voluntary courses were mentioned most often as the most useful element of the UTQ and writing the portfolio as the least useful element.

Interesting here is that also some lecturers mentioned the complete opposite; indicating that the courses were too broad (not specified for their specific discipline), and writing the portfolio forced them to properly think about their courses. All in all, these results prove that the UTQ process is a very individual one, therefore it is relevant to zoom in on the experience of two lecturers, one still in the process and one who has obtained his UTQ.

b. The University of Twente, faculty of Engineering Technology

As stated, lecturers who start working at UT are obliged to finalize their portfolio within 3 years. The competences of UTQ are designed to help the lecturer to learn and reflect on various dimensions of teaching in higher education. Starting from the "designing and redesigning of education", the UTQ process contributes to the improvement of both the experience of the lecturer and the quality of teaching at the university.

Based on the reflections of the authors, lecturer's experience before starting the UTQ process varies. Some of the lecturers have prior knowledge and even experience in completing a "teaching qualification portfolio". That is mainly because, improving the quality of teaching in higher education has been a world-wide phenomenon. While the structure of the process might be different for every lecturer, the aim of all teaching qualification portfolios is approximately the same. For instance, in one of the universities that authors previously worked, the PhD and Post-Doc's take courses for improving their teaching quality in higher education, developing a course and lecture plans before they get a certificate. Therefore, the lecturers who have this prior knowledge might feel more confident in starting and handling the process. Still, the UTQ is different than any other course that international universities offer and unique in covering all the dimensions of teaching in higher education which helps the lecturers to reflect on their teaching.

The UTQ process shows several contact points with the well-known Bloom's Taxonomy approach. Figure 2 explains how the "non-natural born lecturers" can perform the five competences of the UTQ adopting the educational objectives of the taxonomy as backbone for each one of those.



Figure 2. How Bloom's Taxonomy is integrated in the 5 UTQ competences.

Referring to the first UTQ competence, “Designing (or re-designing) a course”, it is highly important for lecturers to start with “knowing” and “comprehending” the contextual information and the pedagogical requirements of the course within a study programme. Once the lecturer has the proper confidence with the needed information (expected students’ level, workload of the course, assessment criteria), she/he can translate the gained knowledge in practice, “applying” it in designing a course.

After that, an “analysis” phase gives to the lecturer the opportunity to test whether the set general learning requirements are met in the design she/he made. Based on these results changes can be “synthesised” in the following times the course will be executed. Finally, the lecturer has to “evaluate” her/his own role in the design process of the course.

The role of the researcher is not forgotten in the UTQ process. The lecturers are also expected to do research in addition to their teaching duties. This helps the lecturer to look from a different perspective: how could we integrate the research experience and knowledge into the topics of the lectures. This does raise the challenge, namely to communicate the complexity of the knowledge with the students through appropriate teaching methods. Therefore, UTQ process assists the lecturers to learn those methods and implement their professional research skills and knowledge into their teaching.

4. Conclusions

University Teaching Qualification (UTQ) is a standardized Dutch professionalization programme that aims at improving the educational needs of higher education. This paper outlines the reflections of supervisors and lecturers on the process.

UTQ offers a tool to improve the personal learning skills in higher education. The process is evaluated positively by most lecturers. The results obtained during the UTQ sessions force the lecturer to learn how to get more students’ engagement, how to create collaborative socialization, how to supervise and give proper and constructive feedback increasing at the same time the own educational competences. These competences are related not only to how to build and organise a course, but also in general to the challenges

related to supervising students. What could strengthen the process is to have the courses more specified to the disciplines of the different lecturers.

Moreover, the UTQ offers a relevant opportunity to let the lecturers apply and experience different strategies, to reflect on eventual teaching mistakes and possible points to improve, understanding the reasons behind them during the discussion sessions. The feedback that lecturers receive about their progress during the UTQ development make them feel almost always more confident (or shows them they still need to work hard).

References

- Baume, D. (2006). Towards the End of the Last Non-Professions? *International Journal for Academic Development*, 11(1), 57–60.
- Bloom, B.S. (1956). *Taxonomy of educational objectives*. New York: David McKay.
- de Jong, R., Mulder, J., Deneer, P. & van Keulen, H. (2013). Poldering a teaching qualification system in higher Education in the Netherlands: a typical Dutch phenomenon. *Revista de Docencia Universitaria*, 11(3), 23-40.
- González-Geraldo, J. L. & Monroy, F. (2017). Impact of a teacher development programme on approaches to teaching in higher education. *3rd International Conference on Higher Education Advances*, HEAd'17, Universitat Politècnica de Valencia, Valencia. DOI: <http://dx.doi.org/10.4995/HEAd17.2017.5052>.
- Hanbury, A., Prosser, M. & Rickinson, M. (2008). The differential impact of UK accredited teaching development programmes on academics' approach to teaching. *Studies in Higher Education*, 33(4), 469-483.
- Kelchtermans G. (2006). Teacher collaboration and collegiality as workplace conditions. A review, *Zeitschrift für Pädagogik*, 52, pp. 220-237.
- Keesen F., Wubbels T., van Tartwijk J. & Bouhuijs P.A.J. (1996). Preparing university teachers in The Netherlands: Issues and trends, *International Journal for Academic Development*, 1 (2), pp. 8-16. <https://doi.org/10.1080/1360144960010202>.
- Parsons, D., Hill, I., Holland, J. & Willis, D. (2012). *Impact of teaching development programmes in higher education*. Report from the The Higher Education Academy. Retrieved from: https://www.heacademy.ac.uk/system/files/resources/hea_impact_teaching_development_prog.pdf.
- Stewart, M. (2013). Making sense of a teaching programme for university academics: Exploring the longer-term effects. *Teaching and Teacher Education*, 38, 89-98.

University of Twente, CELT. (2017). *UTQ Manual: University Teaching Qualification*. Report from University of Twente, CELT. Retrieved from: <https://www.utwente.nl/en/ces/celt/utq/utq-manual-deelnemers-dec-2017.pdf>.

University of Twente. (n.d.). In *Homepage University of Twente*. Retrieved 29th of January 2018, from <https://www.utwente.nl/en/organization/structure/>

van der Hulst, J., Weltje-Poldervaart, M., Pauw, E., Rijnbeek, G., van de Wouw, H., van Eck-de Vries, W., Hahnen, M. & Sjerps, M. (2016). *4TU Regulations*. Report from 4TU. Retrieved from: <https://www.utwente.nl/en/ces/celt/utq/4tu-utq-regulation-def-uk-08-03-17.pdf>.

Results of the use of Kahoot! gamification tool in a course of Chemistry

Ares, Ana María^a; Bernal, Jorge^b; Nozal, María Jesús^a; Sánchez, Francisco Javier^b
and Bernal, José^a

^aDepartment of Analytical Chemistry, Universidad de Valladolid, Spain, ^bComputer Science Department and Computer Vision Center, Universitat Autònoma de Barcelona, Spain

Abstract

The present study examines the use of Kahoot! as a gamification tool to explore mixed learning strategies. We analyze its use in two different groups of a third-year theoretical subject in the Degree in Chemistry. An empirical-analytical methodology was used among two different groups of students with different frequency of use. The academic results of these two groups of students were compared and these in turn with those obtained the previous year, in which Kahoot! was not employed; the aim was to measure the extent to which the students' knowledge had developed. The results showed, in all cases, that the use of Kahoot! had led to a significant increase in the overall marks and in the number of students passing the subject. Moreover, some differences were also observed in students' academic performance according to the group. It can be concluded that the use of a gamification tool (Kahoot!) in a university classroom had generally improved students' learning and marks, and that this improvement was more prevalent among students who had achieved a better Kahoot! performance.

Keywords: *Academic improvement; Gamification; Information and Communication Technologies; Kahoot!; Smartphones; University students.*

1. Introduction

Given the strength and interactivity of Information and Communication Technologies (ICT) in all areas of society, the current classroom cannot be conceived without the use of technological tools (Gros & Contreras, 2006), and in this regard one of the main challenges in the educational field is to determine how ICT can contribute to the objectives and needs of education (Carneiro & Díaz, 2012). Consequently, it is necessary to determine how the objectives of education can be fostered and assisted by the various tools included in ICT. Several researchers have indicated the improvement in students' motivation when the use of ICT is introduced in their teaching-learning process. One example is the introduction of mobile elements (tablets, smartphones or laptops) in the classroom (Rojas, 2014). Currently, most students attend the university with a very powerful tool in their pockets, the smartphone. It is so widely used that the number of smartphones and/ or tablets on the planet is greater than its population, and Spain is one of the European countries that make most use of them. Mobile devices provide various tools/applications to be used not only within an experimental laboratory, but also in theoretical classes, permitting a complement to the student's training and learning; this means it is better adapted to scientific method (Andújar et al., 2011). However, it is necessary to instruct students in the use of mobile devices (smartphones or tablets) for educational purposes in the classroom, as the correct implementation of this new methodology requires a series of requirements to be met (Ng & Nicholas, 2013).

One clear example of the use of mobile devices in education is gamification, which is understood as the use of mechanisms, aesthetics and thinking in order to attract people, encouraging action, promoting learning and solving problems (Kapp, 2012; Rodríguez-Fernández, 2017). It is obvious that new technologies have contributed to the evolution of gamification, including narrative transmedia. Games do not necessarily have to be played in a static way, but they allow the inclusion of common everyday devices such as the smartphone, thereby opening up new possibilities for attracting those generations accustomed to the use of technologies (Rodríguez-Fernández, 2017). One of the most employed gamification tools is Kahoot!, a free tool that has gained popularity among teachers for its simple use and its ability to establish active work dynamics in the classroom. Kahoot! allows teachers to create surveys, questionnaires and discussions, obtaining feedback from students in real time. In the case of questionnaires, which is the object of our study, the teacher creates the questions and determines the correct answer whilst setting the time in which the student has to respond. The questions are projected in the classroom and the students answer them via their smartphones within the designated time. Each question shows the respective winner and the points are accumulated to offer a final ranking, as if students were in a competition. Thus, Kahoot! questionnaires could be

seen as an alternative to the traditional way of reviewing a university lecture, whereby instead of the teacher telling students what they should have learnt, this quiz allows them to demonstrate what they have learnt (Young & Nichols, 2017). There are certain key benefits arising from the approach: i) students see it as an entertaining activity; ii) students have to reflect on what they have learnt in order to answer the questions; iii) teachers can get a sense of how well students have grasped the material from the lessons; iv) students are allowed to obtain immediate formative feedback on their learning without any risk of embarrassment (Hussein, 2015).

The following is a case study, carried out with two groups of students of a third-year theoretical subject in the Chemistry Degree at the University of Valladolid during the present academic year (2017-2018): The gamification tool Kahoot! was applied with different frequency of use. The latter was selected mainly because it is a simple and cheap way to obtain classroom response, in comparison with other tools requiring payment for levels of subscription hiding any premium features, and also as there are no restrictions in terms of the number of questionnaires that can be created or the questions included in each. The academic results of these two groups of students were compared, and then these results were in turn compared with those obtained for the previous year in the same subject (2016-2017), in which Kahoot! was not used; the aim was to study the potential benefits associated with the use of this tool.

2. Objectives and Hypotheses

2.1. Objectives

The main goal of this study was to assess the extent to which students' knowledge developed, by comparing their marks after a new pedagogical approach had been applied. This approach was based on ICT and gamification, through the free tool Kahoot!, as an alternative method of teaching and evaluation with respect to traditional methods. The study was performed with two groups of students of a theoretical subject in the Degree in Chemistry at the University of Valladolid. Moreover, certain secondary goals were proposed:

- To ascertain whether there are differences and whether better learning results are obtained when using the Kahoot! tool compared to traditional methods.
- To promote the use of new technologies and digital games in teaching-learning processes via Kahoot!.
- To encourage an entertaining and attractive learning environment that captures the attention and interest of the students.
- To improve the understanding of the Kahoot! tool in order to use it as a means of evaluation in subjects included in the Chemistry Degree.

- To encourage the motivation and interest among the students to achieve greater active participation and involvement in their own learning process, thereby enhancing their academic performance.

2.2. Hypothesis

The study starts from a series of initial hypotheses:

- Kahoot! contributes to improvement in memorising concepts, thus facilitating students' study process.
- Learning results are better thanks to games in the classroom.
- The effectiveness of Kahoot! depends on the frequency of the questionnaires.

3. Methodology

The present study approaches gamification as a tool in the university classroom through an empirical-analytical methodology, applying the same type of game (Kahoot! questionnaires), with the same contents, among two groups of students of the same subject. These, who were of similar ages and conditions, had the possibility of previously accessing their notes and attending the theoretical lectures, in which, at the end each lesson, a Kahoot! was proposed on the contents addressed. Both groups of students worked with the same tool (Kahoot!) but the frequency with which they played the games depended on the group. One (Group 1; 42 students) played a Kahoot! questionnaire per lecture, while in the case of the other group (Group 2; 47 students), the game was applied once every two lectures. Each questionnaire consisted of 7 questions and offered four different answers with a single correct option; in all cases, the students had 30 seconds to answer each question. Finally, the teacher gave a short explanation after each question. It should be noted that the participation in the Kahoot! questionnaires was not mandatory, and that the students played the Kahoot! questionnaires through their smartphones. To verify if Kahoot! contributed positively to learning outcomes, questions used in the quizzes were included in the partial and final exams of both groups, in this way it was possible to verify if the index of positive answers increased or decreased with respect to those questions that had not been seen in the classroom. Thus, in the partial examination of both groups, 10 test questions were raised, of which 3 had been previously answered through Kahoot!. While the final exam included 5 test questions, of which 2 had been previously answered in the Kahoot! questionnaires.

4. Results and Discussion

4.1. Students' participation

As previously mentioned in section 3, student participation in the Kahoot! questionnaires was not mandatory as this was not an official evaluation instrument. Therefore, the number of students that took part in the experiment varied during the semester (see Table 1). As can be seen, the overall number of students that played the different quizzes remained almost constant, although slight variations in both groups were observed in some specific cases.

Table 1. Overall number of students that participated in each of the Kahoot! questionnaires.

Lesson	1	2	3	4	5	6	7	8	9
Group 1	25	29	31	29	29	29	26	28	27
Group 2 ^A	NP	23	NP	23	NP	22	NP	21	NP

NP: not played; ^AGroup 2 played Kahoot! questionnaires once each two lessons.

Although the number of participating students was quite similar in all cases, these were not always the same ones: in Groups 1 and 2, these numbered 37 and 28, respectively, figures which are significantly higher than those summarized in Table 1; also as can be seen in Table 2, there was great variability in the number of Kahoot! questionnaires played by each student.

Table 2. Number of students that participated in the Kahoot! questionnaires.

Nº of Kahoot! quizzes	9 ^A	8	7	6	5	4 ^B	3	2	1	0
Group 1	16	6	3	1	2	2	5	1	1	5
Group 2	NP	NP	NP	NP	NP	14	5	6	3	19

NP: not played; ^Amaximum number of Kahoot! questionnaires for Group 1; ^Bmaximum number of Kahoot! questionnaires for Group 2;

This could be mainly due to three reasons: i) some of the students had subjects of different courses and therefore did not always attend classes; ii) Kahoot! quizzes were played on the same day that the students had activities relating to other subjects; and iii) students' personal issues. Furthermore, the number of students that participated in the Kahoot! quizzes was significantly higher for Group 1 (37 of 42 students; 88%) than for Group 2 (28 of 47 students; 60%). This difference in the students' participation is difficult to explain, since they were randomly distributed and were always advised of the Kahoot! quizzes one week in advance by the teachers in both groups, in addition to which the activity was

voluntary. Nevertheless, it is worthy of note that a majority of the students in both groups participated ($\geq 60\%$).

4.2. Comparison of the students' academic performance

In order to assess the evolution of the students' academic performance after participating in the Kahoot! questionnaires, the results obtained in the partial and final exams were compared with those obtained the previous year. It should be specified that the structures of both exams were quite similar, with the only exception that this year a test-based question was included in the final exam, in order to ascertain the contribution made by Kahoot!. As can be observed in Tables 3 and 4, students' overall marks were significantly higher in both groups, and this correlated directly with the number of students that passed the exam, representing an increase of more than 25%.

In addition, it was found that if only the repeated Kahoot! questions were taken into account (3), the mean mark was higher in Group 1 with respect to the overall mean mark of this group and Group 2. This could be explained by the higher frequency of the Kahoot! quizzes.

Table 3. Comparison of the students' academic performance (Group 1) in the partial exam.

<i>Academic course</i>	Mean mark (SD)	Mean mark of the repeated Kahoot! questions (SD)	% of students that passed the exam
<i>2016-2017</i>	4.32 (1.75)	NP	66
<i>2017-2018 (Kahoot!)</i>	5.98 (1.93)	6.46 (2.57)	39

NP: not played; SD: standard deviation.

Table 4. Comparison of the students' academic performance (Group 2) in the partial exam.

<i>Academic course</i>	Mean mark (SD)	Mean mark of the repeated Kahoot! questions (SD)	% of students that passed the exam
<i>2016-2017</i>	4.41 (1.91)	NP	68
<i>2017-2018 (Kahoot!)</i>	5.82 (1.96)	5.70 (2.42)	39

NP: not played; SD: standard deviation.

Regarding students' overall academic performance in the final exam, it is worth mentioning that this was similar to that observed in the partial exam (see Tables 5 and 6). The mean marks were higher in both groups in comparison with the previous year as well as the number of students that passed the final exam. However, in the latter case, there was a significant difference between the two groups concerning the number of students that passed the exam (13%). Moreover, as was the case of the partial exam, a disparity was also observed in the mean marks of the repeated Kahoot! questions. Both findings could be explained by the frequency with which the Kahoot! questionnaires were played.

Table 5. Comparison of the students' academic performance (Group 1) in the final exam.

<i>Academic course</i>	Mean mark (SD)	Mean mark of the repeated Kahoot! questions (SD)	% of students that passed the exam
<i>2016-2017</i>	4.00 (1.75)	NP	45
<i>2017-2018 (Kahoot!)</i>	5.01 (1.74)	5.70 (2.99)	74

NP: not played; SD: standard deviation.

Table 6. Comparison of the students' academic performance (Group 2) in the final exam.

<i>Academic course</i>	Mean mark (SD)	Mean mark of the repeated Kahoot! questions (SD)	% of students that passed the exam
<i>2016-2017</i>	4.06 (1.93)	NP	41
<i>2017-2018 (Kahoot!)</i>	5.07 (1.98)	5.10 (2.76)	61

NP: not played; SD: standard deviation.

5. Conclusions

The introduction of ICTs in the university classroom, and more specifically the use of a simple gamification tool (Kahoot!), has proven to be positive for the students' academic performance in a Chemistry course. This can be seen in the significant improvement of their marks or in the number of students that passed the exam in relation to that of a previous year in which Kahoot! was not applied. Moreover, it has been observed that the frequency of playing Kahoot! quizzes had an influence on the students' marks, as significant differences were observed in the mean marks obtained in the repeated Kahoot!

questions in both exams, and in the number of students that passed the final exam. This observation could be related with the students' participation in the Kahoot! questionnaires, which was much higher in Group 1. It may, therefore, be concluded that the goals proposed at the start of the study were successfully achieved and that the initial hypotheses were correct. However, given that the results presented here have been obtained from a pilot study, it is necessary to perform more exhaustive research (different courses and subjects), in order to verify the effectiveness of Kahoot! for improving students' academic performance in the Degree of Chemistry.

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References

- Andújar, J. M., Mejías, A., & Márquez, M. A. (2011). Augmented reality for the improvement of remote laboratories: an augmented remote laboratory. *IEEE Transactions on Education*, 54, 492-500.
- Carneiro, R., Toscano, J.C., & Díaz, T. (2009). *Los desafíos de las TIC para el cambio educativo*. Madrid: Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura, OEI, Servicio de Publicaciones.
- Gros, B., & Contreras, D. (2006). La alfabetización digital y el desarrollo de competencias ciudadanas. *Revista Iberoamericana de Educación*, 42, 103-126.
- Hussein, B. A. (2015). A blended learning approach to teaching Project management: A model for active participation and involvement: Insights from Norway. *Education Sciences*, 5(2), 104-125.
- Kapp, K. M. (2012). *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education*. New York: Pfeiffer.
- Ng, W., & Nicholas, H. (2013). A framework for sustainable mobile learning in schools. *British Journal of Educational Technology*, 44, 695-715.
- Rodríguez-Fernández, L. (2017). Smartphones y aprendizaje: el uso de Kahoot en el aula universitaria. *Mediterranean Journal of Communication*, 8(1), 181-190.
- Rojas, G. C. (2014). Factores que impiden la aplicación de las tecnologías en el aula. *Próxima Zona*, 20, 108-118.
- Young, S., & Nichols, H. (2017). A reflexive evaluation of technology-enhanced learning. *Research in Learning Technology*, 25: 1998.

Relationship between student guidance and academic achievement

Lukkarinen, Anna^a and Koivukangas, Paula^b

^aDepartment of Information and Service Management, Aalto University School of Business, Finland, ^bLearning Services, Aalto University School of Business, Finland.

Abstract

We assess how different types of guidance offered to first-year students are related to the students' subsequent academic performance. Using data from a student survey conducted at a Finnish business university, as well as the university's student database, we build regression models to predict student performance. We find that guidance on choosing a major subject and guidance on study methods are significant predictors of subsequent performance. More tactical types of guidance are not statistically significant, and can be rather considered as enablers. The quantitative findings are supported by verbal feedback collected from students. We conclude that guidance offered to students at the start of their university careers can bear fruit still several years afterwards. The findings have implications for university educators and staff responsible for the orientation of first-year students. Educators and staff can seek to enhance academic achievement by ensuring that students are equipped with sufficient methods and skills necessary for their university studies and by providing students with extensive information on possible study paths beyond the first year.

Keywords: *Academic achievement; first-year students; student guidance; student onboarding; student performance.*

1. Introduction

Starting university studies entails a major change to many individuals. The typical plethora of degree structures, course offerings, information systems, and study methods can be a lot to absorb for new students. In a relatively short period of time, students need to adapt to a new environment, begin mastering the practical skills necessary for university studies, and start learning course content. As the learning skills used in high school are often not sufficient at university level, students also need to find new ways of learning (Cook & Leckey, 1999). Furthermore, several additional tasks, such as making a personal study plan, can seem challenging.

The first year at university plays a crucial role in shaping students' commitment and study progress in subsequent years (Tinto, 2006). According to Haarala-Muhonen (2011), good learning skills and first-year students' ability to systematically plan their studies are key factors affecting the progress and success of university studies.

Universities typically provide first-year students with guidance and counselling to assist them in adapting to, and navigating through, their university studies. The fundamental aim of guidance is to ensure that students are able to complete their degree successfully and within the normative time frame. Indeed, undergraduate guidance and counselling have been shown to be related to successful degree completion (Rickinson, 1998) and grades (Devi et al., 2013). Tinto (2003) highlights the benefit of investing in study guidance and support especially during the first study year.

In this paper, we assess different types of guidance given to first-year students in order to understand which types of guidance are related to subsequent academic performance. The findings are relevant for university educators and staff who plan and implement guidance and onboarding activities to students.

2. Method

2.1 Empirical context

We study student guidance and academic achievement in the context of a Finnish business university. During the first year, students complete a standard package of studies worth 60 European Credit Transfer and Accumulation System (ECTS) credits. It provides students with the core knowledge and skills necessary in business studies and creates a basis for completing the rest of their bachelor's and master's degrees.

This first-year package includes an onboarding course taught by a professional study tutor. The tutor represents a single point of contact to whom first-year students can turn with any questions, be they methodical, practical, or related to career or course planning. The

onboarding course begins with an intensive orientation week, continues with several meetings spread out through the year, and intensifies again in the spring when reflecting on academic aims and career goals becomes topical.

At the end of the first year, students choose their specialization area (or major) for the two following years. Selection of students to the more competitive specialization areas is based on the credits and grades earned during the first year.

2.2. Data

We use two data sources from within the university. The first is an online survey that was administered to all first-year students in spring 2015, towards the end of the academic year. The survey data includes full responses from 270 students. The survey provides information about students' perceptions of different dimensions of their first year of studies as well as expectations for the future. Responding to the questionnaire is part of the onboarding course, and students dedicate time and effort to responding. In addition to Likert scale questions, the survey includes several free text questions, to which each student responded with, on average, a total of 152 words.

The second data source is the internal student information database of the university. It hosts data on completed courses and grades, as well as background information on all students.

We use multiple regression analysis to analyze the quantitative data. In addition, we qualitatively assess students' verbal survey responses.

2.3 Variables

The explained variable measures students' academic achievement:

Average grade. The weighted grade point average of all courses completed by the student during the five semesters that have passed since the beginning of the studies in fall 2015.

The explanatory variables reflect students' views on the sufficiency of different types of guidance they received during their first year of studies. Each variable is measured with a five-point Likert scale ranging from "fully disagree" (1) to "fully agree" (5):

Guidance on planning. Students' assessment of whether they received sufficient guidance on planning their first year of studies.

Guidance on choosing. Students' assessment of whether they received sufficient guidance on choosing a major for their bachelor's degree.

Guidance on practicalities. Students' assessment of whether they received sufficient guidance on the practical matters of studying (e.g., signing up to courses and exams).

Guidance on methods. Students' assessment of whether they received sufficient information or guidance on study methods and skills.

In addition, the following control variables are included in the models:

Study hours. Estimated average number of hours the student used for studying per week.

First attempt. Dummy variable that equals 1 if the student was admitted to the university the first time she/he took the entrance exam, and 0 otherwise.

Gender. Dummy variable that equals 1 if the student is female, and 0 if the student is male (other options for gender are currently not possible in the university's information system).

Age. The student's age in years at the beginning of year 2018.

3. Results

3.1. Descriptive statistics

Descriptive statistics for all variables are presented in Table 1.

Table 1: Descriptive statistics

Variables	N	Min	Max	Mean	Median	Standard deviation
Explained variable						
Average grade	270	2.55	4.94	3.71	3.67	0.54
Explanatory variables						
Guidance on planning	270	1.00	5.00	4.03	4.00	1.04
Guidance on choosing	270	1.00	5.00	3.98	4.00	0.97
Guidance on practicalities	270	1.00	5.00	4.26	4.00	0.92
Guidance on methods	270	1.00	5.00	3.88	4.00	0.97
Control variables						
Study hours	255	4.00	80.00	30.10	30.00	14.16
First attempt	270	0.00	1.00	0.67	1.00	0.47
Gender	270	0.00	1.00	0.40	0.00	0.49
Age	270	20.00	55.00	23.33	22.50	3.56

Overall, students perceived that they had received sufficient guidance across the different types of guidance. Guidance on practical matters was perceived to be the most sufficient, while guidance on study methods and skills exhibited the most room for improvement.

Correlations between all variables are presented in Table 2. Sufficiency of guidance on choosing a major and sufficiency of guidance on study methods and skills are positively related to the average grade, whereas guidance on planning the first year and guidance on practicalities are not related to the average grade in a statistically significant manner.

Table 2: Correlations

Variables	1	2	3	4	5	6	7	8
1 Average grade								
2 Guidance on planning	0.11							
3 Guidance on choosing	0.18*	0.60*						
4 Guidance on practicalities	0.10	0.67*	0.51*					
5 Guidance on methods	0.16*	0.57*	0.55*	0.56*				
6 Study hours	0.33*	-0.02	-0.01	0.00	-0.05			
7 First attempt	0.29*	0.01	0.03	-0.06	0.00	0.02		
8 Gender	-0.15*	-0.15*	-0.16*	-0.19*	-0.13*	0.05	0.01	
9 Age	-0.07	0.06	0.08	0.07	0.09	-0.06	-0.20*	-0.08

Significance: * $p < 0.05$. Pearson correlation coefficient presented for correlations between scale (or Likert scale) variables. Point-biserial correlation presented for correlations between scale (or Likert scale) and indicator variables. Phi-coefficient presented for correlations between indicator variables. As a robustness check, we calculated also Spearman correlation coefficients, with no relevant changes in statistical significance.

3.2. Predictors of performance

Regression models to predict student performance, as measured by the average grade, are presented in Table 3. Separate models are presented for each type of guidance.

Guidance on choosing a major and guidance on study methods and skills are statistically significant predictors of the average grade. Guidance on planning the first year of studies and guidance on practicalities are not statistically significant. Results for the control variables are consistent across models. The hours studied per week are positively related to performance. Students who were accepted at their first attempt at the entrance exam perform better than others, and men earn higher average grades than women. Age is not related to performance in a statistically significant manner.

Table 3: Regression models predicting the average grade

Variables	Model 1	Model 2	Model 3	Model 4
Constant	3.013** (0.255)	2.878** (0.255)	2.996** (0.266)	2.910** (0.249)
Guidance on planning	0.047 (0.029)			
Guidance on choosing		0.086** (0.032)		
Guidance on practicalities			0.048 (0.033)	
Guidance on methods				0.083** (0.031)
Study hours	0.013** (0.002)	0.013** (0.002)	0.013** (0.002)	0.013** (0.002)
First attempt	0.327** (0.066)	0.321** (0.065)	0.331** (0.066)	0.324** (0.065)
Gender	-0.162* (0.063)	-0.155* (0.062)	-0.158* (0.064)	-0.154* (0.062)
Age	-0.002 (0.009)	-0.002 (0.008)	-0.002 (0.009)	-0.003 (0.008)
R ²	0.221	0.236	0.220	0.236
Adjusted R ²	0.206	0.220	0.204	0.221

Significance: ** $p < 0.01$; * $p < 0.05$. Standard error in parentheses. The models do not suffer from multicollinearity (as indicated by variance inflation factors) or from error term non-normality (as indicated by the Bera-Jarque test). The relationship between the dependent and independent variables appears linear (as indicated by plots of studentized residuals against predicted values).

3.3. Insights from students

In addition to the Likert scale questions, the survey asked students to verbally share their views on the topics on which they would have hoped to receive more information or guidance. To gain further insight into the relevance and improvement areas of guidance, we analyzed these verbal answers.

Although many students expressed their full satisfaction with the current guidance provided, certain areas arose as clearly the most relevant ones in terms of importance and improvement potential. They are summarized in Figure 1.

Many students hoped for more concrete and early advice on selecting their major and minor subjects, and for planning their study paths beyond the first year. Many respondents called for information about ways to customize one's studies by, for instance, selecting less typical courses or course providers, or by using alternative ways of completing courses. In

addition, several students felt that they would benefit from further guidance about study techniques and manners, as well as the skills necessary in a university environment. Although the quantitative responses indicated that guidance on practical matters had been sufficient, several respondents raised the need for further guidance on using electronic course systems. Finally, some respondents suggested that the university facilitate information sessions with more senior students representing different majors.

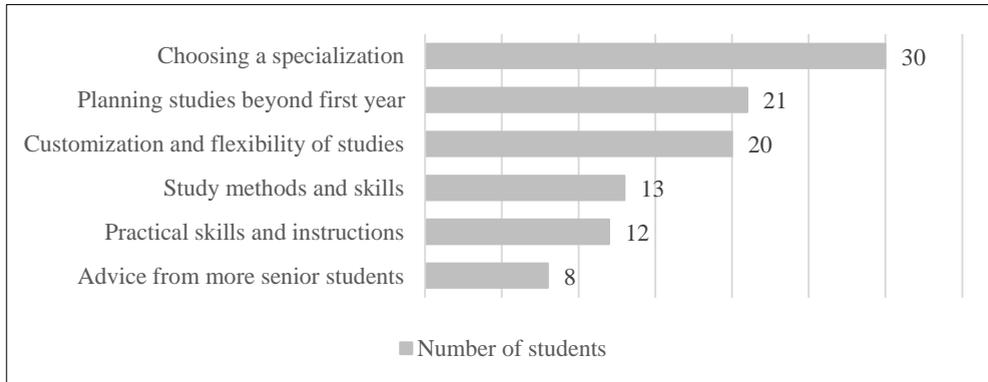


Figure 1: Areas of specific importance and improvement in student guidance mentioned in the verbal answers.

It is also interesting to note that many respondents acknowledged that sufficient guidance would have been available, but that they remained uninformed of certain topics because they had not participated in the relevant sessions or read the relevant materials. It is thus not only important to consider *what* guidance is provided to students, but also *how* it is delivered in an accessible and attractive manner.

4. Conclusions

We have shown that the guidance offered to first-year students at a business university is related to students' subsequent academic performance. Quantitative results were supported by qualitative feedback from students. In particular, strategic types of guidance that relate to students' choice of study direction and to appropriate study methods are significant predictors of academic achievement. More tactical types of guidance related to implementing the first year of studies and handling practical matters were not observed to be related to performance, and can rather be considered as necessary enablers.

The findings have implications for university educators and staff responsible for the orientation of first-year students. Educators and staff can seek to enhance academic achievement by providing students with sufficient guidance on strategic topics in an accessible and attractive manner. This may include, for example, facilitating students' encounters with more senior students or academic staff representing different specialization

areas. The findings emphasize that many first-year students need extensive guidance in order to successfully adapt to the academic environment. Appropriate guidance can assist students in selecting a study path most suitable for their individual preferences and in using efficient and effective learning techniques, thereby supporting students in reaching their fundamental academic goals.

References

- Cook, A. & Leckey, J. (1999). Do expectations meet reality? A survey of changes in first-year student opinion. *Journal of Further & Higher Education*, 23(2), 157-171.
- Devi, R., Devaki, P.R., Madhavan, M., & Saikumar, P. (2013). The effect of counselling on the academic performance of college students. *Journal of Clinical and Diagnostic Research*, 7(6), 1086-1088.
- Haarala-Muhonen, A. (2011). *First-year law students' challenges in studying* (Doctoral dissertation). Retrieved from HELDA – Digital Repository of the University of Helsinki.
- Rickinson, B. (1998). The relationship between undergraduate student counselling and successful degree completion. *Studies in Higher Education*, 23(1), 95-102.
- Tinto, V. (2003). *Promoting student retention through classroom practice*. Presented at Enhancing Student Retention: Using International Policy and Practice, Amsterdam, the Netherlands.
- Tinto, V. (2006). Research and practice of student retention: What next? *Journal of College Student Retention*, 8, 1-19.

OERlabs: Empathy first, solutions later?

Andrasch, Matthias; Hofhues, Sandra; Lukács, Bence

Department of Education and Social Sciences, Faculty of Human Sciences, University of Cologne, Germany

Abstract

The project 'OERlabs - jointly training student (teachers) for Open Educational Resources (OER) use' is funded by the Federal Ministry of Education and Research Germany (BMBF) and aims to sensitize and contextualize OER for all relevant university actors by strategically carrying out an open developmental process. This process includes organizing regular Multi-Stakeholder Dialogues (MSD) over the course of the project. This paper briefly outlines the kick-off MSD event, its methodological approach in context of the entire process, i.e. building a base for working on solutions with implicit use of OER-principles and presents the participants feedback and provides results from the event. In contrast to committee work, our MSD-approach provides participants with more space for open discussions while still working towards a shared goal. In the context of OER, these events show the importance of focusing on the participants attitudes and mindset, rather than confronting them with general OER-related topics right away, such as licensing and creative commons. The project OERlabs will organize its final MSD in July of 2018, while also documenting additional experiences in an Open Book.

Keywords: *Open Educational Resources; Participatory University Development; Open Educational Practices; Teacher training.*

1. Introduction

In order to keep up with the cycle of innovation in educational technologies and educational developments higher education institutions set off various new projects every semester. Most of these projects solely focus on their topic of interest, often losing track of the university as an institution and quite expansive organization itself. The project “OERlabs” (www.oerlabs.de) tries to avoid common pitfalls previously experienced in the early days of e-Learning initiatives in Germany (Bremer, 2010). It became quite clear that it is not enough to operate a given e-Learning platform, or provide teachers with a new technique or a certain approach. Instead one has to focus on the mindset and attitudes regarding certain topics. When combined with a shortage of time that some university projects are faced with, working towards changing the relevant actors’ mindset and attitude often seems to be a real bottleneck. This is especially true for a rather new and innovative topic such as Open Educational Resources (OER), Open Education and Openness in general.

In Germany the topic of OER was introduced at a later stage in the process compared to other countries. The first major accomplishment was only in 2016, when the first ministry-funded train-the-trainer program was initiated (‘OERinform’). On a larger scale (country-wise) this can be traced back to the structure of the central authorities for educational strategy, where each state ministry, as well as one federal ministry cover specific aspects of the educational sector. In order to reach educational mainstream, the OER landscape has to be dealt with by all relevant actors (learners, teachers, and higher education personnel) (Orr et al., 2017).

2. Project OERlabs outline

The project ‘OERlabs - jointly training student (teachers) for OER use’ is funded by the Federal Ministry of Education and Research Germany (BMBF) and aims to sensitize and contextualize OER for all relevant university actors. Despite deriving the project title from the term laboratories, this does not necessarily relate to establishing a working base in a physical space, i.e. laboratory. At a generally large university like at the University of Cologne (331 study programs and 7177 beginner students in 2016 (Abteilung Strategisches Controlling & Informationsmanagement, 2017) it can already be a challenge to find proper working spaces, where theoretically students and teachers could meet, discuss and experiment. This issue meant in turn that the entire process of the project was seen as ‘experimenting’ and the actual term ‘lab’ could be re-defined as any (offline and/or online) space (Hofhues & Schiefner-Rohs, 2017).

Starting the process of changing mindset and attitudes requires shared common spaces where ideas and discussions can openly flourish. For this purpose universities, in this case

the University of Cologne, tend to organize committee work, where a certain group of people meet regularly to share and discuss their views. The OERlabs project on the other hand organizes multiple roundtables, or Multi-Stakeholder Dialogues (MSD) (Doods & Benson, 2013; Seufert, 2013). These MSD¹ events are not limited to an exchange of stakeholder viewpoints, but rather focused on embracing empathy and deeper discussions to connect actors across the university landscape.

This can be an overwhelmingly difficult task, because it means that a rather small project goes against the day-to-day business of university procedure. Working towards solutions on a smaller scale could hamper scientific progress at large, on the one hand leading to fewer excellent scientific results, as well as less educated graduates. The long term effects of similar previous approaches can be seen in teacher education, where student teachers, after studying for several years, are in most cases not confronted with topics related to digital-education, such as media didactics, media production, educational technologies and copyright/licensing issues, despite education existing in a period of time in which the German society at large is discussing the digital transformation and children growing up in a connected world (see JIM-study 2017 and KIM-study 2016) (Medienpädagogischer Forschungsverbund Südwest 2017).

In the pages that follow, the project team attempts to give an example of how it encounter said issues, mainly presenting the first step in the solution process, while finally presenting results, i.e. feedback from the participants of the first MSD. As previously alluded to, the central theme for the project is exploring different mindsets and attitudes across the university landscape by bringing together the relevant actors and fostering discussion.

3. MSD as a symbolic lab: process of solution

During the course of the project (due to BMBF policies 18 months total based on the ministries subsidies policy (see Zierer, 2011)), the project team regularly organizes a number of roundtables, i.e. MSD (an overview of the process can be seen in Figure 1 below). This process was intended to introduce openness and new approaches in thinking to the participants by gradually making the events more target-oriented. At first, the participants were confronted with having to lay new groundwork, i.e. school utopia and the flow of knowledge at the university-level, in their relationship with education, learning and teaching. Then the project team introduced more concrete topics step-by-step, such as copyright and licensing, while also providing a real-world perspective through student

¹ In contrast with committee work, methodically these meetings were based on Design Thinking principles and focused on actively generating ideas and developing solutions.

experiences. The focal point was MSD III, where participants were asked to provide strategies and solutions to various set challenges, as well as to issues based on their individual experiences. In this part, we briefly explain the methodical approach to the kick-off event, as well as present feedback from the participants and contextualize the relevancy of these findings for the entire process.

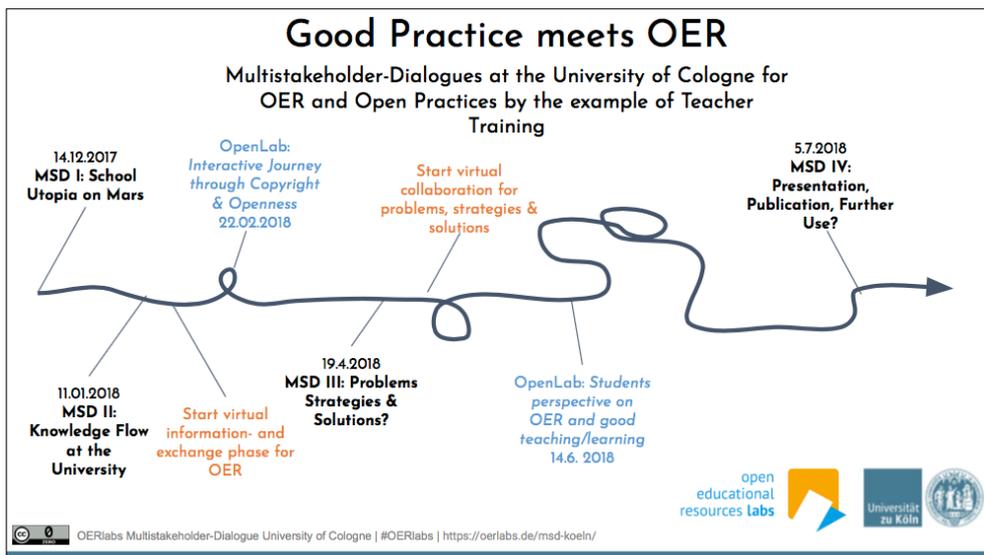


Figure 1. Good Practice meets OER – The entire Multistake-Dialogue process visualized

3.1. Kick-Off MSD: Educational Utopia as groundwork for solutions

At the University of Cologne the project team decided to take the participants to Mars on the first come-together at the kick-off event to stress ‘out-of-the-box’ thinking right away. The aim with this scenario was to loosen and break hierarchical structures between the participants by moving them out of their comfort zones and having to re-orient themselves within their new groups. By letting the participants work through a thought experiment where humans could finally colonize Mars within the next six months, the purpose of having to build a school from ground up and what this entails in terms of educational development immediately became clear. The scenario was based on ‘utopian thinking’ with specific guidelines, such as not having to limit thinking about regulations, i.e. data privacy, legal regulations, architectural regulations etc. These ‘utopian schools’ consisted of four given pillars: teachers, learners, school management and infrastructure. Participants were split into four groups and each work session meant the groups were working on one of the

pillars. Each round the corkboard with the notes and ideas would move clock-wise to another group who would continue working on that new pillar.

3.2. Results and Feedback considering MSD I considering MSDI

At the end of the first session, which lasted around fourfour hours, the project team contextualized the work sessions for the participants. It was decided upfront to leave out specific discussions about copyright, creative commons or best practices, which otherwise would be common for any OER-related event. Instead the project team decided to implicitly include OER practices such as collaboration, re-use and re-mixing, which is why each group was assigned a specific color (i.e. pens, markers, sticky notes etc.), so the participants would be able to gather which path ideas take, not unlike creative commons licensing (e.g. CC-BY). Finally the participants were asked to complete a so called ‘One Minute Paper’ (Angelo & Cross, 1993), containing three questions, see table 1 for the answers.

Table 1. Feedback gathered from One Minute Papers.

<u>N</u>	<u>What did you like the most?</u>	<u>Which topic would you like to investigate further?</u>	<u>Is there something you would like to tell the OERlabs?</u>
1	Motivated participants.	Licensing	Encourage even more exchanges between teams.
2	Exchanging ideas with participants. Thinking about school vision.	OER as “space” for school development	
3	Open discussions in the group.		
4	Good leading questions. Good interactions, great ideas on the corkboard.		
5	Exchanges in the group and different perspectives. No strict conten given, great degree of freedom.	Licensing	Very interesting and well structured.
6	Real utopia, really	Does OER help school	Was surprised how

	cool.	utopia? How do open schools treat OER?	little groups engaged with other groups' cards #realitycheck.
7	Cause irritation and making people think. Different methods lead to fruitful and fascinating dialogue.	General expectations for the dialogue, i.e. exchanging ideas and content, is still to be determined.	Thank you for the organization.
8	Keynote, open space for discussions - enriching.	OER best practices.	Lot of energy und willingness to connect different perspectives.
9	Entry point for discussions (regardless of previous experiences) and open discussions on eye-level.	Licensing and OER repositories (i.e. tagging, etc.)	Continue doing this type of work.
10	Collegial environment among participants.	Dealing with open student made products. Development of participation in education.	Aspects of educational utopia should definitely be picked up again during the next meeting. It offers a great base for discussing the university.
11	Open utopian discussions, great ideas.	Teachers become learners, and vice-versa. necessitates school/university idealogy.	It was not entirely clear how much it was allowed to engage with other groups ideas, but great discussions.
12	Method for discussion. Room for open exchanges. Balance between given content and open discussions - ratio structure/freedom during discussions.	University/Teaching of the future. University as knowledge space 4.0.	Well done.
13	No long lecture. Lot of interaction among	How is OER connected with the University of	More adverstiments. OER movement should

	participants. Good catering and organization.	Cologne? What does the “lab”-approach entail? Does this mean workshop in English?	be more visible at the university. How are students involved?
14	New input. Exchanging ideas. Open participation.	Remixing, everybody can adjust and add something.	
15	Very much liked the open and appreciative discussions, as well as willingness to accept different standpoints.		

4. Conclusion

Generally the feedback received after the kick-off event revealed a need for better networking across the University landscape, a need for open discussion spaces and opportunities, because participants were relieved to be able to talk and disclose their personal views, which in stark contrast to committee meetings, where statements are often made on behalf of the department or institutional viewpoints. It is important to design such events more and more target-oriented as the process moves along.

Although participants were content with the open structure and open discussion format, they nonetheless expressed a desire to be able to focus more on detailed questions regarding OER, such as licensing, best practices and future educational developments, which in turn lead the project team to methodologically focus the following MSD events toward specific issues: e.g. the flow and exchange of knowledge at the University, where participants had to focus on student teachers, teacher training and beginner teachers in detail and how knowledge is shared, transferred and/or exchanged among these stakeholders throughout the entire process of becoming a teacher (MSD II); thematically the project team also offered ‘OpenLabs’ where participants could learn about copyright, licensing and OER, as well as opening up space for students to share their own experiences; finally MSD III (the last work session), participants were specifically asked to provide solutions and strategies to challenges and problems they encountered at the University.

Taken together, the feedback from the participants and the findings worked out at the events strongly support the need for structured networking opportunities at larger

Universities, especially when it centers around fairly new topics such as OER, Open Educational Practices and Openness. University actors and stakeholders are individually aware of many issues, and can often provide solutions, but otherwise lack opportunities to connect and collaborate across institutions. Inciting organizational change is a challenging process, but by opening up the developmental process and enabling university actors to network in an open setting, mindset, attitudes and structures will eventually start to change from within.

References

- Abteilung Strategisches Controlling & Informationsmanagement. (2017, December 18). Zahlen I Daten I Fakten. Retrieved August 2, 2018, from https://strategy.uni-koeln.de/strategisches_controlling_amp_informationsmanagement/zahlen_i_daten_i_fakten/index_ger.html
- Angelo, T. A., & Cross, K. P. (1993). Minute paper. *Classroom Assessment Techniques: A Handbook for College Teachers*, 148–153.
- Bremer, C. (Ed.). (2010). *Landesinitiativen für E-Learning an deutschen Hochschulen*. Münster: Waxmann.
- Dodds, F., & Benson, E. (2013). Multi-Stakeholder Dialogue. In *Stakeholder Forum for a Sustainable Future*. Johannesburg: Civicus.
- Hofhues, S., & Rohs, M. (2017). *Vom Labor zum medialen Bildungsraum: Hochschul- und Mediendidaktik nach Bologna*.
- Medienpädagogischer Forschungsverbund Südwest (mpfs). (2016). KIM-Studie. Retrieved from <https://www.mpfs.de/studien/kim-studie/2016/>
- Medienpädagogischer Forschungsverbund Südwest (mpfs). (2017). JIM-Studie. Retrieved from <https://www.mpfs.de/studien/jim-studie/2017/>
- Orr, D., Neumann, J., & Muus-Merholz, J. (2017). German OER Practices and Policy – from Bottom-up to Top-down Initiatives. Retrieved April 25, 2018, from <https://iite.unesco.org/publications/3214746/>
- Seufert, S. (2013). *Bildungsmanagement: Einführung für Studium und Praxis*. Stuttgart: Schäffer-Poeschel.
- Zierer, K. (2011). Wider den Projektezwang. *Erziehungswissenschaft*, 22(1).

Embedding Social Innovation in Latin America Academic Curriculum

Galego, Diego^a; Soto, Waldo^b; Carrasco, Gabriela^b; Amorim, Marlene^a and Ferreira Dias, Marta^a

^aDepartment of Economics, Management, Industrial Engineering and Tourism and GOVCOPP, Research Unit on Governance, Competitiveness and Public Policies, University of Aveiro, Portugal, ^bAshoka-U, Chile.

Abstract

Recently we have witnessed the growth of social innovation initiative as a viable approach to address many challenges of contemporary societies across the social, cultural, economic, educational and environmental domains. Social innovation sets up to develop alternative, and sustainable, solutions to social issues by means of organizational models that rely on strong civic engagement and participation across private and public sectors. As such, social innovation holds a strong potential for the transformation of societies and has attracted a growing interest from researchers, practitioners and policy makers around the world. A key domain of concern is the need for developing adequate models and methodologies for the qualification of individuals for social innovation. In this vein the Student4Change project aims to develop and implement an integrative methodology to embed social innovation and entrepreneurship in the academic experience of students in Latin America. This paper offers a preliminary description of the advancements led by 10 universities in 5 Latin America countries engaged in the project, in order to develop competences for social innovation and social entrepreneurship through innovations in academic curricula.

Keywords: *Social Innovation; Social Entrepreneurship; Universities; Latin America; Students4Change.*

1. Introduction

At the heart of the social innovation and social entrepreneurship movement in Europe, many initiatives have been taking place, often as responses to pressures from youth unemployment numbers. The social enterprise movement, the typical vehicle to scaling up social innovation, emerges in this context as an organizational model that can support a diversity of initiatives to address social, cultural and environmental challenges (Bikse, Rivza, & Riemere, 2015). Overall, the last decades, the European landscape, has been marked by a significant increase in the number of social enterprises as one of the ways to solve social issues (Bikse et al., 2015).

Individuals and organizations that are putting forward innovative organizational models to address societal challenges are the promoters of social entrepreneurship. Usually this class of entrepreneurs is highly motivated towards addressing community problems, and leads the identification of innovative answers (Zahra, Gedajlovic, Neubaum, & Shulman, 2009). In order to sustain such solutions, they need to be willing to take risks and actively seek for the necessary resources, partners and stakeholders to implement their projects (Abu-Saifan, 2012). The Office for Social Innovation launched by White House in US, followed by UK, have started, since then known a generalized dissemination worldwide. While social innovation appears to be a sustainable solution for social problems, this notion has been criticized for the broad understanding about the concept being vague, and has gained attention in policy debates, governmental interests and project priorities (Fougère, Segercrantz, & Seeck, 2017; Păunescu, 2014). Social innovation can build on very diversified activities, including the nonprofit economy, social entrepreneurship, social economy, services sector, and in corporate social responsibility practices (Martinez, Gonzalez Alvarez, & Nieto, 2015; Mulgan, Tucker, Ali, & Sanders, 2007). The diversity and proliferation of examples is calling for specific competences to enable their promoters to set up sustainable models that guarantee the continuous engagement of communities. Despite the dissemination of the social innovation movement, in Europe as well as in Latin America, its effective implementation and sustainability is largely dependent on the involvement and engagement with local communities. Academics, social innovators and policy makers, all need to understand more about such organizational and entrepreneurial process, in order to act towards its strengthening in their respective contexts (Herrera & Ugarte, 2008).

According to Domanski, Howaldt, & Schroder, (2017), social innovation in Latin America is creating approaches to face and minimize social problems within a modern economic development, taking into consideration the less incentives addressed by government into a sustainable welfare and quality of life. The economic crisis has caused that more innovative initiatives are emerging in many countries in Latin America (Herrera & Ugarte, 2008). Universities can have an important role in the development of local “social innovation

ecosystems”, specially in the training and inspiration of students willing to be part of it (Cunha, Benneworth, & Oliveira, 2015). Recent evidence suggests that Universities have been developing different programs and ways to introduce social innovation in their education mission, either as mandatory courses, or as extra-curricular programs, but strongly as a response to an emerging demand. However, we still lack a shared vision of social innovation as an academic field, much because of the existing different contexts for the understanding of social innovation, and consequently the existence of a fragmented view and discourse about it (Păunescu, 2014).

Students4Change, is an international project with capacity building purposes, that targets Latin American universities, with the objective of contributing to address the calls for education and training that stem from the practice, and the demands for social innovation. The aim of this project is to integrate social innovation in curricula and learning environments at the partner universities, improving the quality and relevance of its academic programs in relation to the skills that ought to be developed by students in order to solve the social problems affecting their regional context. The present study attempts to offer a broad view of the social innovation field, which can deliver to scholars and researchers a brief characterization of the reality in Latin America concerning on the implementation of social innovation and its potential feasibility under the Higher Education Institutions (HEIs) scope and influence in society in that region.

As the definition of social innovation is still a work in progress, lacking academic and international consensus, the project embraced a preliminary task of building a shared understanding about the concept, based on the existing literature as well as in insights provided by all partner universities. In order to define the main concepts a qualitative analysis of data was performed. The various definitions offered by the project partners evidenced some consistent elements. The ingredients identified in the social innovation definitions were also aligned with the framing of social innovation found in prevalent research and institutional documents relevant in the field.

2. Data Collection, Results and Discussion

This study offers an overview of two data collection efforts conducted across Latin America Higher Education Institutions. A first data collection exercise aimed at achieving a shared and meaningful vision of social innovation and social entrepreneurship, to support the development of learning to integrate its awareness and promotion in academic curricula. To this end a questionnaire was developed and conducted with informants from the 10 project partners in Latin America, in five countries (Brazil, Chile, Colombia, Costa Rica

and Mexico), for a sample of two universities by each country, in the context of the Project Students4Change¹ (www.uestudents4change.org/).

The questionnaires were applied to professors, acquainted and involved with social innovation as well as to members of rectorate and other management representative, project managers and other institutional experts in social innovation. The respondents were asked to distinguish the concepts of social innovation and social entrepreneurship as well as to mention what were the prevalent sources in academic literature that were used to support and inform their action and thought in the context of their institution. This way the data collection aimed to capture an institutional shared view over social and entrepreneurship innovation. This data was subject to a qualitative analysis, that led to the identification of key elements in the institutional understanding concerning the concepts and references on this topic in Latin American universities.

The second data collection effort concerned the identification of methodologies, teaching and learning practices that were currently being employed by the same sample of universities to the students, in order to develop competences for social innovation and entrepreneurship innovation. This data collection aimed to target evidence about learning approaches, practices and tools as well as innovative curricula experiences, such as the development real projects with local communities in the curricula experience.

In what concerns the search for a common understanding of social innovation and social entrepreneurship, the data analysis allowed for the identification of three key common defining elements about Social Innovation: 1) the idea of social innovation as a new solution specifically developed to address a social need or challenge; 2) the distinguishing characteristic of an ample and diversified participation of social actors in the processes of social innovation; 3) the association of social innovation with social change and impact.

The definitions for social entrepreneurship offered by the partners of this project revealed an evident association of the ideas of social innovation, notably in what concerns the goals, the objectives, the purposes of ventures/organizations/enterprises created under such label. Also, the understanding of Social Entrepreneurship in the context of Students4Change can be summarized into: 1) A Purposeful Entrepreneurship, i.e. aiming at social good; 2) An organization based on Sustainable Resource Management Model.

Beyond the effort of putting together a common definition to work and the similarities that the exercise brought between the partners, the general conclusion is that, there is a lack of a formal or unique definition and/or understanding in terms of social innovation and entrepreneurship. That is not only distinct in their declarations of meaning but also in the

¹ Erasmus+ Project number: 574133-EPP-1-2016-1-MX-EPPKA2-CBHE-JP

approach each university takes and the practices they characterize as social innovation initiatives.

In what concerns the information gathering about the existing teaching and learning approaches and practices, a total of 48 courses with social innovation and social entrepreneurship ingredients were reported, spread across 42 undergraduate disciplines (87%) and 6 postgraduate disciplines (13%). Reports emerged from very diversified academic areas, notably such as, health, agriculture, economy, entrepreneurship, management, visual design, business, social responsibility, urban planning, rural development and software engineering, for undergraduate courses addressing social innovation methodologies. For postgraduate areas examples ranged from project and technological management, social economy, entrepreneurship, innovation and creativity challenges were described as more common lines of student preparation pointed by several universities. The diversity of areas of studies reported on this study can, to some extent, be explained by the existing ambiguity in the understanding of the concepts, something that can lead to an inadequate classification of the courses as social innovation or social entrepreneurship courses (to see Fig.1).

These results aim to offers a first building block to the understating of social innovation and social entrepreneurship, as well as to shed ligh on the eduction practices that can contribute to their development. To that end, as it undertakes an overview and an analysis of the existing courses reported by universities, that they consider are facing social challenges, not necessarily as social innovation per se. In the context of the project Students4Change is previewed theconduction of a “Pilot Program”, which will be further developed in subsequent phases, and that will involve the adoption of active learning approaches to promote social innovation awareness and competences on 50 academic diverse areas of studies, in various partner universities. Overall, the results suggest that many HEIs have already drafted education answers to this end, by means of punctual activities and training, but there is a generalized feeling about the need of formalizing a program specially design to promote social innovation, and to qualify the university professors for that endeavor.

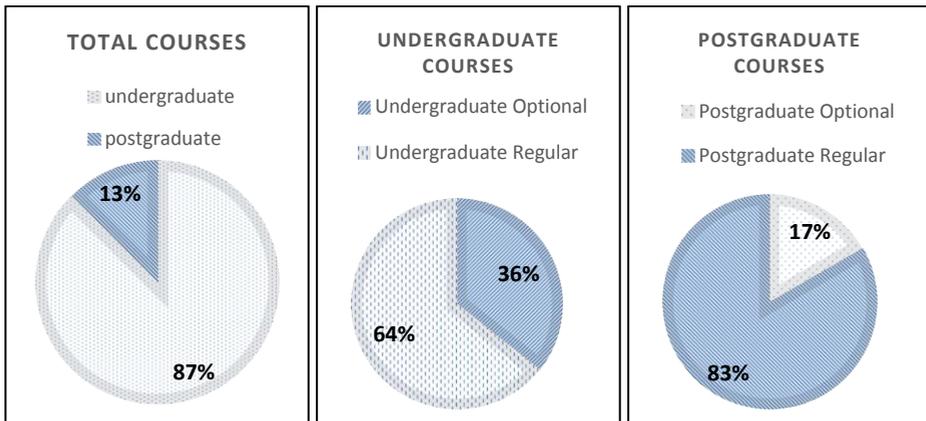


Figure 1. Distribution of the nature of the 48 courses reported by Latin America universities.

This insight about the social innovation and social entrepreneurship as a formal education, suggests what the universities are promoting in Latin America, and raises many research questions: How are universities embedding social innovation into their curricula courses? How they are addressing this change in academia? Which are the most common landscape of offers? The ongoing project attempts to answer such questions in further analysis addressed empirically, based on the evidence reported by partner universities showing a transversal understanding of theory and action, implicit in different initiatives underpinning the relationship between university and local community.

Another indicator seems to be relevant in this study is the methodologies reported by universities as transversal to conduct the social innovation and social entrepreneurship courses, representing the academic interventions and resources able to student in each institution. The Figure 2 presents the different formats where universities were pointing as much important on the institutional teaching and learning approaches.

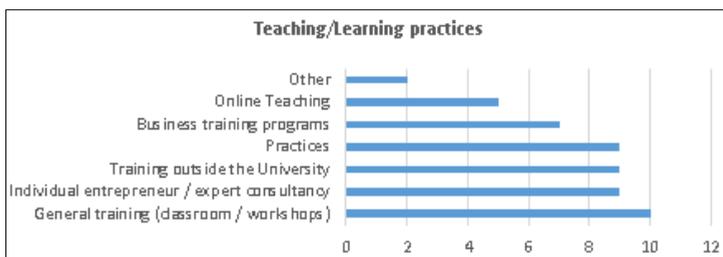


Figure 2. Reported teaching and learning approaches offered by the universities

Some formats are well spread across the sample. *General Training* was pointed as a current methodology offered by all institutions and *Practices*, *Training outside the University* and *Individual entrepreneur/expert consultancy*, were pointed as the second fundamental format for 93% (9) of the total respondent institutions (10). It shows that, the courses are engaged

in their contextual society and improving the relationship extra institutional, bringing the “real cases” to inside the classroom scenario. On the contrary, *Online teaching* was less frequently reported as educational practices of teaching and research in the courses, being mentioned by only five universities.

Concerning the offered efforts of academic formation (see Figure 3), all the universities agreed that the most effective way of debates and dissemination of innovative strategies performed in academia is *Conferences*, which greatly enhance further intern and extern collaboration opportunities with peers. Subsequently followed by *Series of Talk*, *Competitions* and *Practices*, highlighting various types of formation, which can help to increase the options for students to have a more transversal academic degree.



Figure 3. Social innovation and social entrepreneurship formation resources offered by universities

A relevant read can be found in results by contextual regions, where universities present a dynamic participation in their social community building bridges with external enterprises, underpinning the opportunity to link theory with practice. Transposing geographical barriers HEIs are leading to a new paradigm in social innovation and social entrepreneurship embedded in academic curricula, delivering goods and specialized services to the central or peripheral communities in urban and rural areas. More and more initiatives are awaking including the “social” term in entrepreneurial and innovative sectors, following supranational framework, attempting to fulfil the lack of resources and technical assistance. Indeed, this perception of the “academia relationship” towards a new paradigm to link university-industry-government, as known Triple Helix (Etzkowitz, 2008; Heitor, 2015) receive much more attention by emerging technological and polytechnic universities shifting the economic growth, social and cultural landscape in their host city.

The social innovation and social entrepreneurship perspective will contribute to balance the HEIs mission and compromise, linking academia with social needs.

3. Conclusion

During this first year of researching on how the universities are embedding the social innovation in their academic curricula, it seems that several fields of study are relatively adapting methodologies, also facing some obstacles to foster a practical inclusion of it in higher education level. However, those reported courses could have a social dimension, the professors could have a strong social collaboration, but, it does not consider the isolate disciplines as a compulsory, neither optional social innovation or social entrepreneurship course. The Students4Change project proposing a consensus over the social innovation and social entrepreneurship concepts, developing a common understanding about it among the partners, will offer a knowledge contribution with a training course for professors enhancing their competences in order to design and include an innovative methodology on their syllabus. Mentioning some conclusions the importance of HEIs as key element promoting and delivering knowledge-based society (Albulescu & Albulescu, 2014) leads to attract the government interests at local, regional and national levels. The importance of the development of this strategy - embedding social innovation and social entrepreneurship as formative curricula – demands a clear and concrete methodology, which can lead to social, educational, technological, innovative and economic growth, better enhancing supports attached to quality of life and social problems. Such commitment between universities and society reflect the mutual benefits on those agreements, generating social impact and values. It is necessary to continue researching. A lot of questions have not been addressed in the research field yet. Further research about the social impact of these courses will be the next question addressed on this project.

References

- Abu-Saifan, S. (2012). Social entrepreneurship: definition and boundaries. *Technology Innovation Management Review*, (February), 22–27.
- Albulescu, I., & Albulescu, M. (2014). The University in the community. The university's contribution to local and regional development by providing educational services for adults. *Procedia - Social and Behavioral Sciences*, 142, 5–11. <https://doi.org/10.1016/j.sbspro.2014.07.578>
- Bikse, V., Rivza, B., & Riemere, I. (2015). The Social Entrepreneur as a Promoter of Social Advancement. *Procedia - Social and Behavioral Sciences*, 185, 469–478. <https://doi.org/10.1016/j.sbspro.2015.03.405>
- Cunha, J., Benneworth, P., & Oliveira, P. (2015). Social Entrepreneurship and Social Innovation: a conceptual distinction. In *Handbook of Research on Global Competitive Advantage through Innovation and Entrepreneurship* (pp. 616–639). <https://doi.org/10.4018/978-1-4666-8348-8>

- Domanski, D., Howaldt, J., & Schroder, A. (2017). Social Innovation in Latin America. *Journal of Human Development and Capabilities*, 18(2), 307–312. <https://doi.org/10.1080/19452829.2017.1299698>
- Etzkowitz, H. (2008). *The Triple Helix: University–Industry–Government Innovation in Action*. New York: Routledge. Retrieved from <http://ssi.sagepub.com/cgi/doi/10.1177/05390184030423002>
- Fougère, M., Segercrantz, B., & Seeck, H. (2017). A critical reading of the European Union's social innovation policy discourse: (Re)legitimizing neoliberalism. *Organization*, 24(6), 819–843. <https://doi.org/10.1177/1350508416685171>
- Heitor, M. (2015). How university global partnerships may facilitate a new era of international affairs and foster political and economic relations. *Technological Forecasting and Social Change*, 95, 276–293. <https://doi.org/10.1016/j.techfore.2015.01.005>
- Herrera, A. R., & Ugarte, H. A. (2008). *Claves de la Innovación Social en América Latina y el Caribe*. Santiago de Chile.
- Martinez, D. A., Gonzalez Alvarez, N., & Nieto, M. (2015). Emprendimiento social vs Innovación social. *Cuadernos Aragoneses de Economía*, 24(1–2), 119–140. Retrieved from http://gide.unileon.es/admin/UploadFolder/emprendimiento_social_vs_innovación_social.pdf
- Mulgan, G., Tucker, S., Ali, R., & Sanders, B. (2007). *Social Innovation: Why it is, Why it matters and How it can be accelerated*. The Young Foundation. London: Basingstoke Press.
- Păunescu, C. (2014). Current trends in social innovation research: Social capital, corporate social responsibility, impact measurement. *Management and Marketing*, 9(2), 103–116. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-84907274813&partnerID=tZOtx3y1>
- Zahra, S. A., Gedajlovic, E., Neubaum, D. O., & Shulman, J. M. (2009). A typology of social entrepreneurs: Motives, search processes and ethical challenges. *Journal of Business Venturing*, 24(5), 519–532.

Equity, Access, and Diversity through Short-term Study Abroad in Online Education Programming

Clothey, Rebecca A.

Drexel University School of Education, United States

Abstract

This paper describes the challenges of creating quality international educational opportunities for non-traditional adult learners who are studying online and have families and full-time jobs. The paper discusses the potential for success of an education model for study abroad designed specifically to address the needs of this student population. It concludes that although the model attracted some students among the target population who may not otherwise have gone abroad, more work needs to be done to create inclusive study abroad models.

Keywords: *study abroad; online education; non-traditional students.*

1. Introduction

International education has been praised as a way to facilitate cross-cultural awareness and global citizenship. However—although the US post-secondary student body has never been so diverse in terms of age, race, ethnicity, and gender—males and ethnic minorities tend to be underrepresented in the US student population studying abroad (Obst et al., 2007). This paper describes the challenges of creating quality international educational opportunities for non-traditional¹ adult learners who have families and full-time jobs. The paper discusses the potential for success of an education model for study abroad designed specifically to address the needs of this student population.

2. Higher Education, Non-traditional Students, and Study Abroad

The massification of higher education in the United States has led to a more diversified student population, with the proportion of White college students declining, while racial and ethnic minorities have increased (Snyder, 2011). In addition, as of 2009 approximately 42 percent of college students were over the age of 25 (Clothey et al., 2012). Massification of higher education is due in part to new pathways for access, including distance learning. Indeed, online enrollments in the United States are growing faster than the overall higher education student population, with almost 30% of students taking one online course (Allen and Seamen, 2017). The flexibility of online courses appeals to students with constraints such as family or work responsibilities, or because of geographic limitations (Clothey, 2016). However, the online student profile across the United States tends to be mostly women, with almost half above age 26.

Despite the diversity in higher education generally, research shows that certain populations continue to be underrepresented in study abroad, including males, minorities, and nontraditional aged students (Stroud, 2010). Perceived barriers to studying abroad among these populations include academic, personal and financial concerns (Forum, 2009). Certain majors are also underrepresented in study abroad. For example, although business and education are among the largest number of degrees awarded in the U.S., only 4.1% of education majors studied abroad in the 2009/10 academic year, compared with 20% of business majors (IIE, 2011). Such a low percentage of education majors going abroad is troubling given that that population is most likely to be shaping the future by working with

¹ According to NCES (n.d.), non-traditional students are characterized as being over the age of 24. “Age acts as a surrogate variable that captures a large, heterogeneous population of adult students who often have family and work responsibilities as well as other life circumstances that can interfere with successful completion of educational objectives.” (NCES, n.d., p. 1).

children. As a key to broadening the mind, study abroad programming should be an essential component of an education degree. Master's degree students are even less likely to study abroad than those enrolled in Bachelor's degree programs (Stroud, 2010).

3. Barriers for Non-traditional Online Students to Study Abroad

The study abroad programs referred to in this study were designed to enhance an online Master's degree program in international education based at a private comprehensive university located in the northeast of the United States. Although the program is by nature international, with a student body and instructors residing worldwide, designing a study abroad program that would be appropriate for the sparsely located and non-traditional student population was a challenge. Most students enrolled in the program fit the profile of typical online students and also fall within one of the underrepresented groups for study abroad. They are full-time working professionals taking online courses because they do not have time to attend face to face courses several times a week. The program's students range in age from 22 to 52, and many of them are also spouses, parents, and even grandparents, requiring additional demands on their time (Clothey, 2016).

In an internal analysis, barriers that students identified would prevent them from studying abroad included: getting enough time off from work, having to make babysitting arrangements for children while abroad, the cost of travel, the cost of not working while traveling, and timing. Most students in the program work as full-time as teachers, and therefore are more likely to consider study abroad options offered during the summer (Clothey, 2016). According to Stroud (2010), financial concerns are not the top limitation for most students studying abroad, due to the 2007 Simon Act, which allows students to use financial aid for study abroad if it is required for course credit.

However, our internal analysis reflected the opposite. For these students, time and money mattered a lot, because even with financial aid to support a student while abroad, the non-traditional student may still face expenses at home that need to be attended to. As one respondent stated: "Not working and having to pay all of the usual bills while abroad is not easy for adult working students" (Brack, as cited in Clothey, 2016, p. 27).

4. Incorporating Short-Term Study Abroad into an Online Model

Short-term study abroad that offers programs for shorter lengths of time than a semester or academic year has contributed to a growth in study abroad enrollment (IIE, 2008). Indeed, more than half (approximately 56%) of U.S. students enroll in these, compared with 39% of students studying abroad for an entire semester (IIE, 2011). However, some study abroad

advocates claim that longer programs are better, and provide deeper cultural immersion opportunities (IIE White Paper 2007). In 2009 the Forum on Education Abroad produced a list of nine standards of good practice for short-term education programs to respond to this concern. The standards emphasize creating short-term programs with well-defined academic objectives (Forum, 2009).

Thus, in line with the Forum's suggestions and student needs, a model for a short-term study abroad program of no longer than 2 weeks in duration was developed that would be integrated with a 3-credit online course. The rationale was that a short-term stand-alone study abroad program would have less academic value for fostering student learning and development (Forum, Standard 2) than one which was integrated into a full academic-term experience. In addition, it was believed that integrating a mandatory short-term study abroad component into a full 3-credit course would have potential to attract more students. Participants could take the course as part of the credits needed toward their graduation, and they would also be eligible for financial aid under the Simon Act, which allows students to use financial aid for study abroad if it is required for course credit (Clothey, 2016).

In the short-term study abroad model adopted by the program, students participated in class online during the first four weeks of the term, in which they learned about the history and key issues of the target country. This academic foundation prepared students for meeting in person in country, for 8-10 days of on-site lectures, meetings, and visits to key sites relevant to the course topic. When students returned from the trip they had another two weeks of class online, during which time they reflected on the experience and completed final projects related to the course theme. The courses were offered in consecutive years during the summer term, in order to include as many students as possible.

5. Potential of Model Success

Wheeler (2000) notes that although study abroad enrollments are increasing, stays abroad are getting shorter. In the past, short-term study abroad programs were considered undemanding and not valuable, but recent studies have shown that students who participated in short-term study abroad programs gained the same personal and intellectual growth as those who enrolled in traditional long-term study abroad programs of a semester or more. For students who wish to have the experience of studying abroad and getting a taste of another culture but perhaps do not have the time, money, or resources to complete a traditional semester or year abroad, short-term programs may be ideal.

Evaluations for the study abroad programs described here similarly indicated that the online students also gained a great deal from their short-term stay abroad. Embedding the program within the context of a larger 3-credit course ensured that students were able to maximize

their short time abroad and gain a meaningful experience with relevant preparation and knowledge. According to participant feedback, hands on learning about the subjects they were studying in their coursework, as well as the opportunity for face-to-face interaction greatly enhanced the learning experience (Clothey, 2016). Most significantly, the short-term format of the program attracted some students who would not study abroad in a more traditional academic format.

Nevertheless, an examination of the programs' student demographics indicate that the population was not as diverse as had been hoped. The proportion of minority students who participated in any of the programs was low; however, the online program's minority population is also proportionately low. Thus, the minority population on the trips was representative.

Interestingly, although minority students tend to be an underrepresented group in study abroad, all of the minority students who participated in either trip described in this paper had been abroad more than once prior to the integrated online short-term study abroad. In contrast, there were white students on both trips who had never before traveled abroad. Three had never left the United States, and one of these also had very limited experience outside of her home state prior to her trip abroad. More research is needed to ascertain to what extent the integrated online study abroad model may have encouraged these students to participate.

Additionally, although almost a fourth of the online program's students are parents, only two students with children participated in one of the integrated online study abroad programs discussed in this paper. Given that childcare was identified as a constraint against studying abroad among this online student population, this was not a surprise. Yet, it may be significant that any parents participated at all (Clothey, 2016).

Though this case discusses the experience of integrated online study abroad within only one university's Master's degree program, it does illuminate the fact that as the US student population continues to become more diverse, education models must also change and respond to adapt to the changing student needs. If study abroad programs especially designed for target populations are carefully considered, planned, and implemented, study abroad may become a more viable option even for students who face great obstacles in participating.

References

- Allen, I.E. and Seamen, J. (2012). *Going the Distance: Online Education in the United States, 2011*. Babson Park, MA: Babson Survey Research Group and Quahog Research Group, LLC.

- Carroll, A. V. (1996). *Increasing the participation of historically underrepresented students in study abroad programs: An assessment of interest and perception of barriers*. Unpublished master's thesis, Colorado State University, Fort Collins, Colorado
- Clothey, R. (2016). Increasing diversity in international education: Programming for non-traditional students through an alternative curriculum model. *International Journal of Curriculum and Instruction* 8(1): 22–35.
- Clothey, R., Austin-Li, S., & Weidman, J.C. (2012). *Post-Secondary education and technology: A global perspective on opportunities and obstacles to development*. New York: PalgraveMacMillan.
- Forum on Education Abroad (2009). *Standards of Good Practice*. Available online at <http://www.forumea.org>.
- Institute of International Education (IIE) (2007). *Opening Minds to the World: Annual Report*. Available online at <http://www.iie.org>.
- Institute of International Education (IIE) (2011). *Open Doors Fast Facts 2011*. Available online at: <http://www.iie.org>.
- Obst, D., Bhandari, R., and Witherell, S. (2007). *Current Trends in U.S. Study Abroad & The Impact of Strategic Diversity Impacts: White Paper*. New York: Institute of International Education.
- Snyder, T. D. (2011). Mini-digest of education statistics, 2010. U.S. Department of Education National Center for Education Statistics (NCES). Report no. NCES 2011-016. Washington, DC: NCES. Available online at: <http://nces.ed.gov>.
- Stearns, P. (2009). *Educating Global Citizens in Colleges and Universities: Challenges and Opportunities*. New York: Routledge.
- Stroud, A. (2010). Who Plans (Not) to Study Abroad? An Examination of U.S. Student Intent. *Journal of Studies in International Education*, 14(5): 491-507.
- Wheeler, D. (2000). "More Students Study Abroad, but Their Stays Are Shorter." *Chronicle of Higher Education*, (47): 12.

Responsible Research and Innovation: an opportunity to develop creative skills at Higher Education

Rodriguez, Gemma; Saladie, Núria; Revuelta, Gema; Vizquete, Clara; Llorente, Carolina; Carrió, Mar

Health Sciences Education Research Group, Department of Experimental and Health Sciences, Univeritat Pompeu Fabra, Spain.

Abstract

During the last decades, research and innovation have experienced a revolution that has lead to new challenge, and creativity has been identified as a main skill for professional success. In this context, not only concerns about involving society in research and innovation processes have been increasing but also to make this process responsible. Responsible Research and Innovation (RRI) has been defined as the approach for making research and innovation a collaborative, intergenerational and democratic process. The HEIRRI project aims to integrate RRI at all stages of education with the creation of different programs in Higher Eduaction. The aim of this study is assess how creativity has been developed in an RRI framework in the HEIRRI Summer School programme troughout an Inquiry-Based Learning (IBL) approach. On the basis of the results, this paper highlights that the IBL approach, but also the RRI framework foster creativity development in a research proposal design but also that have an impact on how researchers' perceive their profession. This paper concludes that integral elements of this pedagogical approach and RRI, such as discussion, multidisciplinary and including different voices and perspectives are main ingredients to promote creativity in research and innovation processes and have a transformative potential.

Keywords: *Responsible Research and Innovation, Creativity, Inquiry-Based Learning, Multidisciplinary, HEIRRI project.*

1. Introduction

During the late 20th and 21st centuries, research and innovation have experienced a revolution that has had an impact on human development. New challenges have emerged, and to deal with them some skills have become an urgent need. Creativity has been identified as one of the main and needed skills for professional success and adaptability to constant changing environment.

Creativity is an integral property of research and innovation processes. Researchers are challenged create knowledge as new experts: new questions, deductive and inductive reasoning and combination of unrelated knowledge are properties of this process closely linked to creativity (Barrow, 2010). Although creativity has been always identified as the ability of individuals to generate new ideas, in fact, it is considered as the interaction between aptitude, process and environment where a group of individuals produce something new and useful in a social context (Plucker *et al.*, 2004). Creativity is defined as a social and collaborative phenomenon that requires interaction and discussion (Hadzigeorgiou *et al.*, 2012). Creative thinking a social phenomenon involving interactions among people; it's a property of social groups (Sawyer, 2006).

This global revolution has lead, not only to the crucial development of creativity in research, but also to foster research and innovation processes aligned to the societal need and values, to involve society in the process of decision taking about how research has to be developed. After the Second World War, countries stopped needing military equipment and research started thinking about what society really required to produce reliable knowledge. To that end, not only research had to speak to society, this communication was compelled to be bidirectional (Gibbons, 1999). In recent years, not only concerns about involving society in research and innovation processes have been increasing, but also to make these processes responsible. This movement of responsibility, called Responsible Research and Innovation (RRI), has been defined by Stilgoe *et al.* (2013) as “(...) *taking care of the future through collective stewardship of science and innovation in the present*”. Approaches to responsible innovation extended the governance discussion to encompass questions of uncertainty, purposes, motivations, social and political constitutions and directions of innovation. In this framework four dimensions of responsibility were proposed: anticipation, reflexivity, inclusion and responsiveness (Stilgoe *et al.*, 2013).

In this context, research has lead to new models for collaborative research at large scale (Esparza & Yamada, 2007). It has become a driver for innovation and academic research has participated in large and collaborative big science projects, characterized by multidisciplinary teams (Vermeulen, 2010). This kind of projects collect members of different domains to work collaboratively to make discoveries that impact knowledge, future education and healthcare (Oandasan & Reeves, 2009). Big Science has become an

important way to harness researchers' creativity and enhance innovation through collaboration, multidisciplinary and group thinking, but also an essential scenario of promoting responsible research and innovation (Esparza & Yamada, 2007).

The Higher Education Institutions & Responsible Research and Innovation (HEIRRI) is a Horizon 2020 project that aims to integrate the concept of RRI at all stages of education of scientists and engineers, as well as other fields working on or affected by R&I.

Inquiry-based learning (IBL) is one of the pedagogical approaches used in the HEIRRI project to teach RRI, as well as fostering collaborative creativity. The IBL approach models the general process of investigation that scientists use to answer questions in the real world. It allows students to learn different skills, to apply knowledge and find a solution to a complex problem (Savery, 2006). It simulates real investigations to make students learn while practicing important creative skills such as problem-solving, collaboration, autonomy, considering alternative solutions, investigating different scenarios and exploring new questions (Hämäläinen & Vähäsantanen, 2011; Tan et al., 2009). To foster creativity, many techniques can be developed, such as stimulatory techniques (brainstorming or mind mapping), problem-solving techniques or expert facilitation techniques (Adams *et al.*, 2009). Furthermore, working with multidisciplinary groups can also enhance creative ideas due to the existence of different points of view and the possibility to share a large variability of experiences (Adams *et al.*, 2009).

The HEIRRI project has developed ten different programs to introduce RRI in Higher Education through active learning methodologies. One of the programs, the Summer School, which used the IBL approach, congregated participants from different fields who had to develop a research proposal incorporating the RRI perspective. In this paper, we analyze how the participants of the HEIRRI Summer School have developed creativity in an RRI framework throughout the IBL approach and its transformative potential.

2. Materials and Methods

2.1. Participants

This study was run at Pompeu Fabra University (UPF) during the HEIRRI Summer School on September 2017. There were 15 participants with different research experiences (PhD students, faculty and senior research staff, research managers, administration and services staff, etc.) enrolled in this program. The participants came from different disciplines such as experimental sciences, political sciences, humanities and translation and interpretation, for example. In this course, 13 participants were female and 2 participants were male. Despite the sample isn't gender balanced, no gender statistical differences have been found.

2.2. Study design and setting

The HEIRRI project has developed different training programs to integrate the concept of RRI at different stages of the Higher Education Institutions. One of the programs, implemented in Pompeu Fabra University (UPF), has been carried out as a Summer School to integrate in the everyday practice and foster reflection on RRI for different staff of the university. The Inquiry-Based Learning approach was used to integrate RRI in a practical way to propose a solution for a complex and transversal scenario: Ageing. The Summer School was performed during four days, in which 5 sessions of 4 hours took place. Different activities were integrated in the framework of the IBL approach.

Table 1. Summer School course activities overview.

	Activities	Description of the activities
Day 1	Brainstorming	The participants had to design a multidisciplinary research proposal from a transdisciplinary scenario, ageing, and had to incorporate the basic RRI dimensions.
Day 2	Jigsaw activity	The participants discussed the RRI key issues in small groups with an expert on the field. They had to apply the discussed issues to the research project proposal.
	Walkshop	The participants shared their reflections on RRI and on the research projects in a distended context walking around the city.
Day 3	Museum activity	The participants performed a science café to involve the affected and involved stakeholders' point of view on the research proposal.
Day 4	RRI-project presentations	The participants presented their proposals and discussed how RRI can be included to a research project.

2.3. Data collection and analysis

In this study we examined the development of creative skills throughout the implementation of the IBL approach at the HEIRRI Summer School within an RRI framework. The study has the ethical approval from the UPF and the informed consent of all the participants.

The empirical data was collected through a questionnaire solicited at the end-of-course, that were provided to the research team in an anonymous form. The analysis included all the

responses related to the course. The questionnaire was analyzed through qualitative and quantitative methodologies.

3. Results

To analyse how creativity has been developed in an RRI framework throughout the IBL approach and if this pedagogical approach has a transformative quality. The quantitative and qualitative results of the questionnaire have been analysed.

Table 2. Quantitative results of the questionnaire from 1 (strongly disagree) to 7 (strongly agree) (n=10).

Questions	Mean	SD	Mode
The inquiry based methodology proposed in the Summer School fosters the development of creativity in a research proposal design.	6.40	0.84	7
The Ageing context may interest different disciplines.	6.70	0.48	7
The openness of the Ageing context facilitates the creation of ideas from different disciplines.	6.40	0.97	7
The Ageing context can be related to your own research line.	4.50	2.07	6
The Ageing context can be related to your own experiences.	5.40	1.95	7
Collaboration between researchers of different disciplines fosters the generation of the creative ideas.	6.60	1.26	7
Including the RRI perspective in the research project proposal design has favored the development of a more creative project design.	6.22	0.97	7
Including the RRI perspective in the research project proposal design has limited the development of a more creative project design.	1.89	1.36	1
During the course, participants can verbalize their beliefs about science and society relationship.	6,40	1.07	7
During the course, participants can discuss different points of view/perspectives	6.30	1.06	7
During the course, a constructive dialogue is generated giving way to new conceptions.	5.90	1.20	7
During the course, my point of view on the science and society relationship has changed.	5.10	1.73	6

Table 3. Qualitative results of the questionnaire analysed through categorisation system (n=10).

Category	Sub-category	Further subcategory	Findings
Creativity	IBL pedagogical approach	Scenario	The participants of the summer school state that a global, broad, relevant, shift paradigm scenario that implies emotionally participants can promote creativity development in a research proposal.
		Multi-disciplinarity	Discussion between participants of different fields was very productive. Different perspectives, as well as emotional and personal experiences, makes them think about some points they never thought before, but also to think in a different way and enrich their proposal.
	RRI theoretical framework	RRI integration	Taking into account the RRI perspectives, makes develop more ideas, incorporate new points of view, and anticipate consequences of the developed ideas.
Transformative potential			The RRI perspective, multidisciplinary, including different points of view and rethinking ideas had an impact on how researchers perceive their research.
Limitation			Some activities were more useful than others. However most people regret not having enough time.

4. Discussion

The findings of this study suggest that the IBL approach had a positive impact on creativity development. As the results show, this pedagogical approach fosters the development of creativity in a research proposal design. Presenting an open and broad scenario that include different disciplines and perspectives can facilitate the creation of new and multidisciplinary ideas. A context which can engage emotionally people can contribute also to this issue. Furthermore, interprofessional groups with people of different fields is seen as a fact of creativity development. Different perspectives and points of view makes

participants' think in a different way and incorporate more original and innovative ideas in a research proposal, but also explore different options, solutions or arguments in a bigger framework or complex situation. Some techniques used during this course also facilitate this process, the science café and the post-it brainstorming are good examples of that. The 100% of the participants considered that the science café fostered the creativity of their research proposal, and the 55,5% that the post-it brainstorming increased too. In fact, creativity is a complex and multifaceted topic, and some studies have identified different factors that contribute to its promotion: improvisation, collaboration, problem-solving, openness and flexibility are essential to creative thinking development (Hämäläinen and Vähäsantanen, 2011). Furthermore, creativity is defined as a property of groups, is a social phenomenon involving interactions among people (Sawyer, 2006). When a working environment brings together individuals from different disciplines and domains and who have different perspectives, the creative potential is enhanced due to different ideas and unexpected connections (Adams *et al.*, 2009). The participants considered with a mean of 6,6 out of 7 that collaboration between researchers of different disciplines fosters the generation of the creative ideas. Some techniques are positive to increase this phenomenon in idea generation and evaluation steps; stimulatory techniques that promote alternative thinking or interaction enhance creative thinking (Adams *et al.*, 2009).

Furthermore, the results also show that not just the pedagogical approach fosters creativity but also the theoretical framework in within the Summer School was developed. Including the RRI perspective into research proposal design made participants think in a deeper way and develop more their ideas, inspect other points of view, analyse information in a different perspective, include different voices and take into account perceptions that they hadn't think before. RRI seeks to bring issues related to research and innovation into the open, to anticipate their consequences and to involve society in discussing how science and technology can help create the kind of world and society we want for generations to come (Smyranio *et al.*, 2017). The four dimensions of responsibility provides a framework for raising, discussing and responding a set of questions that arise from public dialogues on science and public concerns (Stilgoe *et al.*, 2103). This discussion between different stakeholders with different backgrounds but also different perspectives of how research and innovation has to be performed is a theoretical framework that can contribute to creative thinking enhancement, if there is enough time to discuss and reflect.

Finally, this course has become an open and safe environment where the participants could verbalise their beliefs about science and society, discuss different perspectives and generate a constructive dialogue about all the treated issues, but also has been useful to change researchers preconceptions about science and society and had an impact on how researchers perceive their profession and research field.

5. Conclusions

Integral elements of the Inquiry-Based Learning approach, but also from the RRI movement, such as discussion on open and flexible contexts, multidisciplinary and including different voices and perspectives are main ingredients to promote creativity in research and innovation processes. Furthermore, this experience had a positive impact on how the professionals perceive their profession and its influence on society.

References

- Adams, D., Beniston, L., & Childs, P. (2009). Promoting creativity and innovation in biotechnology. *Trends in Biotechnology*, 27(8), 445-447. doi: 10.1016/j.tibtech.2009.05.001
- Barrow, L. (2010). Encouraging Creativity with Scientific Inquiry. *Creative Education*, 1(01), 1-6. doi: 10.4236/ce.2010.11001
- Esparza, J., & Yamada, T. (2007). The discovery value of “Big Science”. *The Journal of Experimental Medicine*, 204(4), 701-707. doi: 10.1084/jem.20070073 PMID:1740271
- Gibbons, G. (1999). Science’s new social contract with society. *Nature*, 402. SUPP.
- Hadzigeorgiou, Y., Fokialis, P., & Kabouropoulou, M. (2012). Thinking about Creativity in Science Education. *Creative Education*, 3(5), 603-611. doi: 10.4236/ce.2012.35089
- Hämäläinen, R., & Vähäsantanen, V. (2011). Theoretical and pedagogical perspectives on orchestrating creativity and collaborative learning. *Educational Research Review*, 6(3), 169-184. doi: 10.1016/j.edurev.2011.08.001
- Oandasan, I., & Reeves, S. (2009). Key elements for interprofessional education. Part 1: The learner, the educator and the learning context. *Journal of Interprofessional Care*, 19(1), 21-38. PMID: 16096143
- Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn’t creativity more important to educational psychologists? Potential, pitfalls, and future directions in creativity research. *Educational Psychologist*, 39(2), 83-97. doi: 10.1207/s15326985ep3902_1
- Savery, J. R. (2006). Overview of Problem-Based Learning: Definitions and Distinctions. *Interdisciplinary Journal of Problem-Based Learning*, 1(1), 9-20. doi: 10.7771/1541-5015.1002
- Sawyer, R. K., (2006). Explaining creativity: The science of human innovation. New York: Oxford University Press.
- Smyranio, Z., Georgakopoulou, E., Sotiriou, M., Sotiriou, S. (2017). The Learning Science through Theatre initiative in the context of Responsible Research and Innovation. *Journal of Systemics, Cybernetics and Informatics*, 15(5), 14-22.
- Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, 42, 1568–1580.
- Vermeulen, N., Parker, J. N., & Penders, B. (2010). Big, small or mezzo. *EMBO Reports*, 11(6), 420-423. doi: 10.1038/embor.2010.67 PMID: 20467436

Digital scriptum – novel approach of student experiment preparation

Roß, Nikolas^a; Kuska, Robert^a; Rieth, Iris^b and Frerich, Sulamith^a

^aVirtualisation of Process Technology, Department of Mechanical Engineering, Ruhr-University Bochum, Germany, ^bFluid Separations, Department of Mechanical Engineering, Ruhr-University Bochum, Germany

Abstract

In mechanical engineering, students pass several seminars aiming at self-conducted experiments and trials. In the ELLI project (Excellent Teaching and Learning in Engineering Science), different virtual and remote laboratories have been installed within the three engineering departments at the Ruhr-University Bochum. The preparation in a classic experiment is usually done with a classic paper print scriptum. This is not suitable for a virtual or remote laboratory, since, amongst others, no supervision is provided. Due to that, a classic scriptum has been transferred in a digital scriptum based on the Open Source software “Adapt Learning” and has been extended by various implemented digital items. This contribution is discussing preliminary student experiences and identified prospective improvements. It turns out that the digital scriptum is suitable for the preparation of virtual and remote laboratories but can be an excellent alternative to the classic printout scriptum in a student experiment in a hands on laboratory as well.

Keywords: *Digital scriptum; preparation; student experiments; remote laboratories; mechanical engineering; engineering education*

1. Introduction

Project ELLI (Excellent Teaching and Learning in Engineering Science) is a joint project of the three German universities RWTH Aachen, Ruhr-University Bochum and TU Dortmund University, and it was funded by the Federal Ministry of Education and Research. Considering teachers' and learners' perspectives, the project aims at improving existing concepts in higher engineering education, and the development of new and innovative approaches is pursued. In the past years, a pool of remote and virtual laboratories has been set up in order to gain flexibility in the usage of experimental equipment in different scenarios. At Ruhr-University Bochum, these laboratories are maintained from all engineering faculties, so topics from environmental, mechanical and electrical engineering are covered.

Since practical experience is considered as essential part in engineering education, engineering students are usually encouraged to take part in seminars aiming at self-conducted experiments and trials. Thus, increasing numbers in study programs are a challenge for providing adequate hands-on laboratories. Currently, it is planned to implement the virtual and remote laboratories at Ruhr-University Bochum as digital enhancement of seminars aiming at practical experiences. The preparation of students prior to conducting an experiment is essential for the learning outcome of both digital and hands-on laboratories. Therefore, the aim of this contribution is showing first experiences of student preparation for conducting a digital experiment in a remote laboratory.

2. Student experiment preparation

The student introduction into experimental set-ups and exercises using virtual or remote equipment differs strongly from classical preparation in laboratories. Usually, before gaining access to a hands-on laboratory, students are preparing themselves, using scriptums, textbooks or databases.

2.1. Classic scriptum

A representative execution of a hands-on laboratory by students at the Ruhr-University Bochum begins with the preparation of the topic. The main and only relevant object is a classic scriptum, whose content leans on the respective lectures teaching this topic. Its structure usually aims at the first parts of typical journal articles:

- Introduction
- Materials and Methods
- Theoretical background
- Experimental set-up and execution

The pdf-file scriptum can be printed out. It contains fixed content, and its continuous text is mostly interrupted by specific and explanatory figures and tables. This is completed by issues and tasks the students have to solve and by information on how they have to handle the gained data.

The preparation is followed by a person-to-person assessment of the laboratories' supervisor. A group of up to four students receive random questions, which can be answered by the knowledge gained in the classic scriptum. The assessment mainly aims at a validation of the students' preparation in order to verify their ability to undertake this experiment.

2.2. Interactive scriptum

In the last decades, a trend on remotely accessible real and virtual laboratories was observed. While the technology improved, companies and universities realized the potential in productivity, availability and education. Increasing internet speed and computational power lead to a variety of approaches, but the goals in engineering education are still the same: Students should know the handling of machines and processes, and they are able to understand theoretical backgrounds by applying it in practical work. Although personal feedback is crucial for the students' learning-by-doing, the supervision of experimental performances is not given in remote access. This change to unsupervised experiments results in different learning outcomes (Lindsay & Good, 2005). Two groups of students were observed, and the group with access to the real laboratory performed better (Lindsay & Good, 2005). Thus it was shown that a better understanding of the apparatus before execution a remote experiment is helpful. Still, the students' preparation is neglected by the development. Hence, the classic scriptum needs to be adjusted to the still ongoing evolution of digitalized laboratory education to enhance the students' cognition of the laboratory.

This work deals with the realization of a modern, flexible, intuitive and interactive scriptum. It should be accessible from all devices, online, offline and be able to use digital items like interactive figures and animations that a classic scriptum cannot. Furthermore, it should give students a variety of possible preparation ways, so that the system aligns more to the students' learning preferences.

Different approaches and software systems can be found that are applicable in the field of education. The preparation can be switched to videos or to an online survey (LinkedIn Austria GmbH, 2018; Netigate AB, 2018). As well flexible systems can switch between informing and testing via questions or similar with lots of possibilities (Elucidat Limited, 2018; Strategic Technology Solutions dba SmartBuilder, 2018).

While the aforementioned solutions are either limited in their functionality or are commercial, “Adapt Learning” is a freeware Open Source authoring tool with some significant benefits (Adapt community, 2018).

It uses HTML5 to achieve a browser-based experience and has a responsive design that allows the accessibility and readability on all kind of devices and operating systems. In addition it is Open Source, so it can be extended. A community develops plugins which can be implemented in the own system. In Adapt Learning many digital items are already included, such as video implementation, interactive figures and assessments with variable question types. An important maintenance factor is the easy to use graphical user interface.

However, what is possible in a modern scriptum? Primary the classic scriptum is represented in a new way. Then some digital items can be implemented where a benefit is to be foreseen, such as interactive figures to introduce the experimental set-up. Questions for self-reflection can be implemented after each chapter. A feedback system for wrong answers can lead to the important passage within the scriptum and offer hints to find deeper understanding online or in books. Video or animation implementation can be used to visualize problems, which are hard to describe with words. Complex systems can be easier to access with 3D models instead of static pictures with various angles of the apparatus. Interactive graphs and charts can be used by the students to expand the knowledge of some behavior of the system by easily zoom in and out and concatenate various information autonomously. A final assessment also helps to self-reflect the own knowledge. Where possible, gamification elements can be implemented to already train the student for the performance (Kruse et al., 2018). The participating students should feel well prepared, so no supervisor is necessary in the execution of the experiment.

In this work, a first draft of the new scriptum was realized on a real laboratory, which can be performed via remote access or as a hands-on laboratory. By that, the suitability of the scriptum can be verified for both cases.

3. Experiment set-up

The considered experimental set-up was developed for teaching the principle of heat transfer in the context of a student laboratory. The experimental set-up is integrated in the remote laboratory platform “ELLI Lab Library” to enable online operated measurements (Kruse et. al., 2016). The goal is to comprehend the temperature profile in a heat exchanger using a Fibre Brag Grating Sensor as measurement technique. The students should determine the Nusselt number and heat transfer coefficient as typical key figures, for this heating system and compare it to data from literature.



Figure 1: Experimental set-up

The main part of the experimental set-up in Figure 1 is the double-walled heat exchanger with the installed Fibre Brag Grating Sensor for temperature measurements. This minimally-invasive measurement technique allows the determination of the temperature of the process medium in the heat exchanger at 13 axial positions (Steghake & Grünewald, 2017). While the heating fluid flows downwards in the jacket, the process medium gets pumped through the inlet of the heat exchanger upwards (counter flow). In order to measure the mass flow of the inlet process medium and the outcoming liquid and vaporized parts of it, there are three weighing instruments.

The thermostat and the pump can be regulated manually at the device itself, but the regulation can also be done in a software for controlling processes. LabVIEW is used for controlling pump and thermostat, and it shows the temperature of the heating fluid, the mass in the collecting containers and the measured temperatures inside the heat exchanger. The students can observe the separation of the liquid and vaporized part of the outcoming process medium via camera, which is also integrated in LabVIEW. The communication between the students and the laboratory is realized by iLab, an Open Source time management system. It allows students to access the experiment, read off the measured data and regulate the pump and thermostat online.

Before the students start the remote laboratory, they need to do the online scriptum. This scriptum has the challenge to impart the experimental set-up and the function of its components without the students seeing it live. The tutorial focuses on understanding the principle of a heat exchanger, the online handling of this experimental set-up and the collection of all relevant experimental data. When the laboratory is started, the students have to heat up the thermostat first and to choose set points of the thermostat and pump

inside a given range, which is integrated in LabVIEW to ensure a safe operation. If the heat exchanger reaches stationary conditions for the chosen set point, the students have to read off the temperatures inside the heat exchanger and the weight of the collected samples of the processed medium at three points in time. After the students finished the remote laboratory, the calculation of the key figures has to be done, using the correlations and data, which are given on the online platform.

4. Results and discussion

The developed digital scriptum is divided in different chapters as shown in Figure 2. The start screen includes the main information like topic, contact person and experimental location. By using the “Start”-button, the preparation is started and the view changes to the chapter overview. This first approach of preparation is separated like the classic scriptum in six main chapters. In each chapter, different kinds of presentations, questions or assessment components were used to allow interactions either to inform the students or to enable their self-reflection in study progress.

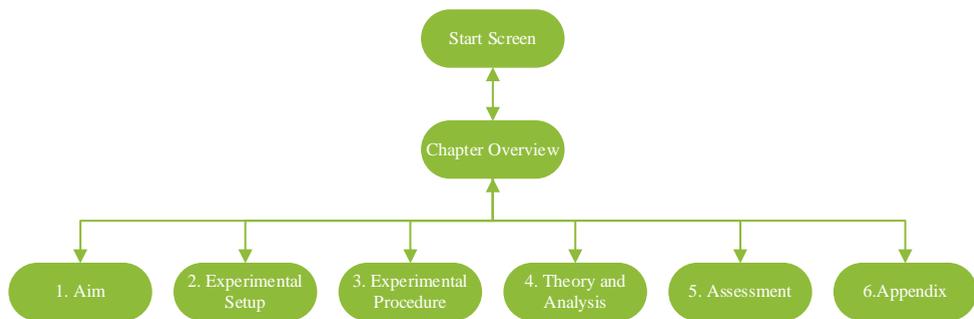


Figure 2: Structure of the digital scriptum

To collect first experiences, a testing of the digital scriptum was done at the Ruhr-University Bochum with a mixed focus group. The focus group contained 15 students out of different engineering science courses (Mechanical Engineering, Environmental Technology and Resource Management) with different progress of their studies (Bachelor/Master/Doctorate). The laboratory preparation was installed offline on surface tablets. The students could freely choose the orientation of the tablets, concerning the responsive design of Adapt Learning. The preparation with the digital scriptum took the students around 20 minutes. Afterwards, they were asked to fill out a questionnaire to collect the student’s impressions.

The testing showed that the students especially liked the interactive introducing figure for the experimental set-up. The implemented set-up is shown on the left side in Figure 3. Via icons, the students were able to inform themselves about each specific item of the

processing plant. As shown on the right side in Figure 3, they get detailed information by activating the specific icon on the picture.

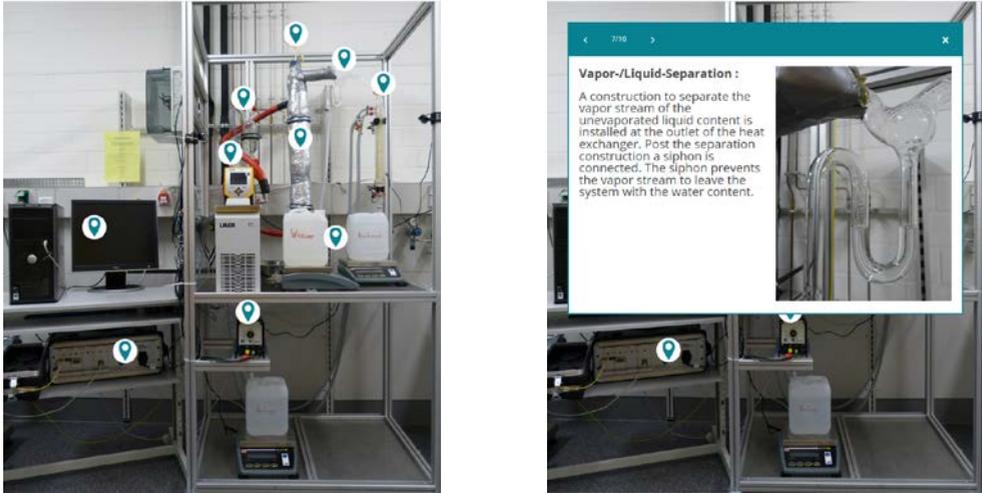


Figure 3: Experimental set-up (left) implemented in Adapt Learning and pop-ups with detailed information for each marked part (right)

Another noted positive aspect was the structure of the scriptum itself as it is visualized in Figure 4. Since the structure of the digital scriptum was oriented in a similar way like the classic scriptum, the students had no orientation problems.

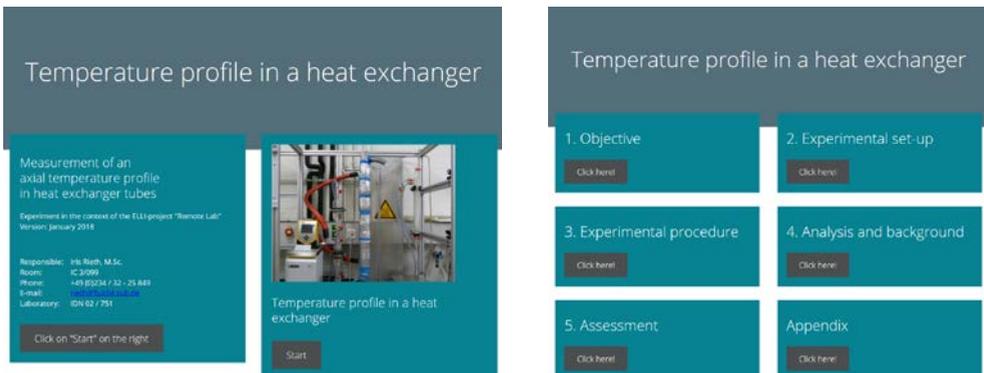


Figure 4: Start screen (left) and chapter overview (right) of the digital scriptum

The handling of the preparation tool was also noted positively. The students needed no further explanation about the tool, thus they could prepare themselves without further assistance.

As negative feedback, the students would have favored more content and explanations especially regarding the innovative temperature measuring system. Furthermore, the

students asked for complementary elements like calculation examples, videos of the running experiment or explanatory videos of the inner side of the heat exchanger. It shows a general interest in the possibilities of the innovative way of laboratory preparation, which will be considered in future steps of development.

5. Summary and outlook

The first trial showed that the digital scriptum could be an excellent alternative to the classic printout scriptum. The students can inform, interact and self-reflect themselves, which is usually not possible in this extent by using a classic scriptum. The laboratory and its preparation should be tested and evaluated with a bigger, more homogeneous group in the context of a practical course, in order to gain further insight. In the prospective, the scriptum can be supplemented by further elements like interactive diagrams, videos or stream animations to visualize problems. The final assessment cannot only help the students to self-reflect their knowledge, a successful completion can be used to grant the students the direct online access to the remote laboratory in the future.

References

- Adapt community. (2018). Adapt Learning. Retrieved from <https://www.adaptlearning.org/>
- Elucidat Limited. (2018). Elucidat. Retrieved from <https://www.elucidat.com/>
- Kruse, D., Frerich, S., Petermann, M., Ortelt, T. R., & Tekkaya, A. E. (2016). Remote labs in ELLI: Lab experience for every student with two different approaches. In *Proceedings of 2016 IEEE Global EDUCON: Date and venue: 10-13 April 2016, Abu Dhabi, UAE* (pp. 469–475). <https://doi.org/10.1109/EDUCON.2016.7474595>
- Kruse, D., Kuska, R., Frerich, S., May, D., Ortelt, T. R., & Tekkaya, A. E. (2018). More Than “Did You Read the Script?”. In M. E. Auer & D. G. Zutin (Eds.), *REV 2017, held 15-17 March 2017, Columbia University, New York, USA* (Vol. 22, pp. 160–169). https://doi.org/10.1007/978-3-319-64352-6_16
- Lindsay, E. D., & Good, M. C. (2005). Effects of Laboratory Access Modes Upon Learning Outcomes. *IEEE Transactions on Education*, 48(4), 619–631. <https://doi.org/10.1109/TE.2005.852591>
- LinkedIn Austria GmbH. (2018). video2brain. Retrieved from <https://www.video2brain.com/>
- Netigate AB. (2018). Netigate. Retrieved from <https://www.netigate.net/>
- Steghake, C., & Grünewald, M. (2017). Anwendung von faseroptischer Messtechnik zur gering-invasiven Temperaturprofilmessung in Reaktoren. *Chemie Ingenieur Technik*, 89(4), 480–485. <https://doi.org/10.1002/cite.201600138>
- Strategic Technology Solutions dba SmartBuilder. (2018). smartbuilder. Retrieved from <http://www.smartbuilder.com/>

Learning Lab “Digital Technologies” - Concept, Streams and Experiences

Brehm, Lars and Guenzel, Holger

Department of Business Administration, Munich University of Applied Sciences, Germany

Abstract

Digital technology capabilities are highly important also for non-computer-science students. Unfortunately, the understanding of the underlying technologies of daily used devices is often non-existent, but also difficult for lecturers to explain. There is a need for new ways of teaching and learning; this here presented concept of the Learning Lab “Digital Technologies” is an answer to this challenge for building up knowledge and breaking down barriers to technology in a playful and self-contained way. The focus is on hands-on approaches to technology and solving assignments in small student teams.

The four core elements of the Learning Lab: didactic concept, stream concept, assignment repository concept and community concept. The article outlines the experiences with students of the business administration master program in the specialisation field of “Digital Technology Entrepreneurship” at the Munich University of Applied Sciences. The article concludes with all key benefits of the Learning Lab for students and lecturers and an outlook for further development.

Keywords: *Learning Lab, Digital Capabilities, Digital Technology*

1. Introduction

The usage of smartphones and tablets by students is taken for granted; on the other hand non-computer-science students understanding of the utilised technologies with their strengths, weaknesses and the related risks by on the other hand is often less significant. Especially in the era of digitization, academic teaching needs to give students an understanding of digital competencies as well. Beside the discussed effects of digitalization on collaborative skills, these include communication skills, project management and self-learning competence by Kreulich and Dellmann (2016), especially the understanding of digital technologies and digital systems architectures.

For students of the business administration master program in the specialisation field of “Digital Technology Entrepreneurship” at the Munich University of Applied Sciences (<http://t1p.de/DTE>), the topic “digital technologies” - especially the architectures of IT systems and their business impact analysis as well as innovation drivers, like Internet of things (IoT), big data or Virtual Reality / Augmented Reality - is an important curricular element. The challenges of the master program sometimes lie in the distance of the students to their educational background, but also in inflexible learning spaces (especially computer pools) not designed for collaborative work.

Therefore, the authors of this article searched for solutions for the following questions: What is necessary for a good Learning Lab to “properly” put digital technologies to the test? How can a playful, self-controlled start with “self-learning methods” be realized at moderate costs?

2. Fundamentals of the Learning Lab

The Learning Lab “Digital Technologies” serves as a new approach, in which students can, through concrete sample projects, familiarise themselves with digital technology and its possibilities - without becoming “too technical”. This foundation is the basis for applications in areas like data mining, industrial internet or smart mobility. The Learning Lab includes four core elements: didactic concept, stream concept, assignment repository concept and community concept.

2.1 Didactic concept

“Competence-building and maturing learning is a self-directed action through which the learning subject develops abilities regarding self-organised and proper problem-solving. It moves inside a learning environment (that defines a competence profile and distribution methods), but simultaneously realises a learning inner world (self-learning and design)” (Arnold & Erpenbeck, 2014, p. 5 f.). The didactic requirements for that are: from input to infrastructure, the opening of a subject classification system to situation dynamics and from instruction to self-directed learning (Arnold & Erpenbeck, 2014). Therefore, the change of

perspective from a knowledge-delivering didactic to a self-controlled acquisition of knowledge and competencies is fundamental (Blinkstein 2013). This is based on the insight that learning is most effective when the learner can acquire the findings independently, experience their sustainability and is able to put them to the test (Schüßler, 2008). In such a context the didactic setting (the learning infrastructure) holds a distinguished position. Like in a physical workshop the Learning Lab calls for diverse materials and tools that encourage self-active learning and learning through experience. Frontal-arranged seminar rooms with fixed furniture and without appropriate teaching and learning materials are unsuitable for this purpose. The Learning Lab focuses on designing inspiring learning environments and learning situations.

In the classic definition of self-directed learning, Knowles (1975, p. 18) describes the approach of self-directed learning as “a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating their learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes“.

It is necessary to especially highlight that built into the process of self-directed learning is a constant reflection and hence, correction loop through the evaluation aspect. Within the learning process the teacher plays different roles. He or she is an expert for the learning content, active listener, productive inquiring person, enabler for a focused and trusting learning atmosphere, trainer that recommends exercises, and process facilitator in the sense of a “critical friend” (Siebert, 2009; Borthick, Jones, & Wakai, 2003).

In the Learning Lab, student teams are being challenged to use hard- and software through the autonomous work on exercises or small sample projects, the so-called assignments; quick wins motivate the students to independently deal with and solve following exercises. The lecturers are predominantly there as coaches. The assignments are concluded by reflection work and “lessons learned” elements. To carry the course through, the Learning Lab is temporarily set up in a seminar room with flexible furniture.

2.2 Stream concept

The Learning Lab is geared to offer several streams. An overview of the currently available streams is shown in figure 1. Additional streams can be added easily.

All streams are based on the utilisation of available, inexpensive and expandable standard components. We used the following digital technologies:

- Digital Technologies Essentials: The Raspberry Pi3 with memory card, power supply, monitor cable as well as various sensors and actuators – such as the “Sense-Hat” to measure temperature and motion as well as an LED field - meet these requirements with a maximal total amount of 100 euros per team. The

introductory assignments require a keyboard with a mouse and a monitor, which were taken from the department’s inventory. In terms of software, the free-of-charge operating system Raspbian and freely available software packages - like the programming language Python - are used.

- Learn to Code with Cozmo: To use the robot Cozmo (www.anki.com), the students need a tablet (Android or IOS) and a cost-free app for using the programming language Scratch or additionally a computer and a simple editor to get deeper into the use of sensors and actuators with Python. With Scratch, the participants can make a practical introduction to programming constructs like loops or variables and robotics elements like driving or lifting a cube.
- 360 VR Collaboraton: The students use end-consumer 360 degree video cameras as well as Virtual Reality glasses (based on Android smartphones and Samsung VR gear headset). In the stream they understand the technology, produce 360° videos (at typical locations of our city) and watch them. Additionally, this is embedded in an international project cooperation across three universities. The student teams across the location also watch the presentation of the other locations and thus share not only the content, but also some part of their surroundings.

Digital Technologies Essentials (DTE)	Learn to Code with Cozmo (LC2)	360° Virtual Reality Collaboration (360VR)
Understand digital architectures	Learn programming & robotic basics	Understand virtual reality
		
Raspberry PI 3 SenseHat	Cozmo Scratch and Python	Gear 360° camera VR Glasses
2 days 23 assignments	1 or 2 days 11 or 22 assignments	1 day 12 assignments
... IoT, database, cloud	... agile development	... international project

Figure 1: Current streams of the Learning Lab “Digital Technologies”

2.3 Assignment repository concept

Derived from the didactic concept a repository with standardised assignments has been created. From a professional perspective, the challenge in creating these assignments is the

right length and autonomy, so that these assignments can be re-used in different teaching contexts without a complete and elaborate edit becoming necessary. For this reason, a common structure and a consistent composition have been determined:

- title
- learning objectives
- necessary requirements of software and hardware
- solution steps including indications of further information sources and solution hints as well as
- questions about lessons learned in form of a retrospective

Currently the existing 55 assignments of the Learning Lab have a length of between two and twelve pages. The structure allows for assignments with different levels of difficulty and assignment types, from theoretical basics to game manuals, because the detailing of solution steps and solution hints can be varied.

Organisationally and technically these assignments are managed centrally via GitLab. The assignments have been written in the programming language Markdown, to keep them easily edible in a default structure and consistent format within the writing process, despite the distributed creation by the lecturers. In contrast to Markup languages like HTML, explicit formatting commands are not required. The vocabulary is rather small and easy to acquire. From this repository, specific workshop packages for various learning scenarios can be put together with little effort.

2.4 Community concept

The Learning Lab's concept also includes the active creation of a community of lecturers, that develops the Learning Lab content-wise as well as technically and also gives access to numerous students coming from different study areas. In addition to universally usable basic modules, subject-specific modules are being developed.

The community includes professorial colleagues at the Munich University of Applied Sciences who face a similar challenge across different departments as well as an inter-university community across Germany and Europe. Benefits for the colleagues are: a finished and tested didactic concept, small preparation time and - if required - fast adaptability. At the same time the Learning Lab "Digital Technologies" serves as an "umbrella brand" to develop new formats like Internet of things (IoT), Machine Learning or Hackathon.

3. Experiences

In the following we describe the experiences with the Learning Lab “Digital Technologies Essentials”, which have been performed three times in the last two semesters. It has the following structure of two workshop sessions and a preparatory introduction (see figure 2).

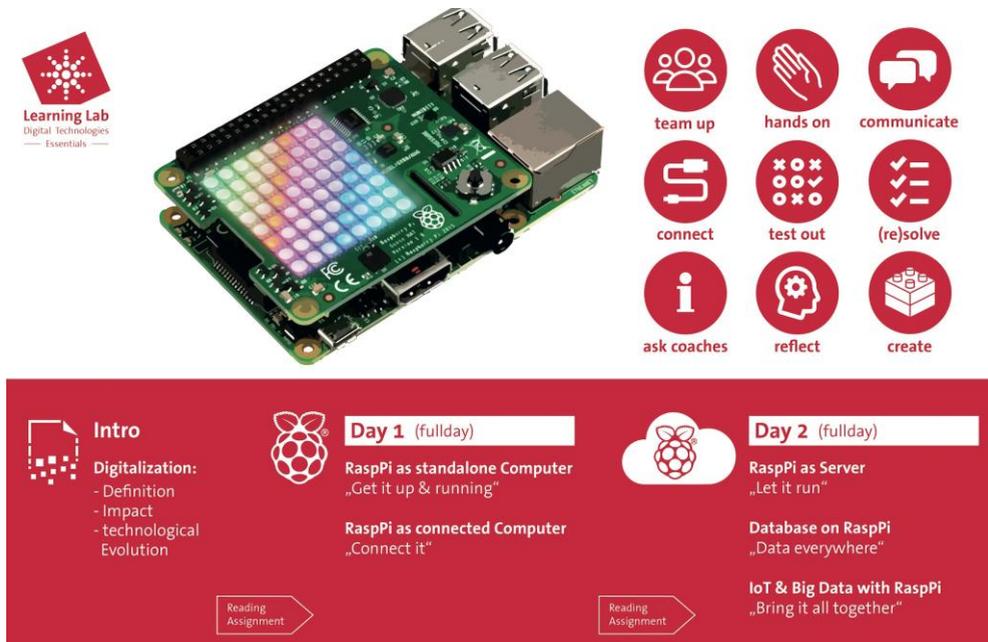


Figure 2: Overview of the Learning Lab “Digital Technologies Essentials”.

The Learning Lab “Digital Technologies Essentials” was designed, set up and carried out within several weeks. The starting point was the **concept** including two workshop days preceded by an introduction to the theoretical basics and several texts for self-study. The first workshop day serves as an introduction to hardware, software and the operating system; the second workshop day focusses on the specialist subjects as a basis for the corresponding course. Typical courses are a course on technologies and their architectures, agile project management or a data mining course. In these courses the gained experiences are taken up again and deepened in the specific direction.

The **preparation of the mobile lab** included the acquisition of hardware and software (operating system, programming environment, etc.). Also, the selection and development of the theoretical principles as well as the assignments, which were designed separately and tested on the hardware, had to be prepared.

The **implementation** began within the first weeks of the semester by a three-hour introduction in a face-to-face lecture and a following distribution of the self-learning

documents. After that, in week two and three, the two all-day workshops were carried through. The students were provided with printouts of the assignments on the workshop days. In this way the independent and intensive engagement in the assignments at a respective own pace is achieved. Paper-based assignment documents also allow for quick notes about own findings. The physical installation of the hardware took place on the workshop days within about one hour before the beginning of the event. The flexible furniture of the room, regarding the creation of autonomous work stations and the possibility to display the workgroup’s reflections, is an important factor. The assignments are processed by the students in a mostly autonomous fashion.

From a didactical point of view the experience shows, that the Learning Lab’s working method brings along a certain fun factor and motivation for the students, because besides the casual interaction with the topic it allows a self-directed learning at their individual pace. Furthermore, the autonomous group work showed a positive effect. From an organisational point of view the easy acquisition, the high cost-effectiveness and the quick reutilisation in different contexts need to be mentioned. Access to the university WiFi had proved to be unstable during the implementation and will be reviewed.

Overall we have experienced the following key benefits of the learning lab for students and lecturer:

Table 1. Key Benefits of the Learning Lab for Students and Lecturer

Students	Lecturers
<ul style="list-style-type: none"> • Reduction of fear of contact with technology, the subject of computer science or programming languages • Development of a basic understanding for IT architecture, basics of programming languages, new technologies such as IoT, cloud, sensors, robotics, etc • Raising the awareness of problems with IT: data security, programming errors, communication with the IT department, requirements for applications, challenges of new technologies • Self-determined learning: learners determine the speed of the unit 	<ul style="list-style-type: none"> • Role of a coach: the lecturer acts as a coach and facilitates the learning process of the students. During that process the students determine the speed of the lecture. • Establishment of a homogeneous learning group: Homogenisation of competences before the lecturer enters the subject matter her-/ himself

4. Outlook

Beside those improvement measures, the further creation of assignments and new Learning Lab streams is pushed forwardly via the described community of lecturers. Hereby, on the one hand the professional scope is supposed to be widened, and on the other hand assignments with a focus on special topics, e.g. the construction of tablets or IoT applications, should also to be developed. Furthermore, first mutual projects between lecturers arise from the community as well. In addition, extensive accompanying research for quality assurance and measuring regarding the digital competencies is being developed.

References

- Arnold, R. & Erpenbeck, J. (2014). *Wissen ist keine Kompetenz. Dialoge zur Kompetenzreifung*. Schneider Verlag: Hohengehren.
- Blikstein, P. (2013). Digital fabrication and ‘making’ in education: The democratization of invention. In J. Walter-Hermann & C. Büching (Eds.), *FabLabs: Of machines, makers and inventors* (pp. 203–222). Bielefeld: Transcript Publisher.
- Borthick, A. F., Jones, D. R., & Wakai, S. (2003). Designing learning experiences within learners’ zones of proximal development (ZPDs): Enabling collaborative learning on-site and online. *Journal of Information Systems*, 17(1), 107–134.
- Knowles, M. (1975). *Self-directed learning: A guide for learners and teachers*. New York: Association Press.
- Kreulich, K. & Dellmann, F. (2016) *Digitalisierung: Strategische Entwicklung einer kompetenzorientierten Lehre für die digitale Gesellschaft und Arbeitswelt*, Fachhochschule Münster University of Applied Sciences: Berlin.
- Schüßler, I. (2008). *Reflexives Lernen in der Erwachsenenbildung – zwischen Irritation und Kohärenz*. *Bildungsforschung*, 5 (2). Accessable at: <https://uhh.de/k9dmq> [11.11.2016].
- Siebert, H. (2009). *Selbstgesteuertes Lernen und Lernberatung. Konstruktivistische Perspektiven*. ZIEL Verlag: Augsburg.

***“I see students’ digital practices as an extreme impoverishment”:
The Non-Use of the Competences Framework and Stigmatisation
of Technology of Italian Secondary School Teachers***

Vezzoli, Yvonne^a; Pagani, Valentina^b

^aCISRE, Ca’ Foscari University of Venice, Italy, ^bCISRE, Ca’ Foscari University of Venice, Italy

Abstract

The research aims to explore empirically the competences-based teaching and assessment practices of 19 Italian secondary school teachers through a focus group methodology. The meeting was the starting point for a professional training course on inclusive learning design using multimodal digital environments, i.e. social network sites and the Web 2.0. Results show that the competences-based framework adopted at an institutional level more than one decade ago did not impact the knowledge-based teaching and “intuitive” assessment practices of participants. These conclusions advance the understanding of the weak relationship between educational policies and teaching practices in the Italian context. Furthermore, interesting limits toward pedagogical and digital innovation in secondary school emerged. In particular, the learning practices of young people in social network sites and Web 2.0 were identified as the most influencing factor on the perceived detachment between participants and their students. As a consequence, teachers stigmatised these technologies, revealing marked tensions while introducing ITC and innovative digital pedagogies based on new forms of learning.

Keywords: *Competences-based learning; Secondary School; Assessment; Digital Pedagogies; Innovation; Teacher Training.*

1. Introduction

Despite the competence-based approach for the design and assessment of educational programs and activities has been established as shared basis of all the educational systems in the European Union for more than 10 years, the effectiveness of this educational paradigm still lacks of solid empirical confirmation (Lassnigg, 2017).

To contribute to fill the gap in the Italian context, we explored the competences-based practices of two groups of secondary school teachers. We collected data during the first meeting of a professional training course that focused on inclusive learning design for dyslexic young people. Indeed, previous research revealed the potential of multimodal digital environments, such as social network sites and the Internet, to promote participation for dyslexic teens (Vezzoli et al., 2017). On the basis of these results and following empirical investigations, we are co-designing with teachers a new pedagogy based on dyslexic young people strengths, taking policies and established teaching practices into account.

Results reveal that the competences-based framework fostered at an institutional level did not impact the concrete teaching and assessment practices of teachers. In particular, a general confusion on the meaning and application of the “competence” concept resulted in a *knowledge-based learning design* and “*intuitive*” *assessment* of its outcomes. These results advance the understanding of the real impact of both European and Italian educational policies on teachers’ practices, and they foster the development of future research and training courses that aim to translate policies into teaching practices effectively. Furthermore, teachers appeared suspicious about introducing technological and pedagogical innovations at school. The most important factor of tension was identified in the digital practices of teens in social network sites and the Internet, interpreted by participants as the cause of the perceived detachment between teachers and students. This contribute to the educational technology agenda, opening further questions on the limiting factors of new digital pedagogies in the Italian context.

2. Background

According to the European Union, competences are knowledge, skills, and attitudes that, in the specific case of the eight fundamental “key competences” for longlife learning, will help learners to find personal fulfilment and, later in life, to find work and take part in society¹. They are traditional skills such as communication in one’s mother tongue, foreign languages, digital skills, literacy, and basic skills in math and science; and horizontal skills

¹ https://ec.europa.eu/education/policy/school/competences_en

such as learning to learn, social and civic responsibility, initiative and entrepreneurship, cultural awareness, and creativity. Welcomed for their potential to enhance connectivity between the school and the workplace (Wesselink et al., 2009), the approaches based on competences re-opened theoretical debates and empirical investigation on the relationships between knowledge and its application, and more broadly between theory and praxis (Everwijn et al., 1993).

In 2009, Gordon et al. explored how the 27 Member States of the European Union developed and updated their approaches to education and training reflecting the intention of the EU framework published 3 years earlier (Gordon et al., 2009). The authors concluded that most of the Member States had created policies that would “*move their school systems from being predominantly input led and subject-oriented towards curricula which include competences, cross-curricular activities, active and individual learning, as well as a focus on learning outcomes*” (p.79). Three main innovations emerged from their analysis: new curricula, guidelines and textbooks/documents at a national and institutional level; new assessment tools for learning outcomes and evaluation tools for the implementation (e.g. Baartman et al., 2007); and training schemes for teachers and senior managers, such as the teacher training course we consider in this paper.

As regards Italian secondary schools, at a national level competences are defined as the fundamental mission of education (Italian Eurydice Unit, 2014), and they are structured in four *cultural axes*: languages, mathematics, science/technology and history/social studies. Competences are also the basis for building learning pathways aimed particularly to acquire the key competences that can help students in adulthood and for lifelong learning (Italian Eurydice Unit, 2014). In this context, we ask if and how these frameworks and guidelines are used by Italian secondary school teachers. In addition, our second aim is to understand the perceived strengths and limits of the educational paradigm.

3. Methods

3.1. Participants

We organised a professional training course with the aim to co-design inclusive didactic activities. The course was part of a bigger research project on innovative digital pedagogies for dyslexia. We contacted the technical secondary schools in the Veneto region that had participated in a previous research on the learning opportunities promoted by multimodal digital environments for teens with dyslexia. The teachers working in these schools were invited to take part to the course for free. Furthermore, given that one of the schools involved acts as inclusion centre for secondary schools in the East side of the region, this

school promoted the course to its contacts. Participants were selected through a criterion sampling (Patton, 1990), and our inclusion criteria were:

- Teaching to the first and second year of secondary technical school (students aged 14-16);
- Being involved in the science/technology or history/social cultural axes;
- Being familiar with the competence-based frameworks for teaching and assessment.

In order to facilitate the participation of teachers, the same course was organised in both the main schools taking part to the research, one of which is located in the city of Venice, while the other in Portogruaro, a village in the country. At the end of the recruiting process, 19 teachers agreed to take part to the course, 9 in Venice and 10 in the area of Portogruaro. 10 of the 19 participating teachers belong to the science/technology cultural axe, while 9 of them teach historical/social subjects.

3.2. Data collection

Four meetings took place after school classes, and they lasted 2 hours each. To answer our research questions, we considered the first meeting exclusively, that focused on the concept of competence, and its use in the European and Italian document that are currently the basis of the Italian educational system. In particular, the meeting was structured as focus group (Morgan, 1997) guided by one researcher, who used the European and Italian documents as starting point for the discussions on established teaching and assessment practices. The same procedure was applied both in Venice and Portogruaro. The meetings were audio-recorded with the written consent of all the participants, for a total of 4 hours of recordings.

3.3. Analysis

The recordings were transcribed for analysis. The first author of this paper carried out an inductive thematic analysis following a systematic coding process as suggested by Braun and Clarke (2006). The analysis initially yielded 8 codes categories that have been organised in themes according to the research aims. Then, the analysis has been repeated iteratively to ensure that the themes expressed the full dataset. At the end of the process, 3 themes emerged:

Theme 1: “Knowledge” is “competence” captures a general confusion on the meaning and application of the competences framework. Indeed, the educational paradigm is used as a new frame for the well established knowledge-based teaching practices of participants.

Theme 2: Assessing intuitively focuses on the participants’ established practices of assessing “intuitively” the competences developed by their students, when this form of assessment is required by the school, thanks to the self-assessed experience of teachers.

Theme 3: Perceived detachment describes participants' perceived differences between their teaching practices and the students' digital learning practices. In particular, the latter were perceived as negative, hasty, and superficial.

4. Results

4.1. "Knowledge" is "competence"

When discussing the European documents that describe the framework of competences with participants, a shared terminological confusion revealed conceptual misinterpretations, and their following concrete applications, of the "new" educational paradigm. For example, competences were described as *"abilities that students use"* or as *"capabilities... or abilities. They are synonyms"*. According to teachers' words, this paradigm based on *"things that students do"* limits the duty of schools to educate a good citizen, by promoting concrete, practical skills to be applied in technical fields of work. One teacher described the situation of his school with the following words: *"In technical schools, studying Latin or Dante's Comedy is not considered as important as doing... gaining technical skills. However, I believe that the mission of the educational system should be to form students as people through humanistic knowledge."* In general, competences were perceived as secondary to knowledge, both in humanistic and scientific areas: *"It does not make any sense to understand what a competence is if we do not know what knowledge is. I say <I know something> and then I apply that knowledge"*.

When applied to the assessment of students' tasks, the descriptive framework of competences was used by many participants as a translation of the numerical evaluations assigned to the tests of knowledge. For example, two teachers described their assessment practices in this way: *"After the assessment work, we translate the mark in competence"*, and *"Once I decide a particular mark, I extrapolate the criteria from it"*. Whether knowledge or technical ability, the assessment process appears the opposite of what it should be.

Last but not least, the framework of competences appeared as *"only theoretical"* and *"not feasible"*. During these 12 years, the framework has been interpreted and promoted in different ways by different research groups and scholars, who usually organise professional training courses on teaching methodologies in Italy. For example, one teacher expressed her disappointment for two different teaching methodologies she is coping with in two training courses she is attending, both grounded on the competences framework. *"I don't know which one is better, I see similarities between them but they do not say precisely <do this, do that>, they only talk about learning design and frameworks."*

4.2. Assessing intuitively

The conceptual confusion described did not generate any change or development in the established assessment practices of teachers. Indeed, when certifying students' competences, teachers assessed mistakes numerically and, if requested, they reflected on their criteria only at a later stage. For example, two teachers working in the scientific area declared: *"We look for mistakes in the procedure, we do not have a framework. Each one of us works as he or she thinks it's best."*; *"For example, I follow criteria I've never written"*. This reveals the lack of any kind of shared assessment rubric, even within the same school. Moreover, it fosters subjectivity and opacity of assessment.

One of the participants declared that in one occasion she tried to apply the European and Italian guidelines: *"When I applied that rubric, the final assessment was more accommodating. Therefore, I continued with my method. I translate everything into numbers, avoiding descriptive evaluation"*.

4.3. Perceived detachment

Throughout the first meeting, a number of criticisms about students' digital practices in social network sites and the Internet emerged, revealing enormous differences between the perspectives of teachers and their students. For example, one participant highlighted the impossibility to foster autonomy in his students: *"If competences involve autonomy and responsibility, they should also say how to do it! It's impossible to foster these important dimensions because young people live with a continuous, incessant control by adults and teachers. They live passively with their phone in the hands. 10 years ago it was easier, but now it's impossible for teens, especially within the Italian context."*

The digital dimension of teens' life emerged as the most influencing factor for the perceived detachment between teachers and students. The former struggle to really know their pupils due to different ways of communicating: *"Sincerely, I don't know if nowadays there are solid values in pupils of 14-15 years old. It's difficult to know, they are always with their phone..."*; *"We can't propose collaborative work with our students, we can barely keep them in class"*; *"There is a huge detachment between us and them, enormous!"*. The latter mainly communicate through multimodal literacies (Jewitt, 2005) in digital social spaces: *"For example, if I write a long message in our Whatsapp group, they don't read it! They need a short text. This habit of communicating through images make you avoid text. However, it's going better with vocal messages, they listen to them"*.

Nevertheless, the attitude of some teachers toward visual literacy and its potential for the participation of dyslexic teens (Vezzoli et al., 2017; Vezzoli, 2017) was extremely negative: *"I see their digital practices as an extreme impoverishment. My pupils would never say <Let's read that book> but <Let's watch the movie>".* Another participant expressed a

strong judgement: *“To me, we are forced to use these technologies, we are obliged to adapt our teaching to the lowness of our students”*. Indeed, the difference was labelled as incompetence: *“They don’t know how to write, how to think. They study superficially and fast because they have to do something else.”*

5. Discussion and conclusion

This paper aimed to explore if and how the framework and guidelines of competences were used by Italian secondary school teachers. Furthermore, our second goal was to identify the perceived strenghts and limits of the educational paradigm of competences.

Results revealed that 12 years after the introduction of the competences framework, the practices of teachers do not reflect the change of paradigm. Indeed, despite all the participants declared that they had attended different training courses involving competences-based learning design, this did not impact their teaching and assessment practices. One of the reasons of this phenomenon was identified in the different perspectives and methodologies promoted by different scholars in their teacher training courses, creating confusion. To the best of our knowledge, this is the first research that investigates this issue in the Italian context. Further studies will examine in depth the causes of the lack of impact of the educational framework in the Italian political and cultural context. In particular, as regards assessment, Nicol and Macfarlane-Dick (2006) pointed out that the practices of assessing intuitively creates opacity in the relationships between teachers and students, and it excludes any possible use of assessment as formative tool.

The relationship between young people and their teachers was perceived as particularly difficult due to the pervasive digital practices of teens in social network sites and the Internet. This emerged as the most influencing factor on the perceived detachment between participants and their students. Indeed, participants struggled to know and work with their students, accusing technology to be the unique responsible of all the difficulties they are experiencing with their pupils. Despite there are evident pros and cons in importing digital practices from informal to formal contexts (Crook, 2012), this stigmatisation created a barrier against the design of a new pedagogy that have the potential to foster participation and learning for young people (Vezzoli et al., 2017). Indeed, factors such as teacher’s self-concept, attitudes, motivation and needs are considered crucial to the integration of technologies in education, together with teachers’ computer self-efficacy (Paraskeva et al., 2008). Further analysis will consider all the data collected during the training course, with the aim to understand in depth the teachers’ attitudes toward digital innovation at school, with a particular focus on the learning opportunities offered by multimodal digital environments.

Contributions of the authors

The first author of the paper wrote the sections 1, 2, 3 and 4. The second author wrote section 5 and provided useful feedbacks to improve the other sections.

References

- Baartman, L. K. J., Bastiaens, T. J., Kirschner, P. A., & Van der Vleuten, C. P. M. (2007). Evaluating assessment quality in competence-based education: A qualitative comparison of two frameworks. *Educational Research Review*, 2, 114-129.
- Braun, V., and Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative research in psychology* 3, 2, 77-101.
- Crook, C. (2012). The 'digital native' in context: tensions associated with importing Web 2.0 practices into the school setting. *Oxford Review of Education* 38, 1, 63-80.
- Everwijn, S. E. M., et al. (1993). Ability- or Competence-Based Education: Bridging the Gap between Knowledge Acquisition and Ability to Apply. *Higher Education* 25, 4, 425-438. *JSTOR*
- Gordon, J., et al. (2009). *Key Competences in Europe: Opening Doors for Lifelong Learners Across the School Curriculum and Teacher Education*. CASE – Center for Social and Economic Research.
- Jewitt, C. (2005). Multimodality. "Reading" and "Writing" for the 21st Century. *Discourse: Studies in the Cultural Politics of Education* 26, 3, 315-331.
- Italian Eurydice Unit (INDIRE). (2014). The Italian Education System. *I quaderni di Eurydice*, 30.
- Lassnigg, L. (2017). Competence-based Education and Educational Effectiveness. In: Mulder M. (eds) *Competence-based Vocational and Professional Education. Technical and Vocational Education and Training: Issues, Concerns and Prospects*, vol 23. Springer.
- Morgan, D.L. (1997). *Focus Group as Qualitative Research* (2nd Ed). Qualitative Research Methods Series. Sage.
- Nicol, D.J., and Macfarlane-Dick, D. (2006). Formative Assessment and Self-Regulated Learning: A model and Seven Principles of Good Feedback Practice. *Studies in Higher Education* 31, 2, 199-2018.
- Paraskeva, F., Bouta, H., Papagianni, A. (2008). Individual Characteristics and Computer Self-Efficacy in Secondary Education Teachers to Integrate Technology in Educational Practice. *Computer and Education* 50, 1084-1091.
- Patton, M. (1990). *Qualitative evaluation and research methods*. Sage.
- Vezzoli, Y., Vasalou, A., Porayska-Pomsta, K. (2017). Dyslexia in SNS: an Exploratory Study to Investigate Expressions of Identity and Multimodal Literacies. *PACMHI* 1, CSCW, Art. 103.
- Vezzoli, Y. (2017). Visual literacy: A Definition Problem. *Formazione & Insegnamento* 15, 2, 211-217.

Wesselink, R., de Jong, C. & Biemans, H.J.A. (2010). Aspects of Competence-Based Education as Footholds to Improve the Connectivity Between Learning in School and in the Workplace. *Vocations and Learning* 3, 19, 19-37.

The Effectiveness of Different Levels of Activation in Higher Education

Figas, Paula ^a; Sailer, Michael ^b; Hagel, Georg ^a; Sailer, Maximilian ^b

^a Faculty of Computer Science, Kempten University of Applied Sciences, Germany

^b Faculty of Psychology and Educational Sciences, LMU Munich, Germany

Abstract

Although there are several empirical studies about active learning in higher education, there are some open research questions. Especially, it appears to be relevant to find out what type of activity (active, interactive and constructive) has a positive effect on the learning result of participants in task-based activities. In order to answer this question an experimental study was conducted with students in German higher education (N=50). The results do not show a significant difference between active, interactive and constructive activities on learning performance in task-based learning. But all groups have benefited from the classroom activities according to the test results.

Keywords: *active learning; task-based learning; higher education; experimental study*

1. Introduction

Active learning has received a great deal of attention in higher education (e.g. Wanner 2015; Virtanen, Niemi and Nevgi 2017). This article deals with this approach and presents an experimental study about the role of different types of activation. The first part gives a brief overview of previous research findings on the topic of active learning in higher education. The second part is about the effectiveness of different levels of activation by looking at the results of an experimental examination. The last part summarizes the key findings and outlines future research needs.

2. Active Learning in Higher Education

The question of the effectiveness of active learning begins with the approach's fundamental ideas. Prince (2004) defines it as any instructional approach that engages students in learning, for example *collaborative learning*, *cooperative learning* or *problem-based learning*. According to Freeman et al. (2014) "active learning engages students in the process of learning through activities and/or discussions in class, as opposed to passively listening to an expert". Watkins, Carnell and Lodge (2007) stated that active learning includes three dimensions of learning: behavioral, cognitive and social. Although it remains challenging to study the impact of active learning (Prince 2004), studies show that it does positively impact students' learning (e.g. Hyun, Ediger and Lee 2017; Prince 2004). There are several ways of active learning; one possibility is to stimulate students with tasks-based activities (Wiggins et al. 2017). *Task-based learning* in foreign language learning shows for example how tasks can serve as an instrument to enable communicative interactions (Ellis 2009). Michelene Chi separates active learning into three types: active, constructive and interactive (Chi 2009; Chi and Wylie 2014). Being *active* simply means "doing something physically" (Chi 2009, p.77), for example through repeating or rehearsing. *Constructive* behaviors can be described as those in which students "produce additional externalized outputs or products beyond what was provided in the learning materials" (Chi and Wylie 2014, p.221), for example through generating hypotheses or reflecting out-loud. Finally, being *interactive* means dialoguing and creating processes, for example through "defending and arguing a position in dyads or small group[s]" (Chi and Wylie 2014, p.221). According to Chi, interactive activities are collaborative, creating processes in which all students' contributions are taken into consideration. Chi examined and interpreted experimental studies conducted within the science of learning to find out whether her conceptual division could be identified in practice. She concluded that interactive activities are generally more effective than constructive activities which, in turn, are better than active activities. All three types of activities support learning better than passive methods (Chi 2009; Chi and Wylie 2014). Chi reduces the relationship between the activities in the ICAP hypothesis:

“*interactive > constructive > active > passive*” (Chi 2009). In summary, it can be stated that the degree of participation evoked by the activities can turn out to be very different. Active learning is an umbrella term which implies different versions of cognitive processing and visible behavioral expressions. It should be critically noted that it cannot be assumed that all students always display an identical degree of activity. An educator’s intention of initiating active, constructive or interactive activities will not necessarily result in the corresponding activity that all learners engage in. Students in an interactive setting can still be passive by not engaging in the intended activities.

3. Experimental study

Research shows that active learning does positively impact students’ learning (e.g. Hyun, Ediger and Lee 2017; Prince 2004). However, the role of different types of activation in the same task-based learning situation has barely been investigated so far. This leads to the following research question: what type of activation has a positive effect on the learning result of students with task-based activities? A pilot study with an experimental design was conducted to answer this research question. The study aims to examine parts of the ICAP hypothesis in more detail. It shall be examined to what extent the use of activities creates more efficient joint learning time and to what extent this can be recognized in the learning result. In particular, it will be examined what effects specific variations of the type of activation for performing instructional tasks have on the participants’ learning results.

3.1. Research design

For the empirical experimental study, a pre-post control group design was chosen with the dependent variable (DV) “learning success”. The learning success, operationalized in 20 questions of a declarative knowledge test, was measured immediately before (pre-test) and after completion of the learning unit (post-test). A pre-post control group design establishes before and after value which achieved by an experimental group in the examination. Since the control group does not run through the treatment, both inter-individual (between the groups) and intra-individual (within the experimental group) differences can be ascribed to the treatment, insofar as all possible confounding variables have been isolated.

Table 1: Research design

Pre-Test	⇒	<ul style="list-style-type: none"> • Experimental group: interactive activity • Control group 1: constructive activity • Control group 2: active activity 	⇒	Post-Test
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The major advantage of this design is that differences in the research results of pre- and post-tests can be explained by the intervention. A disadvantage that must be acknowledged is that the recognizable differences can perhaps be ascribed to the pre-test. Different treatment conditions are created for the independent variable (IV). The independent variable “type of activation” is three-tiered. Through a simple randomization, the participants are allocated to the various conditions. During the learning unit, a complex learning task is given to the students. The tiers of the independent variable differentiate between an experimental group which receives the treatment, a control group 1, and a control group 2. The groups vary in the degree of activity (interactive, constructive, and active) while solving the same application tasks during the learning unit. To ensure comparability, the lecturer is given a detailed introduction to the instructional procedure. Aside from the defined behaviors, it was necessary for the lecturer to possess well-founded professional competence. An overview of the research design is shown in table 1.

- The conditions in the *experimental group* aim to approximate the idea of “interactive activity”. That means, during the performance of the task the focus lies on group work and dialoguing. The lecturer assumes a very active role, gives specific instructions, and encourages students to discuss with each other and to integrate separate contributions in the task process.
- The conditions of *control group 1* aim to simulate the idea of “constructive activity”. The lecturer encourages students to “contain new content-relevant ideas that go beyond the information given” (Chi 2009, p. 78): The lecturer instructs the participants to individually solve the tasks. In contrast to the experimental group, he acts more passively and does not stimulate discussions. Besides, he does not proactively monitor the processes, but instead lets the students determine the procedure themselves.
- The *control group 2* simulates the idea of “active activity” according to Chi. The lecturer only introduces the learning tasks to the students, but neither engages any discussion nor supports group work. Students can solve the task by using existing learning materials. The lecturer at no time functions as a point of contact during the attendance time, but instead leaves the students to work through the problems independently.

Following this joint learning time, the declarative knowledge test consisting of 20 questions is taken again as post-test. The internal consistency of the test (pre and post), calculated via the Kuder-Richardson Formula, which is used for dichotomous items, shows a value of $KR-20 = 0.70$ for the pre-test and a value of $KR-20 = 0.75$ for the post-test. Based on the results, a satisfactory internal consistency can be assumed.

3.2. Results

In total, 50 bachelor students studying Educational Science in a German University took part in the study, divided into the experimental group (n=19), control group 1 (n=14), and control group 2 (n=17). 96% of the students are female and only 4% male, which can be ascribed to the gender-related composition of the degree. In order to answer the research question, an ANCOVA was conducted in SPSS with the three-tiered group variable “type of activation” with the manifestations experimental group (interactive activity), control group 1 (constructive activity), and control group 2 (active activity) as a fixed factor and the variable “knowledge test result” (post) as the dependent variable. Since the same knowledge test was already used as the pre-test before the intervention, the variable “test result” (pre) is used as a control variable and integrated into the model as a covariate. With this analysis, the results of the post-test are examined to determine whether differences between the three groups are recognizable, whereby the results of the pre-test are controlled (Field 2009). No predominant role is attributed to measuring the growth or changes. By controlling for the covariate alone aims, to determine the “pure” effect of the treatment on the post-test results, and also, to partial out the effect of the pre-test. By applying an analysis of covariance, the influence exerted by the control variable on the dependent variable is neutralized (Bortz 2005). This is related to the structure of the method, since the analysis of covariance combines ANOVA and regression models. The regression model calculates the partial influence of the control variable on the dependent variable. Therefore the within-group error variance will be reduced (Bortz 2005; Field 2009). The requirements for conducting an ANCOVA were met. From the descriptive results (see table 2), it becomes clear that the experimental group shows the highest (M= 12.68, SD= 4.08) and control group 2 the lowest mean value (M=8.59, SD=4.29). The difference between the experimental group (interactive activity) and control group 1 (active activity) is very small ($\Delta = 0.97$).

Table 2: Mean values and SD post-test

Groups	M	SD	N
Experimental group	12.68	4.08	19
Control group 1	11.71	3.69	14
Control group 2	8.59	4.29	17
Total	11.02	4.36	50

It shows that the covariate has a significant influence on the variable “test result post-test” ($F(1,46) = 37.41, p < 0.05, r = 0.67$). The effect size r is won from the t -value of the parameter estimation (Rosnow and Rosenthal 2005). In contrast, no significant group differences of the variable “type of activation” could be observed regarding the learning

result of the post-test ($F(2, 46) = 0.42, p > 0.05; \text{partial } \eta^2 = .02$). The results exemplify that a high proportion of variance of the knowledge test (post) can be explained through the pre-test ($\text{partial } \eta^2 = .45$). The differing test results (post) cannot be explained by the variation of type of activation. Although the experimental group achieved the best results on average in the knowledge test, this is not proven to be significant. Nonetheless, the result is not proof that the type of activity within the framework of the attendance phase is unimportant. What is noticeable is that all groups improve compared to the first measurement (pre). The experimental group was able to increase its result by an average of 1.94 points. Control group 1 also achieved an increase by 1.78 points compared to the pre-test, as did control group 2, improving its pre-test results by 1.88 points. Even though these improvements are not significant, they do attest to a supportive learning effect in application-oriented tasks which consolidate the subject matter and enable a new way of accessing the subject. It should also be taken into consideration that both tests examined declarative knowledge, while the attendance phase aimed for application and consolidation of knowledge. It can be assumed that the participants developed a much more in-depth understanding of the subject than depicted by the knowledge test.

4. Conclusion

The results of the study show that all groups – interactive, constructive and active – were able to register a knowledge growth after the active learning unit, but that the differences between the groups were not significant. Obviously, active learning involved practicing together undeniably leads to an increase in knowledge. The “how” of practicing does not seem to be crucial. This supports the assumption that not only the degree of activation during a learning unit is important for students’ learning success, as the literature frequently postulates (Bishoph and Verleger 2013), but that other factors, such as didactically meaningful assignments, also play a key role. Besides, it should be pointed out that the study only measured declarative knowledge. In this respect, it would be interesting to conduct another study which observes procedural knowledge components in a targeted way and to follow the question of how these can be developed through the design of the attendance phase. The non-significant difference between the groups could, however, also be attributed to the experimental arrangement. The relationship between study power and the veracity of the resulting finding should be shortly addressed. The finding of non-significant results may be caused by the small sample size and therefore low statistical power. Nonetheless, the results of the study offer many follow-up possibilities for further studies. Additional research needs also exist for larger studies that include more participants and span a longer period of time.

References

- Bishop, J.L. & Verleger, M.A. (2013). The flipped classroom: A survey of research. In American Society for Engineering Education (ed.), 12th Annual Conference & Exposition. Atlanta.
- Bortz, J. (2005). Statistik für Human- und Sozialwissenschaftler. Berlin et. al: Springer.
- Chi, M.T. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science*, 1, 73–105.
- Chi, M.T., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49(4), 219–243.
- Ellis, R. (2009). Task-based language teaching: Sorting out the misunderstandings. In: *International Journal of Applied Linguistics*, 19(3), 221–246.
- Field, A. (2009). *Discovering statistics using SPSS*. London: Sage.
- Freeman, S., Eddy, S.L., McDonough, M., Smith, M.K., Okoroafor, N., Jordt, H., & Wenderoth, M.P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences USA*, 111(23), 8410–8415.
- Hyun, J.; Ediger, R., & Lee, D. (2017). Students' satisfaction on their learning process in active learning and traditional classrooms. *International Journal of Teaching and Learning in Higher Education*, 29(1), 108–118.
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93(3), 223–231.
- Rosnow, R.L., & Rosenthal, R. (2005). *Beginning behavioral research: A conceptual primer*. Englewood Cliffs, NJ: Pearson/Prentice Hall.
- Virtanen, P.; Niemi, H.M. & Nevgi, A. (2017). Active learning and self-regulation enhance student teachers' professional competences. *Australian Journal of Teacher Education*, 42(12), 1–20.
- Wanner, T. (2015). Enhancing student engagement and active learning through Just-in-time teaching and the use of PowerPoint. *International Journal of Teaching and Learning in Higher Education*, 27(1), 154–163.
- Watkins, C., Carnell, E., & Lodge, C. (2007). *Effective learning in classrooms*. London: Sage.
- Wiggins, B.L., Eddy, S. L., Grundspan, D.Z., & Crowe, A.J. (2017). The ICAP active learning framework predicts the learning gains observed in intensely active classroom experiences. *American Educational Research Association Open*, 3(2), 1–14.

Vegetable gardens for educational purposes: a specific toolkit for didactic contexts

Mastrantoni, Claudia and Mazzarello, Martina

Design Department, Politecnico di Milano, Italy.

Abstract

The paper reports on how urban and community vegetable gardens are a increasing phenomenon with the ability to address a strong community capacity.s (Shanghai, Ljubljana, Milan) have allowed the authors to understand a need for multifunctional spaces, where the citizens of these spatial realities are oriented towards the virtuality of relational behaviors.

One of the main research objectives is to let the people, even non-designers, to define the spaces, functions and ways of use of these gardens. Through co-design sessions with different communities related to specific schools, the design output aims at the creation of a multifunctional space, where people, time and the interaction between them become regulators and generators of the space itself.

The expected result is a set of guidelines tools able to deal with the creation of vegetable gardens by defining the layouts, the functions and the experiences.

Keywords: *Social innovation; Urban Agriculture; Service Design; Spatial Design; Co-design; Education.*

1. Introduction

Current literature reveals how urban and community vegetable gardens are an increasing phenomenon with the ability to address a strong community capacity. Community gardening fosters neighborhood ownership and civil pride which in turn build a constituent base for a policy agenda (Twiss et al., 2011).

Urban vegetable gardens can be even more than just community garden, they can be Shared Gardens, Guerrilla gardens, or can provide a more specific service for a given community, like gardens for a enterprise or for school, with a didactical purpose. They are not only “food, community and culture makers”, but they are able to produce hope, like an opportunity for the collective imaginary (Hou et al., 2009). This paper will focus on the increase of socialization and co-creation, with a specific didactical role. It aims to investigate how school, university and campus internal spaces and surrounding areas can become incubators of social practices. Urban community schools gardens can be considered the physical connection and filter between the local context and the environment through different lines of aggregations. One this can be identified by the “learning by doing” method in order to stimulate, with specific tools, the creativity as a strategy for social innovation (Schank et al., 1999).

Nowadays community gardens are no longer considered as marginal or only related to peripheral areas (Union, 2010) and finding new ways of meeting social needs that are not properly met by the public sector is one of the final goals. They play a role of social integration, a new path to simultaneously meet social needs and create social collaboration. (Murray et al., 2010). Urban agriculture could become a sharing system to increase aggregation, and developing relationships in the surrounding context, even those without a direct link i.e. schools environments. The expected results are a collection of guidelines tools to create community gardens such as learning environments with spatial and service approaches.

2. Citizens as designers of their needs

Design methods as a tool applied in new fields, such as an impactful social innovation tool aimed at developing new solutions to response to the social needs. Different initiatives can be impactful demonstration of social innovation such as visualizing or prototyping using co-creation methods too. In the contemporary city, we tried a convergence of tensions and expectations practices and attitudes, a new horizon of values. An evolving movement is bringing people to live “individually together” (Bauman, 2002).

We live in a hyper-connected world, were creativity happen in practices fields of designing teams and human interaction (Christensen, 2013). The idea of creative class, were service

designers belongs, means to be in the heart of new products, new processes and social structure (Kuosa & Westerlund, 2012).

Starting with the creation of new opportunities and participatory spaces, creating everyday things, developing cohabited spaces where there was almost nothing, generating new spaces defined by conviviality (Illich & Lang, 1973) in the system of relations generated.

The community garden in this sense is turning into an impactful resource, a powerful touchpoint, a sharing circle and the actors that live these realities are multiple-identities, fragile in real relationships and in some personal relationship behaviors, tending more and more towards the virtual realm while also being co-operative and participatory (Lega & Piccinno, 2012).

A new landscape, “theatres of strong dynamics” (Gilles, 2004), is emerging from the margins and interstitial parts of towns and cities, from “in between” spaces where conditions of diversity take place. Collaboration and collaborative communities are at the base, and have the foundations in actors and users that share same needs and interests. Inventors of a “local discontinuity” who, acting in this critical technological condition, find the way to be able to create a more sustainable and self-sufficient process.

Environmental design, and in particular the design of communal spaces, needs a strong user and use definition with a powerful multifunctional aspect, where building relationships need to be defined, transforming and producing energy of intangible aspects that change over time. (Branzi, 2006)

People are observers of details, starting from the smallest things, generating a mechanism of understanding of everyday life; the ability to transform everyday objects into something that generate and provide pleasure and satisfaction. In this sense, everyone could become a designer, with the combination of good observation skills and good design principles, in order to design our lives, our rooms and the way we do things (Norman, 2016). The designer and researcher can ultimately be considered as the same figure. But the designer, at the same time, still plays his critical role in giving form to the ideas (Visser et al., 2005). In addition, the tension between the consumer and designer when working together on a project, is the influence of a professional designer on a design, versus to the consumer's influence (Fisher et. al, 2002).

Trying to identify design behavior in subjects that can be considered both as consumers and designers, is mentioned the emergence of adaptive design, in which the user could scale his involvement with a product from passive consumption to expert adapting (Hermans & Valtonen, 2014).

Finally, we can talk about “communities of practice”, when a group of people starts to sharing the interest in what they usually like to do and want to learn (Lave & Wenger,

1998). The stakeholders of a community garden want to share experiences, stories, resources, skills, etc. This sharing process can generate a self-sustainable system, self-coordinated, and self-aware, with the improvement of daily life, starting from its own actors.

3. The process of sensitization and coordination of user's needs, a meta-design approach

Cultivating the garden at school is an interdisciplinary activity adaptable to every age, an opportunity for growth in which the division between teacher and student is overcome and new knowledge is learned by sharing gestures, choices and notions, as well as method.

The goal is to make the gardens, educational tools able to take root permanently in the school program, powerful experiences that aim at the redevelopment of the courtyards and gardens of the schools making them fully accessible to young people, promoting food education as knowledge of the process that leads from the land to the table; involving in a participated way the communities around the school, in the planning and management of the gardens trying to develop in the students scientific knowledge and civic sense, through the care of a common good. A multicultural integration among students also promoted in the convivial spaces around the vegetable garden, adding public space to organize more curricular activities or a better free time.

Here, the need of a space without a rigid and defined function, but a multifunctional space, where people, time and relationships between them become regulators and generators of the space itself.

Giving a fundamental role to the communities' needs, a user centred approach with some rapid prototyping experiences is the starting point of the design process as a tool of social innovation (Murray et al., 2010).

A number of failed projects related to communities of people working together, have also stressed designers motivating them need to develop new approaches to be able to contribute in this perspective (Mulgan et al., 2007). New ways to establish and set awareness and coordination.

In this context designers could become supporters and mediators in order to give input that will become new visions and expectations for the users involved, they become generators of dialogues and facilitator of interactions (Sanders et al., 2010).

In the sense proposed by Gobo (2008), a participant observation through interviews, focus groups, ethnographic observations and various other tools designed on purpose like, for instance, a toolkit for these kind of spaces, are able to:

- *generate a direct relationship between the “social actors” and the researchers*
- *have a contact with their natural environment, with the purpose of observing and describing their behaviors*
- *learning their habits, fluxes and interactions in order to understand the meaning of their actions and to adapt their needs in a spatial context.*

A meta-design approach has been used to approach the design of a didactic garden, creating a chart of the main elements. The chart helps to simplify the choice and visualize new or existing solutions and components in defining a spatial layout and in creating an efficient vegetable garden. As a set of tools, it wants to make it easier the adaptation of the format into several contexts.

It's a matrix of elements with some variables on the budget, time, space and the specific maintenance required, in this way students, teachers and staff of the context can choose the different elements of a community garden and module them in a layout, trying to set up a system of an integrated and flexible green area.

The flexibility is a common value during the prototyping of the community garden, allow for a wide range of use, limited only by our students' or users imagination.

A flexibility that is defined as the ability to be easily reconfigured to suit the needs of all the students using the space for a variety of activities.

To support pedagogical innovation, with a shift toward an active learning model, the flexibility is also the capability to include the green area as an informal learning space, in order to introduce new transversal and disciplinary skills that can make the time spent in a school environment useful and profitable.

To better understand this variability related to a specific context and the specific communities' needs, a spatial survey has been conducted visiting and listing some best practices in different parts of the world (Milan, Shanghai and Ljubljana). A research to highlight that every space has a specific identity, and inside the space there are features tied to the community for which it is designed for. This survey is a process that lasted months, to get closer to places, to local cultures and specific issues. The survey conducted on sixteen practices in the three different contexts were divided into five areas of expertise depending on their functional purpose: Corporate gardens, Educational gardens (tied to a school space, the object of this paper), Connection gardens (with a social function), Commercial gardens (depending on a commercial activity) and Picking gardens (with the food as primary objective).

By comparing elements and functions in these categories, the surveyors found that the cultivated area and the convivial area do not have a constant percentage, but vary in each typology in relationship with the activities to carry on in the space.

The comparison between the percentage of each part has been useful to build the design model to follow.

According to the survey, didactic gardens have the percentage of the agricultural activities similar to the one of convivial gardens. The garden could be a new space for relationships, with a multi-functionality quality characterizing all the functions it's designed for.

The area of cohabitation and the cultivation space often co-exist, as can be seen in the diagram of the percentages here below. In terms of spatial function the area of yellow color, which indicates the space dedicated to the convivial function overlaps the green area, which indicates the area dedicated to the cultivation. The blue area indicates paths, usability spaces, with a connective function between the other two areas, generating precise flows. Paths also play an important role during the didactic activity: the learning groups, composed of at least 2/3 students, need a fluid mobility during the lectures and workshops. The learning space often changes, rotates, generates multi-functionality, in this way workshop area often coincides with the cultivation one and sometimes with the convivial one, as the area initially destined to other recreational activities. Therefore, classrooms can be considered the spaces where the scientific-investigative phase and the interactive phase co-exist and where through extracurricular activities we reach a play-practice phase, with recreational performances such as exhibitions, concerts, film and documentary projections.

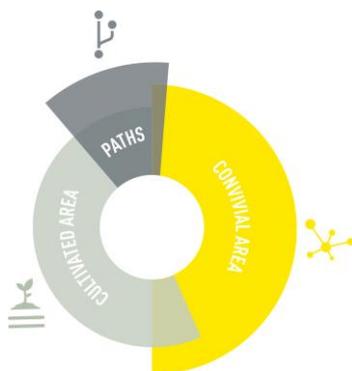


Figure 1. Diagram about percentages of convivial, cultivated and paths in a didactic garden.

This is a definition between the parties not based on an a priori delimitation of some hypothetical values for the user. Do not represent rigid parameters, but malleable in respect to the community addressed for the project. Here are some examples of parameters for defining the values for the company: adults, workers and local communities, the initial financial contribution, multiculturalism, coexistence of different needs, curiosity to experiment new activities, the creation of a connection between people involved.

3.1 A vegetable as an educational tool: how to design it for a didactic context

When applying design to the context of social innovation, there are some strengths to take into account, there is a need to simplify the process and could be a fundamental reason to help people who are not designers to guideline their needs (Mulgan, 2010).

This research conducted has shown, how on the basis of this new systemic space is a strong integration between cultivated space and convivial space. The participatory activities, in this way, are linked to the green space itself in an active way, both connected and established in the space, without a direct contact with the agriculture activities.

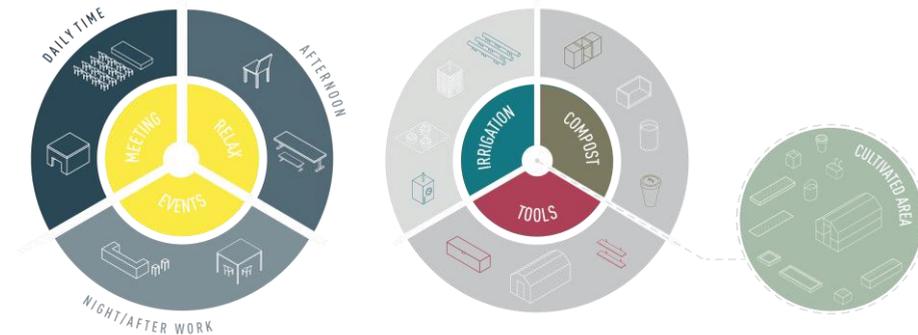


Figure 2. Convivial function and cultivated area diagram.

As illustrated in the diagram here above, a concept of hybridization is applied to the definition of convivial areas, which become more and more open and adapted to the users' need. Here, an example of a timeline and related activities:

- *Meeting* refers to the time during the workday that is tied to specific aggregational activities. They include lectures, workshops, green classes and team-based learning in a pleasant environment.
- *Relax time*, provides a short break and a lunch break, it's when space becomes part of a moment of connection between colleagues.
- *Events*, during the evening hours, are more focused on events or parties, such as concerts, "eve parties" or fitness activities in general, but also team building activities.

The cultivated area has been defined as part of a sustainable health strategy, a natural space that is anti-stress and can improve the welfare of students in a fun and healthy way.

The elements are not diversified depending on the target, but the toolkit provides a recommendation on some items related to a variable of the space (as opening and closing time, number of people..), that can condition the management of space and favor some elements over others.

“experts of their experiences” (Visser et al., 2005).

Aiming at a systemic and integrated space with a cultivated and convivial area together, the expected results are a greater diffusion of the proposed methodology for an increase of the number of shared gardens in the urban context.

References

- Bauman, Z. (2002). Foreword: Individually Together, in U. Beck & E. Beck-Gernsheim (eds), *Individualization*. London: Sage
- Burns, C., Cottam, H., Vanstone, C., & Winhall, J. (2006). Red Paper 02. Transformation design. Design Council. Retrieved from <https://www.designcouncil.org.uk/sites/default/files/asset/document/red-paper-transformation-design.pdf>.
- Christensen, C. (2013). The innovator's dilemma: when new technologies cause great firms to fail. Harvard Business Review Press.
- De Certau, M. (2001). Relatos de espacios. Spatial stories. *Quaderns D'arquitectura I Urbanisme*, (228), 6–7.
- Foucault, M. (1994). *Eterotopia: luoghi e non-luoghi metropolitani* (Vol. 2). Mimesis.
- Gilles, C. (2004). *Manifeste du tiers paysage*. Paris, Éditions Sujet/Objet.
- Gobo G. (2008). *Doing Ethnography*, SAGE Publications Ltd, London.
- Guseynova, N. (2013). Emotions in design process. How to find an emotional touchpoint with the user (pp. 77–82). Presented at the ServDes. 2012 Conference Proceedings Co-Creating Services; The 3rd Service Design and Service Innovation Conference; 8-10 February; Espoo; Finland, Linköping University Electronic Press.
- Hou, J., et al. (2009). *Greening cities, growing communities*. Seattle: Landscape Architecture Foundation in association with University of Washington
- Illich, I., & Lang, A. (1973). *Tools for conviviality*.
- Kuosa, T. & Westerlund, L. (2012). *Service design: on the evolution of design expertise*.
- Lave, J., & Wenger, E. (1998). *Communities of practice*. Retrieved June, 9, 2008.
- Lega, E., & Piccinno, G. (2012). *Spatial design for in-between urban spaces*. (first edition). Milano: Maggioli Editore.
- Manzini, E. (2015). *Design, when everybody designs: An introduction to design for social innovation*. (R. Coad, Trans.) London: MIT Press.
- Mulgan, et al. (2007). *Social innovation: what it is, why it matters and how it can be accelerated*. The Basingstoke Press. Retrieved from <http://eureka.sbs.ox.ac.uk/761/>
- Murray, et al. (2010). *The open book of social innovation* (p. 2). London: National endowment for science, technology and the art.
- Norman, D. (2016). *The design of everyday things*. Verlag Franz Vahlen GmbH.
- Schank, R. C., et al. (1999). Learning by doing. *Instructional-design theories and models: A new paradigm of instructional theory*, 2, 161-181.

Twiss, J. et al. (2011). Community gardens: lessons learned from California healthy cities and communities. *American journal of public health*.

Union, I. (2010). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions-Europe 2020 Flagship Initiative, Innovation union.

Critting the Crit: New pedagogy in architectural education

Flynn, Patrick

DIT School of Architecture, Ireland

Abstract

This paper critically examines the role of the standard method of assessment for architectural students internationally, known as the 'crit'. It examines the pedagogical theory underlying this approach whereby students pin up their work and make a presentation on it, and receive verbal feedback on it, in front of a room of their peers and academic staff. Recent critiques of this hundred-year old approach are also discussed, and the reality of the 'crit' is examined through analysis of practice. This leads into a discussion of a semester-long piece of action research in this academic year in which academic staff have piloted new methods of formative and summative student-centred assessment without a 'crit'. Feedback from students and academic staff has been extremely positive, and is discussed along with the lessons learned from this pilot semester. The next steps in this ongoing piece of action research are also briefly outlined.

Keywords: *Pedagogy, architectural education, action research, student-centred learning.*

1. Introduction

The ‘crit’, short for ‘criticism’, is an assessment practice central to the education of the architect, internationally. It has its roots in Piaget’s ‘constructivism framework’. It aims to place the student at the centre of the learning experience and allow them to develop critical thinking and creative skills through learning-by-doing. The ‘crit’ aims to foster a culture of learning and reflective practice as described by Schon (1983), so the student gains agency over their education. I have re-examined several assumptions about this method of education, and through action research outline how a more reflective, student-centred, intrinsically motivated education is possible.

2. What is the ‘crit’?

The ‘crit’ system began in the 19th Century Beaux-Arts where the ‘Learning by Doing’ model led to juries of tutors assessing students’ work behind closed doors, this ‘closed jury’ system (Anthony 1991) becoming an ‘open jury’ in the 20th century, where tutors commented on work in front of students, so that all could learn together. *‘Crits are an opportunity for the student to present the process and solution to a design problem. The crit should be .. providing the student with encouragement as well as stimulus to continue exploration..’* (Anthony 1991). Schon (1980) argues that conversation about architecture – the ‘crit’ - is the essence of the design education process. In the ‘crit’ the student presents their work in a public setting with the work reviewed by a panel of up to six ‘experts’, normally internal and visiting external academic staff, and/or practicing architects. In this format all students hear feedback on each student’s project, in order to learn about their own work. Schon sees the ‘crit’ as an equal debate between student and tutor, or an exchange of learned opinions rather than delivery of facts.



Figure 1: A ‘crit’ in practice

3. What is happening in practice?

Reyner Banham's essay, *A Black Box: The Secret Profession of Architecture* (1996) compares this teaching method to a tribal long house, and argues that in practice the ideal of inclusion into a new society of equal learning is replaced with enforcing a code of conduct, establishing attitudes and values that are then played out in the profession. Students absorb aesthetic, motivational, and ethical practices as well as language and even dress (Dutton 1991) - broadly speaking what Bourdieu (1990) refers to as *habitus* i.e. embodied manners of seeing, acting and thinking.

Stevens (1998) expands on the roles that tutors and students act out. Students may regard the tutor's approval as indicative of approval by other powerful groups in society on which they are dependent for status and earning capacity. The student sees the tutor's approval as a sign of progression and guarantee of future success – reifying the tutor's opinions.

This is far from the ideal of the student being at the centre of a shared learning experience. It places the tutor as the person who knows 'the' correct solution to every difficulty in the 'crit' process with the student seen to endorse 'acceptable knowledge' (Dutton 1991). Often students only show up for the discussion of their own project and do not hear or see anyone else's work being discussed. The 'crit' moves motivation from intrinsic (coming from the student) to extrinsic (delivered by the tutor - Hennessey 2010). Student-centered learning clearly does not happen when the student sees the tutor/student relationship as that of master/apprentice. Dutton (1991) proposed that true dialogue requires equal participants – a situation that does not exist in the 'crit' power structure. Farrell (2014) correctly identifies this as one of the issues at the core of architectural education, in that this master/apprentice model informed the origins of schools of architecture. It is thus not surprising that these origins continue to reverberate in education today.

4. So what can we do to address this?

The Farrell (2014) report on the future of education in schools of architecture describes how we are now in an era of vast layers of information: construction, materials, specification, performance, energy efficiencies, behavioural data, cost of construction and energy performance in the future. Access to information is no longer a problem for students, the challenge is critical judgement or the need for '*Strong Doubt*' (Till 2005). This requires academics to provide students with opportunities for ethical and critical reflection and practice. This challenges students to progress to a deeper level of learning so that they do not become 'traditional experts' but rather 'expert learners'. A range of authors have advocated the use of collaborative learning and communities of practice to support

deeper learning, including tutors, students, and external partners (Lave and Wegner 1991; Hunter 2012; Buchanan 2012). But the ‘crit’, it appears, is not the best way to support this.

If the crit is no longer fit for purpose, any new system of assessment and feedback needs to establish clear criteria for success. Based on Anthony’s *Design Juries on Trial* (1991) and Mc.Carthy’s *Redesigning the Crit* (2011) I developed the aims in the table below.

FEEDBACK TYPES IN TERMS OF AIMS	Crit	Round Table	Written	Pin up	End Review
Sharing the power-base more equitably					
Being more time efficient					
Greater variety of feedback					
Reducing stress to promote productivity					
Involving active-learning techniques					
Feedback which prepares students for profession					
Peer review and engagement					

Figure 2: Identification of aims of traditional crit system and possible alternatives (After Mc. Carthy 2011)

5. Piloting an alternative approach to assessment – action research.

By re-examining teaching methods and assessment I propose that we can change the power balance to a more student-centred inclusive approach. In 2017/18 I proposed a pilot model, delivered in collaboration with colleagues, where third year architecture students in Dublin Institute of Technology were taught and assessed for a full year without a traditional ‘crit’. By trialling new formats we encouraged the students to discuss each others’ work on a more equal footing with tutors, and understand how the collective can work in a creative manner. The new model has four distinct stages designed to support the student through the design process, based on McCarthy (2011), Sara and Parnell (2000) and Anthony (1991)’s goals of specific tailored feedback at each learning stage.

1) Round Table Review: For the first stage using the Harkness (Barton 2016) method the tutors sat alongside the students in groups of six to discuss and, crucially, draw different approaches to designing their scheme. The emphasis was on the group’s collective knowledge, so students and staff drew and spoke as equals in the learning process, with a direction for the design emerging from an exchange of opinions. This co-creation of knowledge involved an often messy process, with opposing opinions being expressed not only among students but also amongst the staff themselves. The discussion of the student’s work was the learning tool for the whole group and the design process itself was explored. Drawing as feedback is endorsed by Eggink (1991) as the most immediate and understood form of feedback, as he argues it is a universal language.



Figure 3: Stage 1: Tutors drawing alongside students in small groups

2) **Submission: Closed Juries & Open Feedback.** The second stage used feedback as a reflective tool. Cameron (2014) refers to the value of written feedback as a means of providing a more in depth assessment of the students work and the need for staff to give time to work to review, reflect and then offer opinion as part of an equal dialogue. Students were given a deadline to submit work, which was subsequently reviewed by tutors in teams of pairs, both marking and providing written feedback at this interim stage. Marks and written feedback were issued to students, who were asked to reflect on the feedback, and then meet individually with tutors to discuss the feedback and the work submitted. Students were encouraged to ask questions. This meant students and staff could review the feedback in a less pressurised situation than a traditional crit (Cameron 2014, Anthony 1991).



Figure 4: Stage 2: Tutors viewing work and agreeing feedback in pairs.

3) **Review of work in groups:** In the third stage students pinned up their work, including drawn examples of relevant typologies and ideas for how the project could progress, and described and discussed it in small groups of eight. This was to establish a community of learning, where students and staff support each other through the learning process (Lave and Wegner 1991; Hunter 2012). Staff and students first described the work, then the presenting student discussed their intentions. The crit is reimagined as a discussion between all the staff, the students and the person whose work is being discussed, reducing asymmetrical relations of power (Dutton 1991). The student does not stand in front of the work but views it alongside staff and other students to give a literal distance from it, reducing the spatialised imbalance of power (Foucault 1980; Anthony 1991).

4) Selection of Final Work for Discussion: The fourth and final stage is assessment of completed project work. Based on Cameron (2014) & Parnell and Sara (2000) approach



Figure 5: Stage 4: Exhibition of work to class, marking by tutors, discussion of 6 projects.

students and staff viewed an exhibition of all the students' work (unlike in a crit where each student's work is pinned up and then taken down in turn) and were invited to place one red dot on the scheme that they most wished to hear discussed. Cameron (2014) describe this as student-led discussions, arguing that selecting a number of works to review is more likely to support student learning, as it focuses on learning outcomes and problems encountered by the class rather than on one person's work. Tutors marked submissions in pairs. The next day the six schemes with the most red dots were discussed with the whole class. Students were advised that the presented work had to speak for itself as they were not allowed to contribute to the discussion of their own work, but all the other staff and the students could comment. The emphasis was on a celebration of the completed project with a conversation involving all the students on what was learned. Students received marks and written feedback later that day.

6. Evaluating the pilot model

This new model has just been piloted for less than one year, so is in its infancy. Students completed an anonymous evaluation of the process. The main benefits they identified were:

Clarity of feedback: *'Constantly know where we stand.'* *'Assessment was made clear, feedback sheets were incredibly helpful.'* *'I think the feedback is also clearer.'*

Stress reduction and productivity: *'Not having to stress about pin-ups and instead using the time to actually do the work.'* *'It is more of a conversation... I have discussed this with many people in the class and we all agree this is helping us work continually but in a less stressful way...'* *'Less draining than a crit.'*

Peer learning: *'Seeing other students working process and how their schemes are progressing.'* *'Like a conversation.'* *'It's less stressful and less formal and having other students critique can give a completely different perspective and the whole thing becomes a proper discussion rather than a presentation.'*

Changing the Power Imbalance: *‘The simple positioning, seated around a table of work, is something I find makes me less nervous and equal or level with a tutor.’ ‘The discussion between students and teachers was good and very engaging, because generally, in crits, you don’t interrupt.’*

4 out of 60 students gave negative feedback: *‘I prefer the pin up crit.’ ‘The new round table format was sometimes daunting.’ ‘It takes some getting used to, to allow the drawings to describe the concept alone.’*

A comparison of the last three years of student surveys shows significant change in Feedback and Assessment, which is evidence of the impact of the new model.

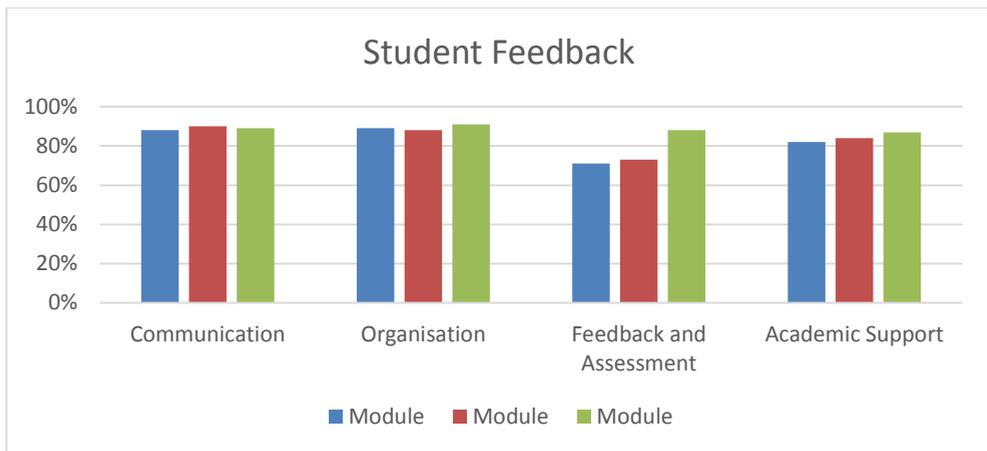


Figure 6: Student Survey Results for last three years

Staff and external reviewers believe that the new system has allowed them to rethink the design education process. Stages one and two in particular have been very successful in producing a higher standard of work and a more inclusive atmosphere in the studio. *‘The students were more engaged with the process and there was a good discussion’; I do like the round table review system and was particularly impressed by [students’] willingness to offer constructive feedback on each other’s work. Good to see that level of student engagement.’* One negative comment was that it was *‘Sometimes hard to get a sense of all the students work’.*

The third stage was possibly the least successful in that students and staff seemed to move into a more familiar ‘crit’ mode where tutors gave instruction and students listened. This could be because the space and pinning up of work resembled a traditional crit. Some staff found this regressive however others thought it could offer a way forward: *‘Could the future be a combination of round table reviews with a final presentation on the wall?’ ‘We could adopt the round table review but it still seems to me to be good training to present for*

a wall crit in preparation for future presentations to client bodies etc.' In the second semester we have allowed more time for these discussions, and changed the learning space which has allowed students to get a sense of the overall work.

7. Conclusion

The pilot model has already delivered useful findings. Each stage of the design process benefits from different methods of customized feedback, which can emphasise specific learning outcomes. Reducing stress surrounding assessments can have a positive impact on the rate of design progress. Peer learning and evaluation impacts on the student's overall ability to improve their critical judgement. The traditional crit can be retained in a modified version to maximize its benefit. In this alternative to the crit the student is empowered to have an ability to adapt to uncertain roles. Judgement and reflection are key to this agility, the core of architectural education.

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References

- Anthony, Kathryn. (1991). *Design Juries on trial*. London: Van Nostrand Reinhold.
- Banham, Reyner et al (1996). *A Critic Writes: Selected Essays*. Uni. of California Press.
- Barton, John (2016) Harkness Method extract from paper *What Are Crits For?* DIT.
- Bourdieu, Pierre. (1990). *Reproduction in Education, Culture and Society*. Sage
- Buchanan, Peter. (2012). *The Big Rethink: Rethinking Architectural Education*.
- Cameron, Milton. (2014) *The Jury's Out: a Critique of the Design Review in Architectural Education*, University of Canberra.
- Doidge, Charles; Parnell Rosie; Sara Rachel; Parsons Mark. (2000) *The Crit- An Architecture Student's Handbook*. London: Architectural Press.
- Dutton, Thomas. (1991) *Voices in Architectural Education, Cultural Politics and Pedagogy*, Bergin & Garvey, New York.
- Farrell, Terry (2014) *The Farrell Review on Architectural Education*.
- Foucault, Michel. (1980) *Power/Knowledge: Selected Interviews and Other Writings 1972-1977*. Pantheon
- Hennessey, Beth (2010) *The Social Psychology of Creativity*. *Journal of Educational Research*.

- Hunter, Will (2012). *Alternative Routes for Architecture*. AR 28 September 2012.
- Lave, Jean and Wegner, Etienne (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press.
- McCarthy, Christine (2011). *Redesigning the Design Crit*. Victoria University.
- Schon, Donald (1983). *The Reflective Practitioner*. Basic Books, US.
- Stevens, Garry (1998). *The Favored Circle*. MIT Press
- Till, Jeremy (2005). *Writings in Architectural Education no.26. : Lost Judgement*. EAAE.
- Wegner, Etienne (1999). *Communities of Practice: Learning, Meaning and Identity*. Cambridge University Press.
- Webster, Helena (2005). A study of ritual, acculturation and reproduction in architectural education. *Arts and Humanities in Higher Education*, 4 (3), p.265-282
- Webster, Helena (2008). *Architectural Education after Schon: Cracks, Blurs, Boundaries and Beyond*. *Journal for Education in the Built Environment*, Vol. 3, Issue 2, December 2008 pp. 63-74

Engineering Graphics Concept Inventory: Instrument Development and Item Selection

Nabutola, Kaloki^a; Steinhauer, Heidi M.^a; Nozaki, Steven Y.^b; Study, Nancy E.^b and Sadowski, Mary A.^c

^aEngineering Fundamentals, Embry-Riddle Aeronautical University, USA; ^bSchool of Engineering, Penn State Behrend, USA; ^cComputer Graphics Technology, Purdue University, USA

Abstract

More reliable instruments need to be developed to assess curricula and measure student learning. It is important to ensure that students properly understand fundamental concepts, as scaffolding learning on a poor foundation can have a negative cascading effect. A concept inventory is an example of an instrument that aims to assess student learning and identifying their misconceptions. Such an instrument is typically comprised of an assessment whose items are prudently chosen to test understanding of a single concept per item. The result of this careful selection of items for the Engineering Graphics Concept Inventory resulted in a 30-question multiple choice instrument that can be used to identify deep-seated misconceptions and to assess course outcomes. This paper will outline the development of the Engineering Graphics Concept Inventory, focusing specifically on developing distractors and the selection process for the items in the instrument. The instrument will provide a means to assess and streamline curricula for engineering graphics educators.

Keywords: *Engineering; Education; Design; Graphics; Concept; Inventory.*

1. Background

At present, there is no nationally standardized means to assess misconceptions and competencies in engineering graphics. Such an instrument could be beneficial to graphics educators within the engineering community, as it will allow them to identify which misunderstandings prevail the most. The development of the Engineering Graphics Concept Inventory (EGCI) has been a result of the combination of efforts from researchers at Embry-Riddle Aeronautical University, Purdue University, Penn State Behrend, NC State University and The Ohio State University, made possible through the support of the National Science Foundation. The development of the assessment began with a Delphi panel of graphics experts who originally identified 10 fundamental concepts of engineering graphics, and is now in its final stages of completion.

The selection of items used in the EGCI has involved the consultation of graphics experts and several meetings where the research team gathered to identify important concepts, create items, and refine the collective instrument over several iterations to make certain the CI will assess the concepts it was designed to measure. Each item required thoughtful consideration to ensure a high quality instrument to accurately reveal any deep-seated misconceptions held by students regarding the identified concept

2. Introduction

A concept inventory is an assessment tool “designed to determine the degree to which students understand the concepts of a subject and to identify misconceptions and misunderstandings held by students” (Jacobi et al., 2003). Numerous concept inventories have been developed for a variety of subjects. The force concept inventory (Hestenes et al., 1992) was the seminal work that preceded concept inventories in thermodynamics (Midkiff et al., 2003), statics (Steif & Dantzler, 2005), heat transfer (Jacobi et al., 2003) and now engineering graphics (Nozaki, et al., 2016) each of which can be used to assess course outcomes and student misconceptions in their respective domain. Engineering graphics was identified as a suitable candidate for a concept inventory as it is typically found in the broad range of engineering curricula, and there is currently no instrument for assessment. The various educational and personal backgrounds of students contribute to a different understanding and perspectives of the concepts in engineering graphics; having an instrument that could assess such divergencies early on in the course of study is one way that the instrument may be helpful. Since 2013, a team of researchers from five different universities have collaborated on the development of the engineering graphics concept inventory (EGCI) (Nozaki, et al., 2016). The intended goal of the EGCI is to provide a means of identifying misconceptions with topics related to engineering graphics and to provide a mode of standardizing curricula for various instructors teaching the same course.

The framework adopted to create and validate the EGCI was the “assessment triangle” which has three interconnected key elements i.e. cognition, observation and interpretation. Cognition refers to the way in which students are believed to develop understanding, observation deals with the instrument utilized to assess the knowledge and interpretation involves the analysis of the measured results (Pellegrino, Chudowsky, & Glaser, 2001).

The first step for developing a concept inventory is the identification and classification of fundamental concepts in the subject area. A Delphi panel of graphics professional identified 120 unique topics that were considered important in the area of engineering graphics (Sadowski & Sorby, 2013; Sadowski & Sorby, 2014). These topics were further categorized into 10 main concepts. These concepts, which are shown in Figure 1, were used in the creation of a pilot study by the research team.

Visualizing in 2D and 3D	Projection Theory
Mapping between 2D and 3D	Parallel Projection Methodologies
Planar Graphical Elements	Drawing Conventions
Sectional Views	Dimensioning
Methodologies for Object Representation	Solid Modeling Constructs

Figure 1: Engineering Graphics Concepts Identified by Graphics Experts

The pilot study comprised of 60+ open-ended questions that addressed each of the ten concepts. Student responses and interpretations were coded. Incorrect student responses formed distractor creation for the initial multiple choice version of the instrument. In order to identify misconceptions, the correct responses in the instrument are accompanied by multiple distractors, each deliberately selected to identify a single misunderstanding of a particular concept. In doing so, this ensures that when a student selects an incorrect answer it can be attributed to a particular misconception. Thus, each item in the assessment has one correct response and three incorrect responses.

Instrument development is best done in iterations to successfully refine instrument attributes. Once distractors were generated for each item, two additional iterations of the EGCI assessment tool, were used to develop the final version. The current instrument is comprised of 30 items and tests five different concepts – Sections, Projection Theory, Mapping Between 2D and 3D, Planar Geometry, and Dimensioning.

3. Method

The first step of item development in the project was a pilot study that was conducted with engineering students as participants. The participants were asked to respond to a series of

open-ended questions. Incorrect responses from the initial assessment were then analyzed, and student narratives helped make it possible to categorize the misconceptions. The items and distractors formed from the pilot study responses were used to create the “alpha” version of the instrument. With a complete instrument, the research team used the psychometric quantities of difficulty and discrimination of each item, given by equation 1 and equation 2, respectively

$$D = 100 - \frac{C}{N} * 100 \quad (\text{Eq. 1})$$

$$R = \frac{(H - L)}{0.27 * N} \quad (\text{Eq. 2})$$

Where D is the difficulty index, C is the number of correct responses for a particular item, N is the total number of responses, R is the discrimination index, H is the number of correct responses in the high performing group, and L is the number of correct responses in the low performing group. Based on Weirisma and Jurs (1990), the top 27% of participants were high performers while the bottom 27% were low performers.

Using the difficulty score and discrimination index, items from the alpha instrument that met predetermined criteria were selected to form the “beta” version of instrument. The items were again multiple choice and had a range of difficulty from very easy to very difficult (with a difficulty index between 20 and 80), and an adequate discrimination index. Items with a discrimination of 0.30 and greater were determined to be good items and kept on the instrument, as this suggested that students who performed well on the instrument tended to score well on those items while low performers did not.

The overall objective of the assessment is to have several unique items per concept that measure student understanding of each concept. Distractors must only address a single unique fundamental concept. If any distractor addresses more than a single topic it is not possible to determine exactly where the students’ misconceptions lie. Therefore, the distractors were intentionally chosen based on the responses to the open-ended questions in the alpha instrument such that only a single feature made the option incorrect.

In addition to the “traditional” engineering graphics concepts, the beta instrument also included Computer Aided Design (CAD) items which intended to measure the understanding of solid modeling. Later it was determined that the use of CAD items was not contributing to the instrument because for most items, there were multiple correct final solutions possible. Furthermore, many of the items had very low discrimination – meaning most participants were able to answer the questions correctly, regardless of overall performance. For more information on the selection of CAD items and the overall student

performance on these particular questions refer to “Assessment of CAD Items for a Concept Inventory for Engineering Graphics” (Nabutola et al., 2017)

The latest version of the assessment, the “gamma” instrument, consisted of 30 multiple choice questions which tested the understanding of traditional engineering graphics concepts without CAD.

4. Item Selection

Including items which test a single concept and clearly have one correct answer is very important in a concept inventory. An example of this can be found in the CAD items that were tested in the beta instrument, and were deemed unusable because they did not meet these criteria. Figure 2 shows an example of an open-ended CAD item tested.

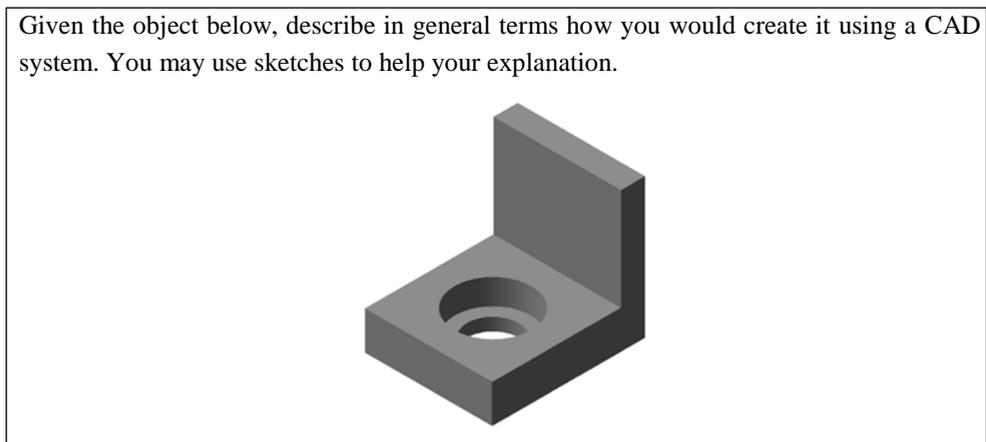


Figure 2: Open-Ended CAD Question

The question shown in Figure 2 can be answered correctly in multiple ways. For example, the “L” shaped profile seen in the right side view can be extruded, and a countersunk hole added directly to the base of the object as shown in Figure 3. This is an example of additive modeling where material is added to form the main features of the object. Alternatively, a rectangular profile can be extruded, and a smaller rectangular block can be removed from the resulting solid before introducing the countersunk hole as seen in Figure 4. This is an example of subtractive modeling where material is removed. These are just two examples of how the part can be modeled. The definition of a “correct” response in this case would depend on the modeling method, the CAD software utilized and the purpose/orientation of the part when in use – correctness can be quite subjective. Coding the responses would be extremely difficult, and subject to a high degree of confounding factors. As such, an open-ended question of this sort would not be very beneficial in developing a candidate item for a concept inventory.

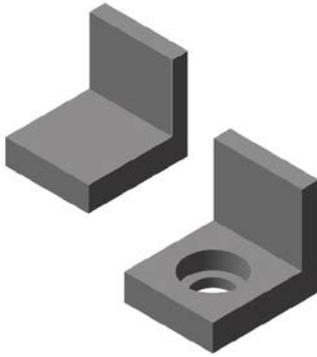


Figure 3: Additive Method

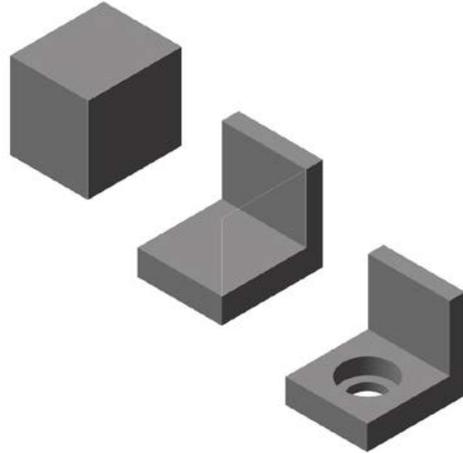


Figure 4: Subtractive Method

The question shown in Figure 5 is the product of a well-phrased open-ended question where there is one clear correct answer. The student is asked to select from one of four options the correct set of orthographic projections which correspond to the object shown. This item falls under the Projection Theory concept, and a student who answers this question correctly likely understands the layout, alignment and orientation of orthographic projections. Notice, there are four options, and each option tests the understanding of layout, alignment and orientation separately such that if a student is to select one of the incorrect responses it can directly be attributed to a misunderstanding of one of those three features.

Select the correct set of orthographic views for the object shown below.

Figure 5: Sample Question on Orthographic Projections

The correct answer in Figure 5 is option A. Students who select option B have likely misunderstood the orientation of orthographic projections. The top view has been rotated 180° such that the features which should appear closest to the left side view are appearing closest to the right side view and vice versa. Students who select option C likely misunderstand the layout of orthographic views. The right side view appears on the left side of the front view which is inconsistent with the appearance of the isometric. Students who select option D likely misunderstand the alignment of orthographic views which is necessary to show the shared dimensions between the views. The width of the top view is not the same as the width of what is shown as the front view.

5. Results

After asking suitable open-ended questions and appropriately categorizing the incorrect responses, the EGCI was created. From the 60+ questions originally used in the pilot study 30 multiple choice questions were chosen through an iterative process. These items, which all have a discrimination index greater than 0.30, cover the five concepts outlined in the introduction i.e. sections, projection theory, mapping between 2D and 3D, planar geometry and dimensioning. The gamma version of the instrument has been administered to over 800 engineering and technology undergraduate students at four different universities. The instrument is currently undergoing its final revision and should be available by Fall 2018.

The instrument can be used to compare the students' understanding of diverse concepts of engineering graphics and this information can then be sorted by instructor and used to relate the teaching style and time spent on each concept to the performance of students. This will ultimately provide a way to streamline instruction such that students are receiving the same information in pre-requisite courses as they advance into more challenging concepts.

6. Conclusion

A concept inventory can be a very useful tool to assess student learning if the items are judiciously chosen with deliberate distractors. The items presented need to have distractors that clearly show one particular misconception per option in order to accurately determine the source of misinterpretation. With well posed open-ended questions and detailed responses from students, it is possible to develop an assessment that tests a number of concepts and indicate subjects where students' misconceptions affect them the most. This can potentially provide instructors an opportunity to revise their course content and utilize different resources and teaching techniques to target areas where students seem to be struggling. Another use can be to administer the instrument by multiple instructors at an institution and the results can be used to compare the performance of students for a number of faculty members all teaching the same course.

Acknowledgements

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References

- Hestenes, D., Wells, M., & Swackhamer, G. (1992). Force Concept Inventory. In *The Physics Teacher*, Vol. 30 (pp. 141-158).
- Jacobi, A., Martin, J., Mitchell, J., & Newell, T. (2003). A Concept Inventory for Heat Transfer. *Frontiers in Education Conference 1:T3D-12 - T3D-16 Vol.1*.
- Midkiff, K., Litzinger, T., & Evans, D. L. (2001). Development of Engineering Thermodynamics Concept Inventory Instruments. *Frontiers in Education Conference 2: F23 Vol. 2*.
- Nabutola, K. L., Steinhauer, H. M., Branoff, T. J., Study, N. E., Miller, C. L., & Nozaki, S. Y. (2017). Assessment of CAD Related Items for a Concept Inventory for Engineering Graphics. *2017 ASEE Annual Conference & Exposition*.
- Nozaki, S. Y., Sorby, S. A., Steinhauer, H. M., Study, N. E., Sadowski, M., & Miller, R. (2016). The Development of a Concept Inventory for Engineering Graphics. *Frontiers in Education Conference*.
- Pellegrino, J. W., Chudowsky, N., & Glaser, R. (2001). *Knowing What Students Know*. Washington D. C.: National Academy Press.
- Sadowski, M., & Sorby, S. (2013). Update on a Delphi Study for Developing a Concept Inventory for Engineering Design Graphics. *Engineering Design Graphics Division 68th Midyear Meeting Proceedings*.
- Sadowski, M., & Sorby, S. (2014). Defining Concepts for an Engineering Concept Inventory: A Delphi Study. *Engineering Design Graphics Division 69th Midyear Meeting Proceedings*.
- Steif, P. S., & Dantzler, J. A. (2005). A Statics Concept Inventory: Development and Psychometric Analysis. *Journal of Engineering Education* 94.
- Wiersma, W., & Jurs, S. G. (1990). *Educational Measurement and Testing (2nd Ed.)*. Boston, MA: Allyn and Bacon.

Defining a taxonomy of employability skills for 21st-century higher education graduates

Ornellas, Adriana^a

^aFaculty of Psychology and Education Sciences, Universitat Oberta de Catalunya, Spain.

Abstract

This paper aims to discuss the theoretical development and the practical validation of a taxonomy of skills for boosting new graduates employability at Higher Education Institutions (HEI).

The taxonomy was developed within the framework of the project Skill Up: Matching graduates' skills and labour world demands through authentic learning scenario. The project, funded by the Erasmus+ programme of the European Union, is a strategic partnership in the field of Higher Education (HE) that involves six partners (four universities, a VET (Vocational Education and Training) school and an employer representative) from three European countries (Spain, Sweden and Germany).

For the definition and validation of the taxonomy two methods were applied: a) a literature review of studies and reports that in recent years have established different frameworks and lists of skills crucial for HE graduates to acquire; b) an asynchronous online focus group involving various stakeholders (undergraduates, graduates, employers' representatives, lecturers and counsellors) to validate the taxonomy.

The paper presents the resulting list of employability skills sorted into four clusters: cognitive, methodological, social and subject-specific.

Keywords: *Employability skills; Taxonomy; Higher Education; Graduate. Soft skills.*

1. Introduction

This paper gives an account of some of the results obtained in the first phase of the project Skill Up: Matching graduates' skills and labour world demands through authentic learning scenarios¹. The project aims to build scalable and replicable ways for connecting higher education (HE) curricula with evolving labour market demands through a strategic partnership that involves six institutions: four universities, a vocational education and training (VET) school and an employer representative from three European countries (Spain, Germany and Sweden). The specific objectives of the project are to:

- Map good practices in matching graduates' skills and labour market demands through authentic learning scenarios in partners' HE settings.
- Improve soft and hard employability skills of undergraduates by means of designing, developing, applying and evaluating authentic learning scenarios in various HE and VET programmes identified by partners as priorities.
- Enhance access to career counselling and guidance services for undergraduates by training tutors in career counselling, with emphasis on e-counselling.
- Implement and promote a virtual environment that acts as a hub for attracting stakeholders, offering guidance to labour market newcomers and real hands-on experiences in the professional world as part of students' learning.

The results presented here consist of a taxonomy of employability skills crucial for HE graduates to acquire that was classified into four clusters: cognitive; methodological; social and subject-specific. Moreover, the competence-centred approach to the concept of employability skills adopted in the project is discussed.

2. Theoretical framework

There are many definitions and approaches established for employability. From an employment-centred perspective, Hillage and Pollard (1998) point out that employability is about three abilities: gaining initial employment; maintaining employment; and obtaining new employment if required.

Yorke (2006) in turn, from a competence-centred approach, defines employability as:

[...] a set of achievements – skills, understandings and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen

¹ The project is funded by the Erasmus + programme of the European Union. More information is given in the website of the project: skill-up-project.eu.

occupations, which benefits themselves, the workforce, the community and the economy (p. 8).

Along similar lines, defining the term “skills” is also a challenge. Often, the terms “skill” and “competence” are used interchangeably, when they are not necessarily synonymous (Cinque, 2016).

The European Qualifications Framework (EQF)² provides a grid of eight reference levels based on learning outcomes which are defined in terms of knowledge, skills and competence, where:

- “Knowledge” means the body of facts, principles, theories and practices that is related to a field of work or study and is described as theoretical and/or factual;
- “Skills” means the ability to apply knowledge and use know-how to complete tasks and solve problems and are described as cognitive (involving the use of logical, intuitive and creative thinking), and practical (involving manual dexterity and the use of methods, materials, tools and instruments); and
- “Competence” means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development, and is described in terms of responsibility and autonomy.

In a similar vein, the Tuning project³, which offers a concrete approach to implement the Bologna Process in HE institutions and subject areas, defines competence as “a dynamic combination of knowledge, understanding, skills and abilities”.

This work takes a competence-centred approach to the concept of employability skills, as formulated in Yorke (2006), understood as a combination of personal qualities and beliefs, knowledge, skilful practices and the ability to reflect critically and productively on experience, and that need to be frequently renewed during a person’s working life. Also assumes a critical position in accordance with Waltz (2011) who asserts that to truly prepare and empower graduates to enter the labour market, it is important to discuss issues beyond the values of corporate managers such as employee rights, explorations of personal values, and critical analysis. Otherwise, we risk encouraging graduates “to believe that becoming and staying employed requires turning themselves into ‘products’ that conform to ever-changing market desires, which is certainly not a concept that should be left unchallenged” (Waltz, 2011: 4).

² <https://ec.europa.eu/ploteus/en/content/descriptors-page>

³ <http://www.unideusto.org/tuningeu/competences.html>

3. Methodology

To define and validate the taxonomy of employability skills in the first phase of the Skill Up project two main methods were used: a systematic review of current literature and an asynchronous online focus group.

The literature review at a European and international level aimed to build the concept of employability skills and to gather information from a variety of studies and reports that in recent years have established lists of skills crucial for higher education graduates to acquire.

The asynchronous online focus group involving 29 stakeholders (teaching staff, undergraduates, graduates, career counsellors and employers' representatives) from the three partner countries (Spain, Germany and Sweden) aimed to discuss the findings from the first cycle of the project and also to validate the taxonomy of employability skills defined. Considering that the group's degree of homogeneity is a key factor in maximizing disclosure among participants (Morgan, 1998), we established the following four groups, hoping to help the discussion flow better:

- First group: comprising nine labour market representatives.
- Second group: comprising six lecturers from HE and VET institutions.
- Third group: comprising nine graduates and students' representatives.
- Fourth group: in which five career counsellor representatives participated.

The online asynchronous focus group was chosen as a method to collect data much more quickly and at a lower cost than a face-to-face focus groups producing similar amounts and quality of information. It was developed in a Moodle platform and hold over the course of four days, with participants choosing when it would be most convenient to participate in the activities. A time dedication of thirty minutes per day with a total of two hours over the four days was estimated, similar to the time they had dedicated to a face-to-face focus group.

4. Findings

As a result of the literature review and taking into account the most current international reports, frameworks and studies reviewed (Davies et al., 2011; Haselberger et al., 2012; Humburg et al., 2013), a list of twenty employability skills required to promote graduates' employability was defined a priori (Figure 1). To define this list, we have considered those skills that are vital for success in the workplace and that should be developed mainly throughout HE training. Therefore, we have not included those skills that from our point of view should be acquired throughout compulsory education (i.e. basic skills).

1. Communication & interpersonal skills
2. Teamwork
3. Negotiation
4. Leadership
5. Creativity & innovation
6. Culture adaptability (willingness to engage with changes)
7. Foreign language
8. Awareness of life-long- learning need
9. Digital skills (collaboration, information management, content creation, safety)
10. Decision making
11. Self management
12. Customer/user orientation
13. Stress management
14. Results orientation
15. Job-specific skills (business, finances, administration and management, career counselling...)
16. Conflict management & problem solving
17. Analytical skills
18. Ethics and values
19. Critical thinking
20. Entrepreneurial skills

Figure 1. Set of skills emerged from the literature review. Source: own elaboration.

On the basis of this list of skills the online focus group activities were formulated including an engagement questionnaire to know how the different stakeholders taking part perceived the importance of these skills for new graduates in order to be employable.

Some remarkable results of the questionnaire regarding the perceived importance of the skills show that counsellors representatives were unanimous in rating as the most important ones communication and interpersonal skills, culture adaptability and digital skills. Communication and interpersonal skills were also the most rated for the group of students and graduates together with foreign language and followed by teamwork and self management. For their part, lectures best rated teamwork, job-specific skills and critical thinking. Employers' representatives preference were negotiation, customer/user orientation, conflict management and problem solving and ethics and values.

The questionnaires also included questions regarding the skills that new graduates are most lacking. The group of students and graduates was unanimous in highlight their gap in skills related to foreign language. It was also commented that "*skills such as communication, self-management, teamwork or critical thinking were not taught by professors, instead it is something you need to learn by yourself in order to successfully manage your studies*". In their turn, lectures and employers' representatives agreeing on pointing out that students and new graduates need to improve in communication and interpersonal skills. Employers' representatives also refered to self management, decision making, team work ethics and values.

Considering the results which have emerged from the questionnaires and from the subsequent discussion in the Moodle forum of the four groups of stakeholders, a new list of employability skills relevant for new graduates from the perspective of both the worlds of education and work was established. The new list have merged some skills considered as similars and also have disregarded the skills more likely to be developed throughout professional life (i.e. leadership or negotiation). The resulting list was sorted into four clusters: cognitive, methodological, social and subject-specific (Table 1).

Table 1. Taxonomy of employability skills required for HE graduates.

	Skill	Definition
 <p>Cognitive</p>	Analytical thinking	Gathering, analysing and articulating information from different sources and using it to solve problems and make decisions efectively.
	Creative thinking	<i>Thinking outside the box</i> in order to bring new ideas to solve problems or seek solutions to a particular situation.
	Foreign language	Performing in a language different from the mother tongue. Also includes intercultural understanding.
 <p>Methodological</p>	Learning to learn	Effectively managing one’s own learning process and needs, identifying available opportunities, and overcoming obstacles in order to learn successfully (European Commission, 2006).
	Problem-solving	Engaging in the actions or thoughts necessities to find solutions to a difficult or complex question or situation and resolve conceptual problems.
	Decision-making	Thinking of several choices when an important decision must be made, finding relevant information to make a good choice and predicting the consequences of the decisions taken for others.
	Digital skills	Being digitally competent in 4 areas (Vuorikari et al, 2016): a) information and data literacy; b) communication and collaboration; c) digital content

		creation and d) safety.
	Results-oriented performance	The ability to make organizational efforts profitable while always having in mind the goals pursued. (Haselberger et al., 2012).
	Self-management	Setting goals and priorities through the selection and distribution of tasks and resources. It also encompasses time management, organization, responsibility, and self-reliance.
	Communication and interpersonal skills	Articulating, transmitting and defending effectively arguments, ideas, feelings or information through verbal and non-verbal messages. Also involves listening, understanding and being receptive to the messages sent by others.
	Teamwork	Working collaboratively with other people in both face-to-face and online environments.
	Cross-cultural and diversity competence	Getting involved and working with people of different ethnicities, races, religions, cultural background, genders, etc, and in different sociocultural environments.
	Ability to cope with changes	Dealing with changes and uncertainty and adapting to new situations in the workplace.
	Conflict management	Taking control of a conflict between two or more parties in an assertive way.
	Stress management	Showing endurance in complicated or stressful situations, workloads or at a work pace that is different from normal while maintaining the same quality level in the tasks accomplished (Haselberger et al., 2012).
		

Source: own elaboration.

5. Conclusions

First of all it should be mentioned that the results presented here are embedded in a wider framework designed in the first phase of the Skill Up project. The most important contribution of this study is the taxonomy of employability skills defined. This taxonomy is not intended to be a definitive list but a starting point for carrying out a more in-depth analysis of the supply and demand of new graduates' employability skills at European and partner countries national levels. The taxonomy also aims to give directions to higher education institutions on how to enhance graduates employability skills by improving the connection between HE curricula with the demands of the professional world. From the perspective of employability as a process or something to be achieved (Reid, 2016) this implies assuming the list of skills not just as an attribute of the new graduates but as something that need to be permanently renewed throughout a person's professional life.

References

- Cinque, M. (2016). "Lost in translation". Soft skills development in European countries. *Tuning Journal for Higher Education*, Vol 3, No 2, pp. 389–427.
- Davies, A., Fidler, D., Gorbis, M. (2011). *Future work skills 2020*. Accessed May, 2017, <http://www.iftf.org/futureworkskills>.
- European Commission (2006). *Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning*. Brussels: European Commission.
- Haselberger, D., Oberhuemer, P., Pérez, E., Cinque, M. and Capasso, F. (2012). *Mediating Soft Skills at Higher Education Institutions. Guidelines for the design of learning situations supporting soft skills achievement*. Accessed April, 2017, <http://www.modesproject.eu/en/the-modes-handbook.aspx>.
- Hillage, J. and Pollard, E. (1998) *Employability: developing a framework for policy analysis*. London: Department for Education and Employment.
- Humburg, M., van der Velden, R. and Verhagen, A. (2013). *The employability of higher education graduates: the employers' perspective*. European Commission.
- Morgan, D. L. (1998). *Planning focus group*. Thousand Oaks, California: Sage.
- Reid, J. (2016). Redefining Employability as something to be achieved: Utilising Tronto's conceptual framework of care to refocus the debate. *Higher Education, Skills and Work-Based, Learning*, Vol. 6 No 1, pp.55-68.
- Vuorikari, R., Punie, Y., Carretero Gomez S., Van den Brande, G. (2016). *DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model*. Luxembourg Publication Office of the European Union. EUR 27948 EN. doi:10.2791/11517.
- Yorke, M. (2006). Employability in higher education: what it is – what it is not. *The Higher Education Academy Learning & Employability*. Series 1, York: THEA.
- Waltz, M. (2011). *Improving students employability*, E-book. www.jobs.ac.uk.

Maintaining the diversity of the professional healthcare workforce through higher education qualification routes

Thomas, Liz^a; and Duckworth, Vicky^a

^aFaculty of Education, Edge Hill University, UK.

Abstract

In England many professional healthcare qualifications, including nursing, are only achievable through higher education, for which tuition fees are payable from this year (2017-18) onwards. This paper is concerned about maintaining both the number and diversity of healthcare professionals to meet the needs of a diverse and ageing population. It reviews student views and the available statistical evidence about the impact of the introduction of tuition fees on applicants, and literature and empirical evidence about what higher education institutions are doing to recruit and retain students from different backgrounds to meet the health needs of the population. It concludes that because professions such as nursing have traditionally recruited from a diverse population minimal knowledge or practical expertise has been developed to widen participation in healthcare education in general and nurse education in particular. Moving forward, the healthcare and higher education sectors will need to work in joined up ways to develop strategies to both attract and retain a wide range of diverse students to higher education professional healthcare qualification courses – and maintain the supply of qualified healthcare professionals.

Keywords: *widening participation, diversity, healthcare, nurse education, tuition fees, institutional responses (maximum 6)*

1. Introduction

1.1 Context

Many healthcare professions in England face a double bind of both recruiting and retaining sufficient staff from diverse backgrounds to meet the health needs of the population. This challenge has become more complex with the introduction of tuition fees for healthcare higher education (HE) programmes and the UK's imminent departure from the European Union. This situation is especially acute in the field of nursing where there are 40,000 unfilled vacancies (Helm, 2017). Contributory factors include an ageing nursing workforce with a third planning to retire in the next ten years (IES, 2016), a reduction in the numbers of international qualified nurses applying to register in the UK due to the political unrest caused by Brexit (NMC, 2017) and thirdly, a drastic reduction in the numbers of students applying for nursing educational programmes in 2017 (see below).

Underpinning this paper are the assumptions that first, widening participation (WP) is necessary to recruit sufficient numbers of staff to meet demand from healthcare providers, and second that diversity of the healthcare workforce contributes to the quality of the care provided (Heaslip et al 2017). WP is understood to mean expanding the diversity of students entering and succeeding in HE, with a particular focus on those from under-represented and disadvantaged groups. Diversity includes a range of factors, including age, gender, ethnicity, class and educational background, sexuality and disability. In the context of healthcare in general, and nursing particular increasing diversity through WP includes recruiting more older students, more males, more Black and Minority Ethnic (BME) students, more students from low income and lower socio-economic groups, more students with non-traditional entry qualifications (i.e. not attained through the school system but gained subsequently through an alternative route), more students with disabilities and more students with caring responsibilities; no data is available on the sexuality of students.

1.2 About the research

This paper draws on two completed studies, and on-going research. The two completed studies were commissioned by Health Education England (HEE) to inform their work to widen participation in healthcare courses in HE that lead to professional registration. Initially we undertook a systematic literature review (Kaehne et al 2014) identifying interventions and approaches to facilitate WP in healthcare programmes. Subsequently, we undertook a mixed methods study exploring WP in healthcare programmes. Here we combined statistical analysis of data from the Higher Education Statistics Agency, with qualitative research with current students and recent graduates, and a review of institutional practices aimed at widening access and improving outcomes (student retention, attainment

and progression into employment) amongst diverse students in healthcare programmes. Our on-going research is focusing more specifically on WP in nurse education. This has included an additional literature review (Heaslip et al, 2017), a survey of the nursing workforce, a review of applications data, and a stakeholder event to explore the views and experiences of practitioners in the health and HE sectors, and providing a rare opportunity for dialogue and learning between sectors. This paper draws from all of these sources to explore the actual and potential role of higher education institutions in widening participation in healthcare education, to both increase the number of healthcare professionals, and ensure the diversity is maintained to reflect the population that use health and social care services in England.

2. Changes to the funding of healthcare education and the impact on the healthcare workforce

2.1 The funding changes

In 2017 changes were implemented to the funding of healthcare education programmes in HE in England, shifting responsibility from the State to individual students and their families for both tuition fees and maintenance costs (DHSC, 2017). Healthcare students are no longer eligible to receive a bursary to contribute to their living costs, instead they are entitled to funding from the student loans system. In addition, healthcare students must now pay tuition fees similar to other under graduate students, currently up to £9,250 per year (<https://www.gov.uk/student-finance/new-fulltime-students>). Student loans cover both fees and living costs, and are repayable after graduation, once earnings exceed a minimum threshold. However, unlike other under-graduate courses, healthcare programmes such as nursing are genuinely full time over 45 weeks of the year; consisting of 50% theory and 50% practice. During the practice blocks student nurses work a 37.5-hour week, including night shifts, evenings and weekends, in a variety of healthcare settings and locations, so in effect the students are actually paying to deliver care round the clock. This also significantly reduces their capacity to undertake additional paid employment.

2.2 Student views of the changes

Before the implementation of these funding changes we interviewed 70 students and graduates from diversity backgrounds. In summary: 92% were over 21 of age on entry; 18% male; 24% BME; and 20% with a disability. 70% said that their annual family income was £25,000 or less, and a further 25% said it was between £25,001 - 42,620; 46% said they were the first person in their family to enter HE; more than half lived with their partner

and/or children, which was assumed to mean that they had a range of other responsibilities, and 25.7% said they had dependent children.

These students discussed the importance of financial issues in influencing their decisions to enter higher education, and continuing to shape their experiences once in HE. This was in contrast to previous research with low-income HE students in other disciplines in receipt of financial support (Bowes et al, 2016). For example, students explained how the availability of funding had enabled them to enter higher education:

I think finance is a big issue, which is why choosing an NHS sponsored course made such a big difference, because otherwise I wouldn't be able to do it. For me, finance was the only issue.

And how concern about funding had led them to postpone and plan for their studies.

I had to discuss with my husband quite a lot before we made that decision. This wasn't something that was just going to affect me.

It had also influenced decisions, such as to study at a local institution to keep maintenance costs low.

I think the fact that I could stay at home was a big issue, because that meant I could save quite a lot of money.

Once on course students again discussed many financial issues that impacted on their participation and experience. Some of the key issues are summarised by this student:

The main one for me was probably the financial side. I had a flat to run and a car and I had to travel. Sometimes I'd be travelling into uni for a one hour lecture. I had to work as well as studying to pay my rent and bills. I had two jobs. When you're on placement that is also a full-time job. Then you've got to do your coursework when on placement. Then you've got to do assessments as well sometimes which also overlap, then also working two jobs. So I was working seven days for a lot of weeks. That was stressful because you're tired and can't focus, but you need the money. So financially, I struggled. I got through it with support from my parents and working. I found it very difficult and if I'm honest, I wouldn't want anyone to do that because my grades did suffer through working. I had to retake one assessment because I just didn't have the time to complete it, but I needed to work to pay the bills.

2.3 A decline in applicants

Given the importance attached to financial issues for students in our study, we were anticipating that the funding changes could make a significant impact on applications to healthcare programmes in general, and nursing courses in particular. Data from the Universities and Colleges Admissions Service (UCAS) showed that by the 15th January deadline for the 2017 cycle there were 23% fewer applicants to nursing from England, and 25% fewer applicants from the EU (excluding the UK) compared to the same time the previous year. Figures released by UCAS in August 2017 however found that there was a drop of about 8% in the number of students taking up nursing places. The data shows that there has been a decline in the number of mature applicants, and an increase in the number of young applicants. We propose to do further analysis to identify trends around who is and who is not participating in healthcare education, with a particular focus on nursing, compared to before the introduction of the changes to funding healthcare education programmes and the subsequent implementation of them.

3. Higher education institutions' responses

Given the changes in funding to healthcare education – and the pressing need for healthcare professionals, and universities own need for students in a marketized HE system – we anticipated that universities would be well-prepared to continue to attract a wide and diverse range of applicants that reflect the communities they serve – both as HE providers and in their role of supplying qualified healthcare professionals to the workforce. We looked at the literature to understand the knowledge-base about widening participation in these subjects (referenced above), and we explored interventions that universities has put in place through a sector-wide call for examples.

3.1 Learning from the literature

The first literature review by Kaehne et al (2014) identified only a limited number of studies (23) about WP in healthcare programmes, and these publications were mainly reporting on small-scale, isolated research projects. The examples identified and reviewed predominantly focused on raising awareness about healthcare programmes by providing further information, and overcoming academic barriers through changing admissions processes or providing alternative entry routes. The studies on retention and success clustered around the academic experience, particularly overcoming academic challenges, and the provision of additional student support. The more recent review of the literature about WP in nurse education (Heaslip et al, 2017) identified ten empirical studies, and similar themes emerged in relation to both access and success. The focus of much of the

work is on academic barriers to participation and the construction of alternative entry pathways. Other studies focus on raising awareness of healthcare programmes and providing increased information about healthcare programmes. Similarly, once in HE, the published studies tend to focus on academic challenges and support. It can be concluded that the evidence base about how to expand the healthcare and nursing workforce through diversification is limited, informed by small-scale, and usually single institution studies. Furthermore, it is largely framed in negative terms directed towards what individual students lack, rather than looking at structural barriers and inequalities, that can be addressed by institutions and the healthcare sector – for example to capitalize on the experience and enthusiasm non-traditional students brought to the healthcare sector (Thomas et al, forthcoming).

3.2 What higher education institutions are doing

In light of the paucity of the literature, we invited HE providers in England to share with us about how they widen participation in healthcare programmes. The call was publicized through a number of on-line mailing lists and communities with a focus on WP and/or healthcare education, and respondents were asked to complete a template to provide information in response to specific questions. Unlike other similar calls undertaken by the authors we received a small response of 18 examples of activities from 14 institutions. Most of the examples provided focused on widening access (11 out of 18 examples). Fewer examples focused on continuation and completion, improving attainment, and progression to PG study or health-related employment. Some of the examples spanned several stages in the student journey.

The widening access examples provided cover a range of activities including open days, taster sessions, summer schools, mentoring, access courses and contextualised application processes. This is broadly in line with what we know are the most common approaches to widening access adopted by higher education institutions more generally (Bowes et al 2013); there does not appear to be any additional focus on financial issues, which is surprising.

Activity to support continuation, completion and attainment tends to be less targeted than access activity, with many institutions choosing to mainstream provision such as pastoral care and support with academic development. This, perhaps, may explain why we received fewer specific examples of activities under this heading. Furthermore, the examples submitted contained very little activity specifically promoting progression to health-related employment or postgraduate study. Five HEIs submitted examples of activities that contribute to promoting progression, however, nearly all of these are outreach activities targeted at school pupils, sixth-form students or other groups outside higher education.

None are examples of work with current undergraduates or recent graduates. While healthcare students may benefit from more generic activities to support progression provided by HEIs, it is surprising how little tailored support is offered to launch graduate careers in their chosen healthcare professions – especially given the different demands of their courses, which combine both academic study and extensive working in practice.

3.3 Evaluating effectiveness and impact

It is also worth noting that the literature identifies a lack of evidence about the impact of the interventions, and this is reflected in the practice examples. Many of the examples submitted include feedback from participants in activities on their perceptions of the helpfulness and self-reported impact. Very few include follow-up information, for example, changes in achievement or the proportions of participants in activities who go on to submit applications to healthcare courses. Even with this information, without any comparator group it is not possible to determine to what extent it is the intervention in question that has delivered the impact, or something else, or whether students would have progressed anyway. HE institutions need to be encouraged and supported to carry out more robust and longer-term evaluations of the impacts and effectiveness of their WP activities in the field of health and social care.

4. Conclusions, implications and recommendations

Healthcare professionals, especially nurses, have traditionally been recruited from a more diverse population than the wider student population (Woodfield, 2014). The literature and empirical research presented here suggests that there is a lack of knowledge and expertise amongst healthcare and nursing education professionals about effective strategies to maintain and increase recruitment and successful completion of students from diverse groups, which is now becoming problematic.

A WP strategy needs to be developed and implemented at national and local levels. This should be based on a partnership approach bringing together the health, social care and HE sectors to foster dialogue and change. This could build on existing WP partnerships in England, but attention needs to be paid to the unique context of healthcare professionals – who have a very full timetable, and who contribute directly to patient care, and the associated importance of funding issues and financial support to many of these students. The approach should thus be informed by an expanded evidence base about the issues and effective practices for diversity in healthcare education in general and nursing in particular. Our research suggests that a strategic, inclusive approach is required, which identifies and addresses the barriers, but which also illuminates the key enabling factors that attract and retain a wide range of students that reflect the communities they serve to higher education

professional healthcare qualification courses. For example, we found that people's commitment and passion for working in these fields is vital, and should be tapped into to support recruitment and success in HE and beyond (Thomas et al 2017), and not be exploited.

References

- Bowes, L. Jones, S. Thomas, L. Moreton, R. Birkin, G. Nathwani, T. (2013) *The Uses and Impact of HEFCE Funding for Widening Participation*. Bristol: HEFCE
- Bowes, L., Moreton, R., Thomas, L., Sheen, J., Birkin, G. and Richards, S. (2016) *Evaluation of the National Scholarship Programme*. Bristol: HEFCE
- Department of Health and Social Care (DHSC) (2017) NHS Bursary reform. London: DHSC <https://www.gov.uk/government/publications/nhs-bursary-reform/nhs-bursary-reform> accessed 9/2/18
- Helm, T. (2017) Recruitment crisis hits NHS with one in nine posts currently vacant. *The Observer*, 9th May 2017 <https://www.theguardian.com/society/2017/may/13/royal-college-nursing-nhs-recruitment-crisis>
<https://www.theguardian.com/society/2017/may/13/royal-college-nursing-nhs-recruitment-crisis>, accessed 9/2/18
- Heaslip, V., Board, M., Duckworth, V. and Thomas, L. (2017) Widening Participation in Nurse Education; An Integrative Literature Review. *Nurse Education Today*. ISSN 0260-6917 DOI <https://doi.org/10.1016/j.nedt.2017.08.016>.
- Institute for Employment Studies (IES) (2016) One in three nurses to reach retirement age within ten years. Brighton: IES <http://www.employment-studies.co.uk/news/one-three-nurses-reach-retirement-age-within-ten-years>, accessed 9/2/18
- Kaehne, A., Maden, M., Thomas, L., Brown, J., Roe, B., (2014) *Literature Review on approaches and impact of interventions to facilitate Widening participation in Healthcare Programmes*. Ormskirk: Edge Hill University.
- Nursing and Midwifery Council (NMC) (2017) Report on European Nurses and Midwives. <https://www.nmc.org.uk/globalassets/sitedocuments/special-reports/nmc-eu-report-june-2017.pdf>
- Thomas, L. et al (2017) *Working paper 1: Persistent passion: Implications for policy and practice in widening access and success in healthcare education*, <http://www.lizthomasassociates.co.uk/wp-nursing.html>, 9/2/18
- Woodfield, R. (2014) *Undergraduate retention and attainment across the disciplines*. York: Higher Education Academy

Initiating a Translational Bio-Mathematics Research Seminar for Undergraduate Students

Turian, Emma^a and Filus, Lidia^a

^aMathematics Department, Northeastern Illinois University, USA

Abstract

The aim of this paper is to illustrate the benefits and the drawbacks of an experimental process on how to develop and teach an interdisciplinary applied math course. The analysis comes from our experience gained during the development and teaching of a temporary seminar called: Mathematical Modeling for Cancer Risk Assessment, implemented at our University. The need for the initiation of such an interdisciplinary course came from an increasing national effort started by Mathematical Association of America's "Curriculum Foundations Project: Voices of the Partner Disciplines". Their study found that research in biology and health-related fields has become more quantitatively oriented than in the past, therefore mathematical curricula should incorporate interdisciplinary modulation. Our seminar instruction included: writing and mathematical software skills, content lecture, project development and presentation. Results showed that students best interact with each other if work is performed during class time; mainly if a large project with possible variations is developed in class, so students or groups of students follow using the same pace. Implementing such interdisciplinary course that provided students with appropriate tools and methodologies, contributed to student retention, and increased students' enthusiasm towards future research programs, carriers, and graduate schools.

Keywords: cancer modeling; interdisciplinary fields; multidisciplinary instruction.

1. Introduction

The need for the formation of the Mathematical Modeling for Cancer Risk Assessment seminar came from an increasing national effort started by MAA's "The Curriculum Foundations Project: Voices of the Partner Disciplines" (MAA 2004), to make undergraduate courses more compelling and keep pace with the changes of how mathematical sciences are used. Based on views expressed during a series of disciplinary workshops, MAA completed an extensive review which resulted in a set of recommendations for the Undergraduate Programs in Mathematics to assist math departments plan their curriculums in the 21st century. These workshops consisted of dialogs among representatives from the partner discipline with mathematicians. A final Curriculum Foundation Conference resulted in a Collective Vision, which consists of a set of recommendations for the first two years of the undergraduate mathematical curriculum. Together the reports and the Collective Vision, became the pillars for the Committee's Guide (CUPM 2004) for the Undergraduate Program in Mathematics, and later on for the 2015 Guide, Schumacher (2015). The agreement that prompted the need for such a "reform" in the undergraduate curriculum, came from the general consensus that the research in biology and health-related fields has become more quantitatively oriented than in the past. While diverse, these quantitative needs require innovative solutions, such as creation of mathematical courses designed specifically for the bio-medical fields, or mathematical modules that could become incorporated into existing bio-medical courses. The experimental creation of our seminar was an example of the former, and attracted a large audience of students. The goal was to provide students with a platform for jumpstarting their research career. The curriculum of this course included teaching writing and scientific software, learning how to analyze data, make inferences and predictions that are meaningful to one important branch of this bio-medical field, named cancer research. The seminar was specifically designed to enhance students' preparedness for careers, which apply quantitative methodology to government organization, industries, education, biomedical fields and research involving complex behavior.

2. Methods

The seminar taught during Spring 2017 became a collaboratively taught research environment that provided a way to incorporate interdisciplinary instruction, where students used mathematics in the context of an application from the Bio-Mathematical field, and it offered a unique opportunity for students to apply their mathematical knowledge, become exposed to research, develop presentation skills, publish their work and present at domestic and international conferences.

At the end of the course students were required to produce a paper-like research project and to present their findings at a conference. The final grade was based on in-class quizzes (20%), homework assignments (30%), a paper-like project (30%), and an oral presentation or poster (20%). The system included alternative grading for projects with considerable mathematical content.

Instruction for this course included four main components as follow:

2.1 Teaching the usage of a TeX editor

At first students were required to download a TeX version on their laptop, specifically using the MiKTeX or MacTeX distribution. Successive lectures included showing students how to perform fundamental tasks in LaTeX, such as the use the maketitle command, create table of contents, sections, tables, insert pictures, references, citations, flowcharts using PGF/TikZ, and how to use the begin/end environments for Theorems, Lemmas, equations, lists, symbols, i.e. OEIS (2017), ShareLaTeX (2018), etc. In order to easily transfer work created in LaTeX to presentation slides, students were shown how to use Beamer, which allowed for the creation of flexible and professional looking presentations, i.e. ShareLaTeX (2018) and Wright (2017). Homework assignments were asking students to create documents from a provided template for their editor. Since students were learning TeX writing for producing paper-like documents, and oral presentations, templates for creating a TikZ poster were developed, i.e. ShareLaTeX (2018). Learning how to write papers, develop oral presentation slides, and posters completed the LaTeX cycle.

2.2 Teaching Mathematica

Since students were not required to purchase a textbook, they were encouraged to acquire Mathematica software. Features of this software were displayed during class using live board projections while students were using their computer. Basic features of continuous modeling using Mathematica were shown such as: define a function, solve an equation, plot a function, solve an ordinary differential equation analytically and numerically, display data along a given function, and save plots so they can later be inserted into TeX documents. Future lectures also included discrete modeling functionality such as graphs, data organization; statistical components such as Pearson Correlation coefficient, tests for normality, AIC, AICc, BIC, confidence intervals, etc.; and optimization. The main Mathematica functionality that students enjoyed through exercise was the Manipulate function, which gave them instant clues regarding bifurcation parametrization.

The important lesson learned from this was that students learn best if all the Mathematica functionality was placed into context. As such, homework assignments increasingly included more real-life problems that were later needed for their projects. In class quizzes were open notes/books and laptops.

2.3 Teaching cancer vocabulary and existing mathematical modeling related to cancer

Cancer vocabulary and existing mathematical modeling was next introduced to the students using a lecture like format. The sequencing of the lecture presentations was as follow:

1. Categorize existing mathematical modeling related to cancer. Cancer vocabulary, a history of mathematical modeling and current tendencies were presented to the students from Araujo (2004) and Cristini & Lowengrub (2010). The material was divided into cancer growth (in-vitro) and cancer regression during treatments. The latter was also divided into different categories of treatment (i.e. radiation therapy, chemotherapy, immunotherapy) and the mathematics that is used in the existing literature for each one of them was explained on the board.
2. Analyze the content of published papers. Published results were presented and analyzed during lecture. Key points of existing papers were analyzed and features of each were described and debated (i.e. what an abstract, an introduction, ..., conclusions section should include). Lectures included methodology for distinguishing between a) the biological and b) mathematical problem from a provided publication.

Students were tested on the ability to recognize specifications related to the mathematical and biological aspect from the modeling problem from a given published article (i.e. Figure 1. Sample student questionnaire).

2.4 Create a paper-like project

The biggest challenge for having to teach this research course was that students had different mathematical backgrounds. The most sensible decision was to have students choose their projects based on their mathematical background. The drawback to such approach was that in time, students required assistance and it became challenging for the instructor to respond to all requests during class time, and therefore difficult for them to advance their research.

All students completed a paper-like project to the best of their ability. Project feedback helped students to later create professional posters (most of them in LaTeX).

1. Is this a continuum, discrete or hybrid model?
2. Is this a tumor growth or tumor reduction under therapy model?
3. The problem in this work represents a:
 - Darcy Model
 - Stokes Model
 - Darcy-Stokes Model
 - None of these
4. Based on the space dimension, this study is a:
 - 2D model
 - 3D model
5. Based on the state of tumor and media, is this a:
 - avascular - in vitro
 - vascularized tumor modeled in silico or in vivo
 - angiogenesis - in silico
6. Based on the number of phases, is this a:
 - single-phase model
 - multi-phase model
7. Based on the mathematical tool, this is a(n):
 - ODEs problem - to model tumor as a homogeneous population
 - PDEs problem, which includes the diffusion equation
 - Integro-differential eq. problem, showing the evolution of heterogeneous cells.
8. What is (are) the main finding(s). Describe (i.e. include terms such as parameter meaning, tumor morphology, tumor evolution).

Figure 1. Sample student questionnaire.

3. Conclusions and future implementation

Northeastern Illinois University has a rich tradition of educational innovation and research is starting to emerge as an important component of its educational activities. Therefore, for such course, in order to prove successful, educational details such as “time-space” optimization techniques had to be implemented to ensure its success. Time optimization relates to the time spent on each of the teaching objectives, which in our case was about one month for the 2.1 and 2.2 objectives, 3 weeks for objective 2.3, and about 2 months for objective 2.4. This time optimization scheme proved to be beneficial for the most of the course participants, but not for those who had to switch to a different project. For the latter category a larger amount of time for the 2.4 objective seemed to be needed. By “space” optimization we refer to the type of teaching objectives as well as space configuration schemes for grouping students during the development of their projects. Students were grouped according to their mathematical background and a leader for each group was

selected. Since larger groups of students who shared materials were more productive, having one project with different components (i.e. same computational scheme but different mathematical functionality to reflect tumor dynamic) for the entire class might seem to be a more efficient solution.

The most successful and the least successful implementations, along with proposed new strategies were as follow:

- Most successful teaching strategies:
 - TeX instruction
 - Mathematica instruction
- Least successful teaching methods and proposed replacement strategies:
 - Implementing criteria on how to read and later structure a research paper, i.e. Borja (2014), and Weingast (2010), seemed like a good idea. Analyzing the components of a published article in class, followed by proper evaluation criteria improved student comprehension, however increasing the amount of time spent on such objective might seem beneficial to students.
 - Having different groups working on different projects. Overseeing different projects from different groups of students might prove exhausting for the instructor and unstable for the students, since they may wish to migrate from one research group to another and possible socialize while the instructor is taken by a group different from the one where the discussion is taking place. Having all students work on the same or similar project, and therefore use similar Mathematica functionality, but perhaps different equations might prove a good replacement strategy. Students could later choose to explore different project ramifications.
 - Interdisciplinary collaboration. In our case, the collaboration consisted of some students being able to collaborate with familiar faculty from biology. This could benefit some students but not the entire class. One improvement may include extending invitations to give talks to specialists from the industry, improve collaboration with faculty from biology who worked on related projects, and/or former students. Also, by

pairing up biology major students with students from the mathematics department might improve student performance.

Students from Mathematics, Computer Sciences, Biology, Chemistry, Environmental Sciences, and Education took this course, which proved to be a dynamic and energizing experience for them as well as for the instructor. The seminar provided students with the opportunity to learn applied mathematics in a context that students find compatible with their interests. The seminar also enriched instructor's experience regarding teaching a research course. The effectiveness of this particular activity was assessed using a survey and the results showed that out of all the responders that wish to continue their education, 75% agreed and 25% strongly agreed that the course influenced their decision to continue their education. Of these, 50% are considering a career in a bio-medical field. Also, from the responders about one third expect to use LaTeX in the near future, one third expect to use Mathematica software and one third expect to continue cancer research. As far as course improvements is concerned, about one third would have liked the course to include additional theoretical background and 20% would have liked that the course includes more medical terminology. The seminar concluded with student poster presentations at the International Conference on Risk Analysis (ICRA7). Eight posters were presented by our students. Of these, one poster won first prize, NEIU (2017). Based on positive feedback from faculty and students as well as student success, our institution agreed to permanently include this course in our university's curriculum.

This experience has taught us that in order to be successful in such an endeavor the instruction should include the right tools (such as TeX writing and Mathematica software), and the desire to maintain the correct balance between the computational and theoretical understanding of the subject matter. Proper research standards should be maintained and additional real-life projects could be included.

References

- Araujo, R. P., & McElwain, L. S. (2004). A History of the Study of Solid Tumour Growth: The Contribution of Mathematical Modelling. *Bulletin of Mathematical Biology*, 66, 1039-1091.
- Borja, A. (2014). 11 steps to structuring a science paper editor will take seriously. Elsevier. Retrieved from: <https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously> (accessed: February 5, 2018)
- Cristini, V., & Lowengrub, J. (2010). *Multiscale Modeling of Cancer: An Integrated Experimental and Mathematical Modeling Approach*. U.K. Cambridge.

- Marc U-Star Program at NEIU. Retrieved from: <http://cs.neiu.edu/wordpress/index.php/conferences-2/> (accessed: April 29, 2018)
- OEIS. (2017). List of LaTeX mathematical symbols. Retrieved from: https://oeis.org/wiki/List_of_LaTeX_mathematical_symbols (accessed: February 4, 2018)
- ShareLaTeX. Beamer. (2018). Retrieved from: <https://www.sharelatex.com/learn/Beamer> (accessed: February 4, 2018)
- ShareLaTeX. Posters. (2018). Retrieved from: <https://www.sharelatex.com/learn/Posters> (accessed: February 4, 2018)
- Schumacher, C. S., & Siegel M. J. (2015). 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences. MAA. Retrieved from: https://www.maa.org/sites/default/files/pdf/CUPM/pdf/CUPMguide_print.pdf (accessed: February 7, 2018)
- Weingast, B. R. (2010). CALTECH RULES FOR WRITING PAPERS: * HOW TO STRUCTURE YOUR PAPER AND WRITE AN INTRODUCTION. Retrieved from: https://web.stanford.edu/group/mcnollgast/cgi-bin/wordpress/wp-content/uploads/2013/10/CALTECH.RUL_.pdf (accessed: April 12, 2018)
- Wright, J. (2017). CTAN. The BEAMER class. User Guide for version 3.50. Retrieved from: <http://tug.ctan.org/macros/latex/contrib/beamer/doc/beameruserguide.pdf> (accessed: April 29, 2018)

Comparative analysis of career choices by students in Latvia and the UK

Bikse, Veronika; Lūsēna - Ezera, Inese; Libkovska, Una and Rivža, Baiba
Liepaja University, Latvia

Abstract

The purpose of this research study is to examine theoretical findings and, based on them, to identify the career choice factors that affect Latvian and UK secondary school students' occupational interests. The research was based on the theoretical concepts of the occupational interests, and the data gained from a survey of Latvian and UK secondary school students. The results of the research indicate that the most essential factors that help individuals to choose a career is to understand their own interests and explore their own capabilities. Also, learning experience and parents' advice is important for them. The occupational interests of the students, who were interviewed, are not harmonized with the demand in the economy.

Keywords: *career choice, education institutions, labour market trends, occupational interests, students.*

1. Introduction

The world of work has undergone rapid change in recent decades. ICT has dramatically changed how we live and work and how economies are structured (GEM Report 2016). Employment opportunities continue changing, and only the ability to understand developments, acquire and use information, general and professional knowledge and skills allow adapting to the changes fast and affectively. All these changes directly relate to the new generation that have to think of their choices of careers and education, as their individual growth and competitiveness in the labour market depend on that.

The importance of this issue has increased nowadays because, *firstly*, the development and competitiveness of the national economy, as never before, depends on the developed human capital, people's professionalism, interest to work actively and being innovative. Only work, corresponding to a person's abilities, desires and interests, can ensure real creativity and successful work in a definite field. It means that the choice of a career has always been and will be a topical issue and an important behaviour component taking part in one's life to set his/her goal to achieve the career. (Kumar, 2016) *Secondly*, forecasting and analysing this century's priorities, the correspondence of career choices by the youth to labour market trends and the role of career education are increasingly discussed. It is difficult for the youth to be competent in the broad diversity of professions, be aware of their talents and abilities as well as harmonise them with labour market requirements without the advice of adults. Under such circumstances, the role of comprehensive education increases, with the greatest focus being placed on career education, shaping school students' professional interests and harmonising their talents and skills with labour market trends.

2. Literature review on factors influencing the career choice

Various factors affect career choices of high school students. The review of the literature has showed that a number of different factors characterizing the impact on decision making by students of their career choices can be found. Having studied them, the conclusion is that, except for a few differences, all the authors include more or less the same factors such as: personality, interests, friends, parents, teachers, social status, prestige, career satisfactions, socio-economic factors, cultural identity, globalization, family business and others. (Kumar, 2016; Pascual, 2014; Fizer, 2013; Edwards, 2011) Other authors, for example Borchert (2002), have made a summary of different factors in three major areas affecting career choice: environment, opportunity and personality. *Environment* includes the forces of family, political, social, and economic issues. *Opportunity* – the issue of poverty; the income level of families may determine what career a student chooses during a specific time in the student's life. *Personality* - a characteristic way of thinking, feeling (attitudes and opinions) and behaving must be a self-motivated type; investigating career

possibilities from early years of the life plays an important role in the choosing of the right career. Summarizing the research done on the career choice factors by aforesaid authors, it is important to mention that there are the interrelationships of psychological, economic, cultural and sociological determinants of career choice decision making (Lombardo). Our position on the above-mentioned determinants identified by various authors could be supported in general. Before choosing a career, an important prerequisite is the formation of *professional interests* or the coordinated identification of the personality's interests, wishes, abilities and skills and the challenges of the 21st century and labour market trends. This means that all the mentioned determinants of career choice have to be taken into account, as well as their interactions.

As regards the concept of *occupational interests*, it consists of two components: occupational and interests. According to the English Cobuild dictionary, occupational means relating to a person's job or profession. (English Cobuild dictionary) However, a pedagogical term dictionary explains the word *interests* as an active attitude determined by needs, experience and choices to the objects of reality; it is a manifestation of human cognition, which directs the mental activity towards a certain object. (Pedagogical term dictionary, 1978) The concept of interests can be defined using a wide range of criteria, depending on what objects and subjects are examined.

According to Watts (2008) and OECD (2004), occupational interests consist of three broad categories: *learning goals* which include improving the efficiency of the education and training system, and managing its interface with the labour market; *labour market goals* - these include improving the match between supply and demand, and managing adjustments to change; *social equity goals* - these include supporting equal opportunities and promoting social inclusion. A challenge for all countries is to maintain an appropriate balance between them in the provision of services. A more detailed description on the concept of occupational interests is given by the Career and Employability Centre indicating that interests and motivations is a key stage in career exploration. It can help to formulate ideas about different job roles and it can be helpful to think about:

- **personality** - what are you like as an individual? what types of roles or workplaces would suit you?
- **abilities and skills** - what are you good at? what skills have you developed throughout your life so far?
- **interests** - what do you enjoy doing? what kind of careers appeal to you? (Careers and Employability Centre)
- **values** - what do you care about? what is important to you?

After summarising all the above, one can conclude that occupational interests are a prerequisite for the choice of a profession, as the process of formation of occupational

interests helps people clarify their [occupational interests] and preferences towards making these important decisions. This may be at the beginning of their working lives, but is also useful if people want to change or develop their careers or to explore options around professional specialization (Occupational choice). Accordingly, the authors of the paper believe that the concept of occupational interests needs to be developed and it could be defined as follows: *occupational interests represent the individual's self-cognition that allows identifying the wishes, abilities and specific skills that determine the choice of a career (field of activity) according to the challenges of the 21st century and labour market trends.* In order that *occupational interests* materialise into the choice of a particular career, they have to be shaped. It has to be understood that the formation of *occupational interests* represents a complex set of activities aimed at developing individual careers and helping to choose education and a career, which, in its turn, allows the personality to grow and get satisfaction from the job. To tackle this problem and successfully choose a career, it is important to design a career education programme that provides opportunities to achieve a real goal and results, which is possible if all interested individuals cooperate in an understandable, creative and democratic environment in order to transfer knowledge and built up necessary skills.

3. Research methodology and participants

The research methodology implemented for this research study involves an analysis of different career choice factors that affect Latvian and UK secondary school students' occupational interests. In order to find out about this, a comparative study was carried out within the present research on the basis of two different surveys of students: 1) survey of students carried out in Latvia and performed in 2015 by the State Education Development Agency. 1064 young people aged 14 to 19 were interviewed via the Internet website Draugiem.lv (State Education Development Agency, 2015) and 2) survey of students in the UK carried out by the market research agency YouGov in the UK questioning 3,154 young people aged between 14 and 19 via YouGov's online research panel on 10 September 2015 and 22 September 2015 asking them about their career choices and considering the future of the UK jobs market. The survey was carried and weighted to be representative of the UK sample aged 14-19 years (City & Guilds, 2015). The comparison of the surveys of UK and Latvian students was performed to identify the youth's professional interests in two European Union Member States with significantly different standards of living and economic development levels: according to the World Bank data for 2016, GNI per capita in the UK in the US dollar value - 42,360; while in Latvia - 14,570 or 2.9 times lower. (World Bank Country and Lending Groups)

4. Research findings

The preparedness of young people to integrate into the labour market means developing their occupational interests, so that they are successful in choosing their careers and the further education field. To find out whether the occupational interests of youth correspond to the labour market requirements, comparative analysis was used in the study performed on the basis of student surveys that were carried out in Latvia and in the UK. Secondary school students' responses have been summarised in Figure 1.

As shown in Figure 1, over 68.1% of Latvia's respondents considered personal interest in influencing an individual's career choice important because they believed the most important thing was to understand their own interests and explore their own capabilities. In contrast to the UK survey results, only 36.0% of the students stated this fact. These results are in agreement with those of Edwards (2011) and Borchert (2002) who reported that when choosing careers, most students consider their interests.

Our research also indicates that young people do not see career advice as important. Of the UK youth, only 5% said that a careers advisor would help the most in getting a job they would be satisfied with, and when asked why they were thinking of a particular career, only 14% said that a careers advisor had recommended it. A comparison of the responses of Latvia's respondents reveals that the role of career consultations in choosing one's future career was less important: only 1.6% respondents considered that a careers advisor would help with career choices (Figure 1).

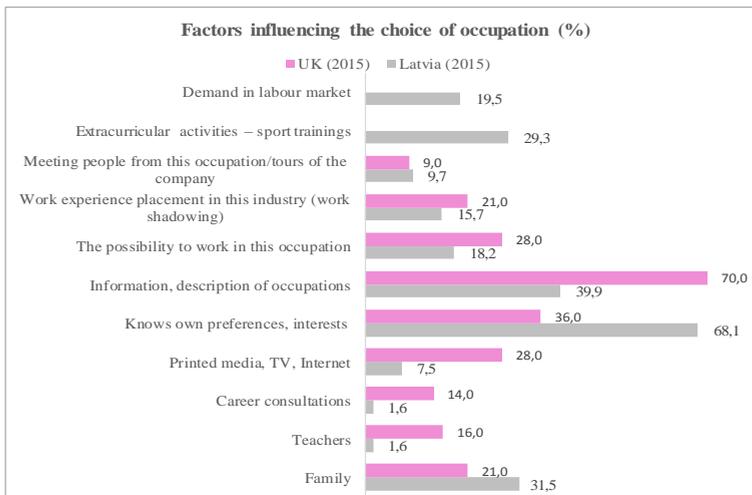


Figure 1. Comparative analysis of the student surveys on career choice factors in Latvia and the UK. Source: authors' compilation based on the State Education Development Agency data, 2015 and City & Guilds, 2015

As mentioned above, when choosing one's career, it is important to align one's interests and capabilities with the needs of the economy. According to the survey data, only 19.5% of Latvia's respondents took into account the demand in the labour market and the trends when choosing their career. Moreover, 35.9% respondents noted that the information about occupational opportunities was not sufficient to help them make appropriate career choices. Moreover, just 7.5% of Latvia's respondents said that the printed media, TV, the Internet were an important information factor. Nearly all of Latvia's respondents admitted that they needed some help in getting information about the contents of the career and remuneration, as well as the labour market development trends and education institutions that provided training opportunities. According to the UK survey results, 70.0% respondents stated that information and the printed media, TV, the Internet (28%) were the main factor that impacted decision making by students of career choices. It has to be mentioned that the information – about the self, about education and training opportunities, about occupations and their characteristics, about the labour market supply and demand – was central to notions such as the self-concept and career decidedness. Information on the labour market supply and demand, including local and regional information as well as national information, is an essential element of career information. (OECD, 2004)

To choose an occupation, it is essential to find out if the learning experience of a student has any influence on his or her career choice. The results in Figure 1 show that hands-on experience built up by getting engaged in summer jobs and extracurricular activities, visiting companies/institutions and meeting people of the particular occupation was also of great importance in taking a decision. Responding to the question: "In your opinion, how can one get the most extensive information about different occupations in order to learn about them?" of Latvia's respondents, 41% said that meeting and talking to people working in this occupation was the most important factor (State Education Development Agency, 2015). Comparing the responses of UK respondents about their career aspirations, it was found out that the good exam results (58%) and going to university (39%) was the best route to a good career, instead of apprenticeships (19%) or a professional qualification or training (13%) (City & Guilds, 2015).

Thus, we can conclude that the factor that most influenced the students' choices was their personal interests. At the same time, the authors consider that it is important to choose an occupation that is in line not only with one's personal interests but also with the needs of the economy as well. Otherwise, one might have to work in a job that does not correspond to the qualification acquired.

5. Conclusion and recommendations for a future study

The research findings show that before choosing a career, an important prerequisite is the formation of occupational interests or coordinated identification of the personality's interests, wishes, abilities and skills and the challenges of the 21st century and labour market trends.

Based on the analysis of the surveys of students on the factors that impact decision making by the students of their career choices, it was found out that in the process of formation of occupational interests, the youth's wishes, talents and skills were not harmonized with the needs of the economy. Latvia's high school students, when choosing their future careers, were mainly guided by their own personal interests. Also, learning experience and parents' advice were important for them. At the same time, the requirements of the labour market were not considered to be an important factor. It means that Latvia's students need some help in getting information about the contents of the labour market development trends and education institutions that provide training opportunities. However, 70% of the UK students were confident they had all the information they needed to make an informed choice about their career. At the same time, it was concluded that young people weren't getting objective information on careers (City & Guilds, 2015). This suggests that career education activities at comprehensive schools are inadequate.

The future demand and supply situation in the labour market depends on today's decisions made by young people when choosing their careers. In this context, it is important to take into account that students' occupational interests are closely linked to their decisions both in relation to the choice of courses in high school and about their studies in higher education (Germeijs and Verschueren, 2006) and these decisions can affect their future career. Therefore, it is necessary to implement better targeted activities in career education and to establish closer links between the education system and the labour market. Similar to the results of this study, Ukil (2016) found that there was a significant correlation between career education and the occupational interests of youth. At the same time, the authors consider that it is necessary to do more research on occupational interests of youth, career choices by higher education institution students and their correspondence to labour market trends.

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References

- Borchert, M. (2002). *Career choice factors of high school students*. A Research Paper. Retrieved from <http://www2.uwstout.edu/content/lib/thesis/2002/2002borchertm.pdf>
- Careers and Employability Centre. Your interests and motivations. Retrieved from <http://www.sussex.ac.uk/careers/careerchoices/interests>
- City & Guilds. (2015). Great Expectations, Great Britain. Teenagers' career aspirations versus the reality of the UK jobs market.
- GEM Report. (2016). Education for people and planet: creating sustainable futures for all. UNESCO, second edition published in 2016 by the United Nations Educational, Scientific and Cultural organization.
- Germeijs, V. and Verschuere, K. (2006). High School Students' Career Decision Making Process: Development and Validation of the Study Choice Task Inventory. *Journal of Career Assessment*, Vol. 14 (4), 449–471
- Edwards, K. and Quinter, M. (2011). Factors Influencing Students Career Choices among Secondary School students in Kisumu Municipality, Kenya. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, 2(2), 81-87
- English Cobuild dictionary. Retrieved from <http://dictionary.reverso.net/english-cobuild/occupational%20interests>
- Fizer, D. (2013). Factors Affecting Career Choices of College Students Enrolled in Agriculture. A Research Paper Presented for the Master of Science in Agriculture and Natural Resources Degree. The University of Tennessee, Martin. December 2013. Retrieved from http://www.utm.edu/departments/msanr/pdfs/Fizer_Research_Project_Final.pdf
- Kumar, S. (2016). Career Choice and College Students: Parental Influence on Career Choice Traditionalism among College Students in Selected Cities in Ethiopia. *International Journal of Psychology and Educational Studies*, 3(3), 23-30.
- Lombardo, J. Factors Affecting Occupational Choice: Psychological, Social, Economic, and Cultural. Retrieved from <https://study.com/academy/lesson/factors-affecting-occupational-choice-psychological-social-economic-and-cultural.html>
- OECD (2004). *Career Guidance and Public Policy: Bridging the Gap*, OECD Publishing, Paris.
- Occupational interests. Retrieved from http://psychology.wikia.com/wiki/Occupational_interests
- Occupational choice. Retrieved from http://psychology.wikia.com/wiki/Occupational_choice
- Pascual, N. T. (2014). Factors Affecting High School Students' Career Preference: A Basis for Career Planning Program. *International Journal of Sciences: Basic and Applied Research*, 16(1), 1-14
- Pedagogical term dictionary. Riga, Liesma, 1978.
- State Education Development Agency (2015). *Open the door to your future occupation!* Retrieved from https://infogr.am/viaa_aptauja_2015.

- Ukil, M.I. (2016). Career barriers to career indecision: a final-year BBA student view. *Polish journal of Management studies*, 13(1), 192–205.
- Watts, A.G. (2008). Career Guidance and Public Policy. In: Athanasou J.A., Van Esbroeck R. (eds) *International Handbook of Career Guidance*. Springer, Dordrecht, Pages 341-353.
- World Bank Country and Lending Groups. Retrieved from <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

Use of Software Tools for Real-time Monitoring of Learning Processes: Application to Compilers subject

Sánchez, Francisco Javier and Bernal, Jorge

Computer Science Department and Computer Vision Center, Universitat Autònoma de Barcelona, Spain

Abstract

The effective implementation of the Higher European Education Area has meant a change regarding the focus of the learning process, being now the student at its very center. This shift of focus requires a strong involvement and fluent communication between teachers and students to succeed. Considering the difficulties associated to motivate students to take a more active role in the learning process, we explore how the use of a software tool can help both actors to improve the learning experience. We present a tool that can help students to obtain instantaneous feedback with respect to their progress in the subject as well as providing teachers with useful information about the evolution of knowledge acquisition with respect to each of the subject areas. We compare the performance achieved by students in two academic years: results show an improvement in overall performance which, after observing graphs provided by our tool, can be associated to an increase in students interest in the subject.

Keywords: *Monitoring; Evaluation tool; Gamification; Student motivation.*

1. Introduction and Motivation

During the last decade, and thanks to the implementation of the Higher European Education Area, there has been a shift in terms of focus in the learning process being the student at its center. As part of this change, some actions have been undertaken such as decreasing the number of students in each class to ease student-teacher interaction as well as changing the balance between theoretical and practical sessions. As a result of these changes, teachers have also had to adapt the way students are evaluated towards a more continuous evaluation.

The continuous proposal and evaluation of learning activities is a high time consuming task, which also needs of strong student motivation to take part in the different proposed activities. As students have to divide their efforts among the different subjects, it is difficult to pursue them to work continuously on each of them as they tend to focus on the most immediate assignment deadline. This, along the low attendance to classroom activities, Bukoye (2017), makes it difficult teachers to have continuous information about evolution of the learning process. This only allows us teachers to correct potential knowledge gaps in specific moments in the semester, mainly as a result of evaluation activities.

To overcome this, some alternatives have been proposed such as rewarding the students for their attendance to classroom activities Bukoye (2017), involving students in the evaluation Valero (2010) Conde (2017) Harland (2017) or, more recently, to include gamification in the learning process Kapp (2012) Su (2015) Mauricio (2017).

As a use-case, we show how we have adapted the subject we teach to the new learning process focus Valero (2010) García-Peñalvo (2014). Our subject is part of a Computer Sciences degree and requires students to learn the basics of compiler building theories. One big part of the subject involves students to build their own compiler; this task is supported by explanations during theoretical and seminar activities. As a result of our experience over years, we have observed the following problems associated to the practical part of the subject: 1) low students attendance and performance and 2) big performance gap between practicum exam and practicum assignments. Students work in pairs and are evaluated individually del Canto (2015) at the end of the semester to verify that each of them have actually taking part in the practicum assignment.

We associate differences between assignment and exam marks to individual students taking charge of a group assignment, excessive help among students and practicum copying, as all students had the same assignment. These reasons might come as a result of low student motivation in the subject, which can be caused by the appearance of difficulties in the learning process that the student is not able to solve and, as they are not known by the teacher, they are difficult to solve.

We study in this paper the role of that a software tool can have to support students learning process. The tool proposed incorporates evaluation and monitoring capabilities so the teacher can know in real-time the level of assessment of the different concepts at a glance without requiring additional information to students. We study the benefits associated to the use of the tool by comparing students performance over two consecutive academic years.

2. Learning Process Monitoring Tool

We present in this section our learning process support tool. To ease readers understanding, we use as example a real assignment from our subject. The task students have to undertake is to add new functionalities over a basic compiler.

2.1. Assignment Preparation

At the beginning of the semester, the teachers define the different additional functionalities that will be incorporated to the compiler. For each functionality, several variations are explored aiming to cover all possible different scenarios that the compiler might face (an example is shown in Fig.1).

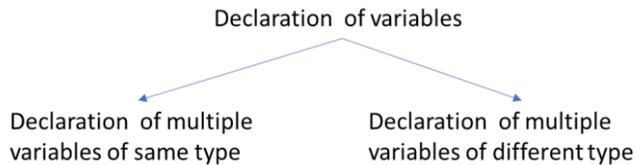


Figure 1. Examples of how variations are defined from a single functionality.

Each variation is given a difficulty score by the teachers, as a result of both personal experience and students observation during the previous academic year. To assign the functionality variations each student has to work with, we use the *assignment preparation tool*. This tool works under the following rules: 1) all assignments have to be different, 2) all the assignments should have a similar difficulty, and 3) all assignment should have one variation from each functionality. This is achieved by the use of a backtracking algorithm Priestley (1994). The teacher can incorporate additional constraints such as imposing compulsory functionality variation to tackle. The use of this tool naturally prevents students from copying, as none of them has all the same functionality variations to add.

2.2. Assignment Evaluation

In order to assess that these functionalities have been correctly incorporated by students, two different types of tests are designed. Public tests aim to assess if the student has acquired the basic knowledges of the subject whereas private ones are focused to explore if

students have gone beyond the minimum requirements in order to build a more robust solution. Private tests do not require additional theoretical explanations but a careful thought about the solution that is being prepared. As an example, a public test will check if the power operation between integers provide the expected results whereas the private one will explore whether the combination of some variable types is allowed (i.e., the compiler should not allow the power between an integer and a character). The content of the public tests is known by the students in advance, and they should be all overcome in order to pass the subject. Private tests are not known by the students and they are used to modulate the mark between 5 and 10.

Students can upload their solution to the assignment using a dedicated website. Every time a new delivery is uploaded, the *assignment evaluation tool* checks whether the tests associated to each of the student-specific functionality variations are overcome. This tool provides instantaneous feedback to the student by generating a report summarizing the level of assessment of the different proposed tasks. This is an evolution over what was done in previous years, as students have to ask the teacher to test their solution which might delay the obtention of the feedback as well as having information about the progress of the learning activities.

For the case of private tests, we only inform students about the percentage of private tests that have been overcome as a way to encourage them to try harder in order to achieve the maximum mark, inspired by gamification theories. By doing this, we aim to transform knowledge acquisition into a discovering experience that can motivate students to gain interest in the subject, as they are ‘battling’ against the unknown.

2.3. Performance monitoring

As students upload the solutions to their assignment, the *performance monitoring tool* also generates a text file that, conveniently processed by common software tools, can provide teachers with useful information with respect to the evolution learning process. For instance, we can easily obtain the following information: 1) number of deliveries and its evolution over time per group or class, 2) percentage of functionalities, variations and test that have been overcome by each group or class, and its time evolution.

By this information, teachers can have information about the level of interest of a group (number of deliveries) or difficulties associated to specific functionalities (low number of tests overcome with respect to the number of deliveries). As the system allows teachers to have this information in real time, learning actions can be implemented to solve knowledge gaps during theoretical and seminar activities and, by this, improve the level of students assessment of the different key concepts.

3. Results

We show in Table 1 a comparison of students performance in two consecutive years: 2015-2016 and 2016-2017. During the latter, the learning process monitoring tool was used. The difficulty level of the practicum was equivalent.

Table 1. Students performance over two consecutive academic years.

Year	Students passing the subject	Students passing practicum exam	Students passing assignment	Students passing practicum
2015-2016	17 out of 57 [29.82%]	20 out of 57 [35.08%]	47 out of 57 [82.45%]	29 out of 57 [50.87%]
2016-2017	49 out of 73 [67.12%]	49 out of 73 [67.12%]	62 out of 73 [84.93%]	57 out of 73 [78.08%]

The main result of this study is a general increase in student performance, which is specially observed with respect to the practicum exam where the percentage of students that surpass the minimum mark is almost doubled. This improvement in the practicum marks is also reflected in the ratio of students that pass the subject, doubled from previous year. We associate improvements in students performance to them being more engaged to the subject. In order to check the validity of this conclusion, we present next some graphs extracted by the use of our *performance monitoring tool*.

Fig. 2 shows the evolution in the number of mean deliveries per group and the mean mark during the period the assignment is active. We can observe how students interact continuously with the tool (though peaks can be observed coinciding with practicum classroom activities). We can also see how the majority of the students achieve the assigned task before delivery date and how, as a result of their interest in the subject, they keep improving their solution which results in an increase in the final mean mark.

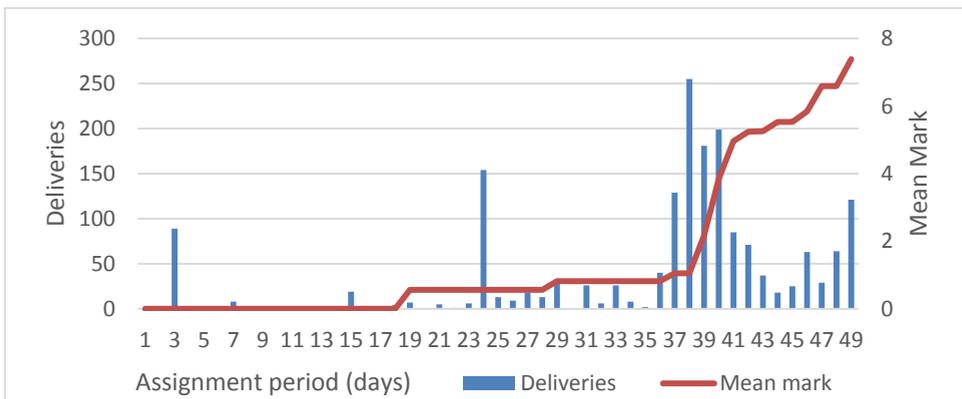


Figure 2. Evolution of the number of deliveries and mean mark over the assignment period.

Our tool also allows teachers to observe which of the tasks presented more difficulties to students. Fig. 3 shows the dependence between the functionality and the number of times the student has tried to overcome the different tests associated to it. We can observe how some functionalities (Parameters, Operators) needed of less effort than others, especially Initialization. This information can be used to reinforce the theoretical explanation of some concepts to reduce the effort needed.

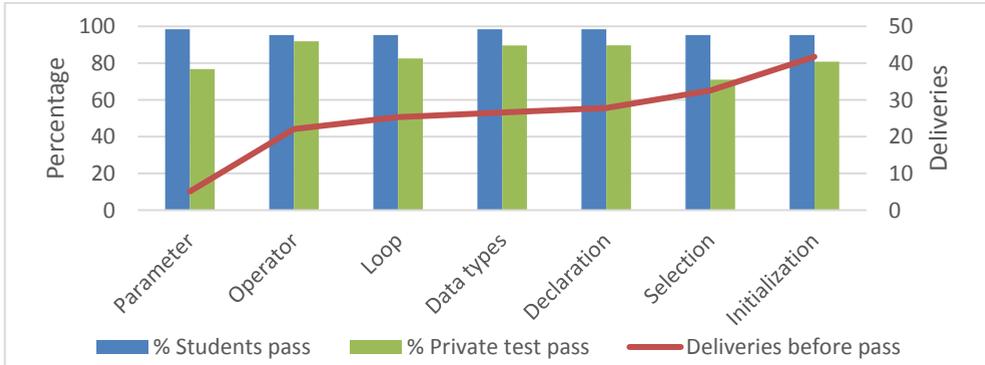


Figure 3. Effort associated to each of the functionalities proposed to the students.

Our tool also allows us to observe in detail the performance related to each functionality. Fig. 4 shows how a very small reduced number of students overcome Object recursion, indicating an area in which to apply a learning action.

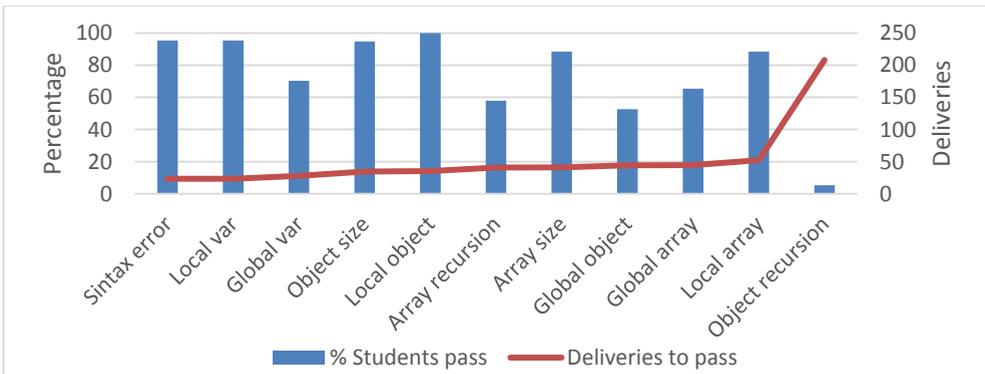


Figure 4. Effort associated to each of the private tests associated to Initialization functionality.

Finally, Fig. 5 shows the global results obtained by the students in all the different functionalities variations that were studied. This graph allows us to determine which of them were easier for the students (higher percentage of overall success and higher percentage of hidden test overcome) as well as to observe which of the sub-functionalities required more effort by the students to obtain the minimum required mark. This

information can be used to prepare the assignments for a new academic year, as teachers have powerful to better balance between assignments.

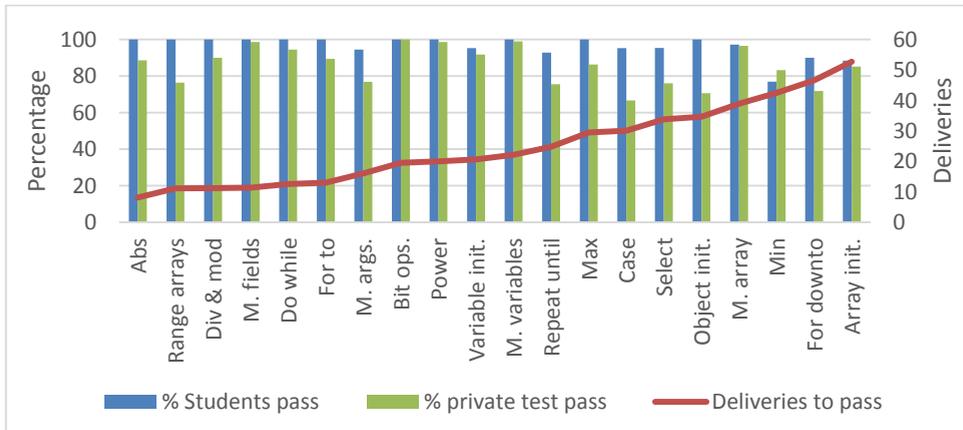


Figure 5. Effort associated to each of the functionalities variations proposed to students.

4. Conclusions and future work

Keeping a high level of interest of the student in a given subject is key to a positive result of the learning process. In this paper we have proposed a software tool to observe students learning process. Our tool incorporates assignment preparation and evaluation as well as monitoring capabilities.

Our tool allows students to have immediate feedback of their performance and also allows teachers to have real time information about students progress. This information can be used to correct knowledge gaps during the present course or to plan improvements in the learning activities of the subject for a posterior year.

A comparison study between two academic years shows promising results associated to the use of the monitoring tool, which suggest that the improvement in overall performance can be associated to an increase in students interest.

Future work should consist of incorporating a control panel which allows the teacher to have direct access to student-specific graphs. We also plan to generate student-specific reports indicating them areas in which they have to improve as well as suggesting supporting material to study. Finally we would like to study the use of mobile applications , either to adapt the ones we propose or use already existing ones such as Kahoot Wang (2016) or Plickers Wood (2017), to obtain real-time information of students learning assessment in order to extend our proposal to lecture classroom activities.

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References

- Bukoye, O. T., & Shegunshi, A. (2016). *Impact of engaging teaching model (ETM) on students' attendance*. Cogent Education, 3(1), 1221191.
- del Canto, P., Gallego, I., López, J. M., Mora, J., Reyes, A., Rodríguez, E., ... & Valero, M. (2015). *La evaluación en el contexto del Espacio Europeo de Educación Superior*. Revista de Educación a Distancia, (1DU).
- Conde, M. Á., Sanchez-Gonzalez, L., Matellan-Olivera, V., & Rodríguez-Lera, F. J. (2017). *Application of Peer Review Techniques in Engineering Education*. International Journal of Engineering Education (IJEE).
- García-Peñalvo, F. J., Cabezuelo, A. S., & Rodríguez, J. L. S. (2014). *Innovating in the engineering processes: Engineering as a means of innovation*. IEEE Revista Iberoamericana de Tecnologías del Aprendizaje, 9(4), 131-132.
- Ghosh, D., & Bhaduri, U. (2017). *A simple recursive backtracking algorithm for knight's tours puzzle on standard 8× 8 chessboard*. In Advances in Computing, Communications and Informatics (ICACCI), 2017 International Conference on (pp. 1195-1200). IEEE.
- Kapp, K. M. (2012). *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education*. New York: Pfeiffer.
- Harland, T., Wald, N., & Randhawa, H. (2017). *Student peer review: enhancing formative feedback with a rebuttal*. Assessment & Evaluation in Higher Education, 42(5), 801-811.
- Su, C. H., & Cheng, C. H. (2015). *A mobile gamification learning system for improving the learning motivation and achievements*. Journal of Computer Assisted Learning, 31(3), 268-286.
- Valero García, M., Canto Rodrigo, P. D., Gallego Fernández, M. I., López Canalda, J. M., Mora Serrano, J., Reyes Muñoz, M. A., ... & Santamaria Barnadas, E. (2010). *Evaluación entre compañeros: Cómo lo hacemos en nuestros cursos de programación de ordenadores*. In VI Congreso Internacional Docencia Universitaria e Innovación (pp. 1-16).
- Wang, A. I., & Lieberoth, A. (2016, October). *The effect of points and audio on concentration, engagement, enjoyment, learning, motivation, and classroom dynamics using Kahoot!*. In European Conference on Games Based Learning (p. 738). Academic Conferences International Limited.
- Wood, T. A., Brown, K., & Grayson, J. M. (2017). *Faculty and student perceptions of Plickers*. American Society for Engineering Education, San Juan, Puerto Rico. IP, 5(31.210).

Educating designers through Materials Club

Zhou, Ziyu ^a; Rognoli, Valentina ^a and Ayala-Garcia, Camilo ^b

^aDesign Department, Politecnico di Milano, Italy, ^bDesign Department, Politecnico di Milano, Italy; Design Department, Universidad de los Andes, Colombia.

Abstract

Materials education is a crucial element in the field of design. Traditionally, learning about materials is theoretical and book based. However, the appearance of Fab labs in universities add tangible opportunities to enhance materials knowledge. Fab labs combined with classroom didactics create an experimental dimension transforming the original material didactics into participatory activities. This paper aims to analyze how existing Fab lab systems can be reframed to maximize benefits in the material education in the design domain. As a result, we propose the concept of Materials Club. The club is a system made to support design students connecting different resources and facilities to experiment with materials during the development process of their projects. This scenario also promotes methods, which could valorize the existing resources in universities and integrate them into a virtuous system improving current design and material education. We believe that the Materials club can become an essential tool making contribution in materials education.

Keywords: *Material education; Fab labs; Personal fabrication of materials; Educational community; System design for education.*

1. Background

Materials knowledge is considered a fundamental pillar in the field of design (Ashby & Johnson 2002). It becomes a crucial element of the design education and is catching the attention of scholars' research. Primarily as the traditional ways of educating designers around materials are proven to suffer from a lack of engagement. Secondly, as the learning process around materials should be about handling and interacting with them, rather than learn only through theories and tables. This paper aims to investigate how the materials education changed and evolved in the last ten years, especially in the field of design. By doing so, we formulate the idea of Materials clubs as active and interactive places to learn about materials and do with them.

The didactics of design consists on a series of relationships and mixed theories from a wide range of disciplines. Designers need to have a broader knowledge in different areas and should understand and dialogue in different languages. Materials knowledge have acquired vital importance in the design process, and as a consequence, the way they are taught requires constant improvement. Today materials education in the field of design cannot be only learned from diagrams technical descriptions, but should also include materials experience boards and experimental storytelling. In other words, materials education should shift from a technical and sometimes complex knowledge approach from engineering and materials sciences to experimentation and the involvement of crafts. (Ayala-Garcia, 2014; Nimkulrat, 2012): All this by acknowledging the designer's way of knowing and the different approaches we have to materials.

The phenomenon of digital fabrication laboratories or Fab labs in the last decade has helped enormously in this transition, as students are engaging more with the knowledge of digital crafts and transformation of materials in novel and creative ways. These Fab labs have a high potential to change and switch the original material didactics into participatory activities, also with the help of the internet and the open-sourced communities. Every year thousands of improvements within the labs, the machines and the capabilities for manufacturing different shapes are added by these communities around the globe (Anderson, 2012 p 25). This didactic trend drives our attention as it can enhance materials and design education as well. To help understanding which is the opportunity for material education connecting Fab labs' widespread in universities is essential to highlight the benefit of Fab labs. A Fab lab, which is short for fabrication laboratory, is a small-scale workshop offering personal digital fabrication based on tools and machines for every aspect of the technology development process: design, fabrication, testing and debugging, monitoring and analysis, and documentation (Mikhak et al., 2002). Since 1980's, faculty and employers in universities and research centers started to consider that design graduates have not prepared themselves in doing any real design work. This consideration became important for influencing the design education (Sheppard & Jenison, 1997) as we give more

attention to the ability of a designer to do a project with the knowledge he or she acquired. Meanwhile, with a large-range dropping in price of digital fabrication equipment in during the following twenty years, the development of product moved towards the small-scale model type, typical of the design studios (Blikstein, 2013). Both reasons drove the growth of Fab labs in universities. The first Fab lab was born at the Media Lab in Massachusetts Institute of Technology in 2001 (Gershenfeld, 2007), and quickly spread over the world becoming a vibrant global movement. Fab lab shortens the process of turning a students' concept into a real prototype, with its low-cost building. By 2012 many schools and universities announced plans to build digital fabrication and 'making' facilities. The trend became mainstream afterwards (Blikstein, 2013).

This digital manufacturing space, give technical and physical support to design education. Equipped with different small size machines (Namely, CNC, 3D or Laser cutting machines), in Fab labs is possible to produce industrial and electronic projects with raw materials on a small scale (Diez, 2012). Moreover, this democratization of computational media and digital fabrication could drive powerful ideas in design (Astrachan, Hambruch, Peckham, & Settle, 2009; Yasar & Landau, 2003). With high levels of autonomy, students can achieve more knowledge and practice in peer to peer study actions. During the elaboration of prototypes, students are encouraged to brainstorm together and to evaluate each other's work. By doing so, they spark discussions within a co-working atmosphere (Mostert-Van Der Sar, 2013). Also, it gives the possibility of interdisciplinary cooperation, which allows students to acquire different knowledge. In the process of working with the diverse backgrounds, design students can help each other in the process of turning raw materials into an interdisciplinary project (Mostert-Van Der Sar et al., 2013).

As the role of materials is becoming critical in the design process, the ability of the designers to deal with materials is being more emphasized than before. Design students are getting in touch with materials and processes on a different scale. The practical action drives students to think more about the materials and how they can express the features of the design adequately. Also, students get inspired to develop a project through the understanding of specific materials qualities. In the same manner, the material libraries surpass the classical way of teaching materials with engineering manuals and data by inspiring designers with real samples, Fab labs and the DIY approaches transcend the material libraries by encouraging students to tinkering with the materials and learn through experimentation. In this scenario, we believe Materials Club will enhance the design education by adding these labs into a system. This system will connect the students with the different tool which can help in the process of a material transformation. By doing so, Materials education is more likely to become a physical practice than a theoretical acquiring of knowledge.

2. From Fab labs to Materials Clubs

As we mentioned above, Fab Labs are evolving as materials knowledge is becoming a crucial part of the development of a project. We created a concept called Materials Club. We see these Clubs as hybrid systems where physical laboratories and virtual platforms meet to aid designers in the process of materials development. By putting the material at the center of the project, and enabling the different tools of an academic infrastructure, we believe it is possible to engage students to develop meaningful projects, creating materials experiences embedded in their creations. Several scholars have already argued, the importance to create a project starting from the materials (Manzini, 1986); tinkering with the materials as a way to get inspired by their qualities and therefore develop a project enhancing the features of the material (Parisi et al., 2017). Designing using material driven methods (Karana et al., 2015) and dealing with materials in different stages of the process and not only in the selection phase (Rognoli & Levi, 2011).

For the creation of the Materials Club, we decided to study Politecnico di Milano's school of design laboratory system, which includes Fab Labs such as Polifactory and other labs. One of the primary objectives of this project is to enhance the use of existing resources without the necessity to build specific infrastructure. Sometimes the creation of a new laboratory requires a solid investment and is expected to bring constant research to keep it going. If no projects run on the laboratories, the lack of use the machines and infrastructure could represent a loss of investment and endangerment of the research itself. One of our goals is to connect different laboratories allowing constant use by students and researchers. We started by mapping and understanding the role of the various laboratories that support didactics and how much they contribute to materials education in design. In the current stage of fab labs and laboratories system of the university, we have found some critical points like the lack of connectivity between the labs, the restriction to use a particular machine due to the complexity and how bureaucracy can delay the process during an academic or research project.

2.1. Turning "passive" material study into the initiative

The school of Design of Politecnico di Milano, like other design schools, have a straight top-down approach when it comes to laboratories. It contains a considerable amount of laboratories which operating similar to Fab labs with open-source infrastructures for teaching and services. They are spread in different locations around the Lombardy region with various equipment for specific functions and to support particular academic and research activities. Within these laboratories students from different levels of education, namely Undergraduate, MSc. and Ph.D. students, create their design projects or handle some interdisciplinary ones. As a politic of the school, students need for security reasons to fulfill different tests for machinery as well as to demonstrate a complete understanding of

the ways to operate machines and different protocols to deal with the available tools in different labs. This is of particular importance as the university is one of the biggest in Europe and there are too many students accessing the laboratories¹.

Being so widespread not only in the Milan area but also in Cremona and Lecco regions makes communication through email the more useful way to deal with permission access and related information of operation of laboratories. This system of communication, however, has proven to be less efficient when it comes to the development of a design project, as usually, the time to prototype, construct, test and present a design development during a course, occurs in the last three to four weeks of the course calendar. Another element of great aid and the development of the design project is the material library of Politecnico, the first academic material library (Rognoli, 2005). This material collection has been recently acquired by the library system of the university which has allowed the material samples to be available for online consultancy, but it is now transferred inside one of the libraries of the campus with limited schedule and access.

These resources have significant benefits in design and material didactic. Students are gaining materials knowledge and have well-equipped spaces for developing their prototypes. However, we can strengthen these benefits by enabling students to get achievements more actively. Instead of being managed exclusively by teachers or school managers, students could access and find opportunities independently and proactively to enhance their design study process. In this perspective, we can see that the system of the labs and infrastructures in university could be optimized. By reframing the system, changing students' role inside of it, they can shift from "passively receiving information" to "seek resources and actively share outcomes". It could be a feasible way to maximize the whole process of design, and it will collaborate to fulfill the goal of allowing the materials tinkering, knowledge and development process to be in the early stages of the design process.

2.2. Broaden the channel for peer learning

When students work on processing materials in a well-equipped spaces with other peers, they have more willingness to seek resources and share outcomes with each other. Besides, with the interdisciplinary cooperatives occurs more, students demands more on the quantity and quality of communication. Only interactions in labs and other tangible spaces in school cannot satisfy the need for large amount of exchanging knowledge and experience. Therefore, consider the channel of communication is narrow, Materials Club devotes to broaden the way helping students connect with each other. In addition to the

¹ Politecnico di Milano is the Italian largest university for Engineering, Architecture and Industrial Design and it is ranked as one of the most outstanding European universities in these fields. In QS world university ranking, it ranked fifth in the subject of Art & Design.

complete offline actions and interactions, the online channel is necessary to enhancing the sense of participation among students and engaging them share their material knowledge. With all the reasons above, we came out the conception of Materials Club.

3. Conception: the system and organization of Materials Club

According to the what we could do on the optimization of the lab system in university, there is a scenario to build the network of Materials Club which could connect all the touchpoints and stakeholders. We defined Materials Club as a campus-based system with a combination of tangible spaces and intangible platforms, for enabling design students to understand, get engaged and explore materials more independently.

Systems are complex entities; to understand its behavior is crucial to map and understand the roles of the different stakeholders inside of it. In this stage of the research, the initial mapping provided a more precise picture of integration. Our initial step to understand how the materials club system could work is called LabMap. It can be treated as prima step as well as the foundation for this system because it takes the first step of building connections. It lists the spaces and tools which related to materials all around the campus, with the introduction and highlighting of the benefits students can get from them. We expect to test this LabMap with different students from the BA until the Ph.D. level. This test will allow us to see how by using the various searching functions, students can precisely find what resource could help them to understand the material and its properties, as well as the possible ways to process and experiment with it. (figure 1).

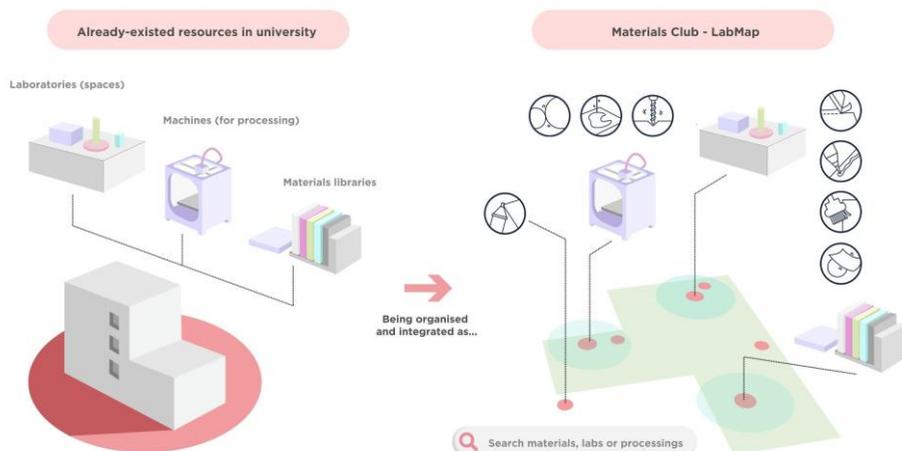


Figure 1. The concept of building the Materials Club-LabMap.

With the help of LabMap, there is a strong connection between people and infrastructures together, and giving design students more opportunities to interact with materials (select materials tangibly in Materials library; personal fabrication programs in labs). The second step will consist in enriching the system by linking the students into a network: we expect to broaden the channel for engaging peer learning by providing more ways of individual interactions, to reinforce the peer-learning and find material experts. In this case, Materials forum will work as an online community of the Materials Club. A team of professors, researchers, technicians will support students in the different stages of the materials development. Either by providing information about a particular material property or the uses and tricks of a specific machine, It can extend students' learning opportunities outside the physical fab labs.

In this second step, we will test how students interact with the network of the system. Leaving messages to others and get feedback, start a creative discussion, share knowledge or even propose an idea to find cooperative opportunities.

We expect to open the door to design students discovering the world of materials by this enabling system of Materials Club. Although it is in the initial phase of the development, it highlights already the demand for a significant amount of research to carry out. The further studies will suggest possible ways to link every stakeholder and every craft activity related to materials development. At the end of the project, we expect the Materials clubs to become an essential tool in the materials education.

4. Discussions

Similarly, how Fab labs brought a revolution in design didactics by shortening the gap between the thinking and the making, we proposed the concept of Materials Clubs as an optimization tool for the materials education. We can say that Materials Club is an entire service system contributing to material education and research by enabling the active interaction theoretical and physical elements of its domain. This open-source community should be flexible, easy-going and co-creative. With it, students get access to information and material knowledge more comfortable and more autonomous.

Because the primary driver of Materials Club is the connection of resources inside the existing lab system of an institution, we believe is a model with high levels of applicability.

Furthermore, Materials Club could enrich the network of Fab labs and Fab cities. As Diez states, with the development of personal fabrication, the open source philosophy both in software and hardware becomes more accessible to the masses and are being shared all over the world (Diez, 2012). The future of production and its relation to the environment will

rely on the different connection of systems of production, and we believe materials education through Materials Clubs can be one of the various strategies to make it possible.

References

- Anderson, C. (2012) *Makers-The New Industrial Revolution*. Random House Business Books.
- Ayala-Garcia, C. Ayala, C. (2014) Experimenting with Materials – A source for designers to give meaning to new applications, Proceedings of the Design and Emotion Conference 2014 (pp. 408-417). Bogota: Universidad de los Andes.
- Astrachan, O., Hambrusch, S., Peckham, J., & Settle, A. (2009). The present and future of computational thinking. *The 40th ACM technical symposium on Computer science education*, Chattanooga, TN, USA.
- Blikstein, P. (2013). Digital Fabrication and 'Making' in Education: The Democratization of Invention. In J. Walter-Herrmann & C. Büchling (Eds.), *FabLabs: Of Machines, Makers and Inventors*. Bielefeld: Transcript Publishers.
- Diez, T. (2012). Personal Fabrication: Fab Labs as Platforms for Citizen-Based Innovation, *Microcontrollers to Cities*, Nexus Netw J 14 (2012) 457–468.
- Gershenfeld, N. (2007). *Fab: the coming revolution on your desktop--from personal computers to personal fabrication*. Basic Books (AZ).
- Karana E., Barati B., Rognoli V., LaanA.Z.(2015). Material Driven Design (MDD): A Method to Design for Material Experiences. *International Journal of Design*, Vol. 9 No. 2 2015
- Manzini, E. (1986). *La Materia dell'Invenzione* [The Material of Invention], Milano, Arcadia.
- Mikhak, B., Lyon, C.,& Gorton, T. (2002). Fab Lab: an alternate model of ICT for development. "*Development by design*" (dyd02) *Bangalore ThinkCycle*. Retrieved 6 July 2013, from <http://cba.mit.edu/events/03.05.fablab/fablab-dyd02.pdf>
- Mostert-Van Der Sar, M., Mulder, I., Remijn, L., and Troxler,P., Fablabs in design education. *International Conference of Engineering and product design education 5 & 6 September 2013*, Dublin Institute of Technology, Dublin, Ireland.
- Nimkulrat, N. (2012). Hands on Intellect: Integrating craft practice into design research. In: *International Journal of Design*, 6(3). pp.14
- Parisi, S., Rognoli, V., Sonneveld, M. (2017) Material Tinkering. An inspirational approach for experiential learning and envisioning in product design education, *The Design Journal*, 20:sup1, S1167-S1184

- Rognoli, V. Levi, M. (2005). *Il senso dei materiali per il design*. Milano: Franco Angeli.
- Sheppard, S., & Jenison, R. (1997). Examples of Freshman Design Education. *International Journal of Engineering Education*, 13(4), 248-261.
- Yasar, O., & Landau, R. H. (2003). *Elements of computational science and engineering education*. SIAM review, 787-805.

Study-related Use of Instructional Videos by Undergraduate Engineering Students

Hennig, Markus and Mertsching, Bärbel
GET Lab, University of Paderborn, Germany

Abstract

In this paper, a questionnaire-based survey on the use of online videos by undergraduate engineering students for study-related purposes is presented. Over the last few years, a large number of instructional videos has been uploaded to websites such as YouTube. Due to the widespread distribution of high-speed internet connections and (mobile) devices, such as smartphones or laptops, which are nowadays routinely used by students, online videos are also frequently used in higher education. While much research on this subject focuses on Massive Open Online Courses (MOOCs) or flipped classroom approaches, this survey examines use of videos for self-study, complementary to traditional face-to-face courses. Furthermore, we analyze the acceptance of a characteristic video production style, which uses specific 3D animations to clarify complex connections between technical and mathematical aspects. The results indicate extensive use of short videos which address subjects that are particularly difficult for the students. This survey can help educators to develop an impression of current video use by undergraduate engineering students.

Keywords: *Study-related Videos; YouTube Videos; Electrical Engineering, 3D Animations, Engineering Mathematics.*

1. Introduction

In recent years, private individuals, companies and educational institutions have uploaded a large number of instructional videos covering nearly every imaginable subject to video-sharing websites such as YouTube. In many countries, virtually every student owns a smartphone, tablet pc or other (mobile) devices with high-speed internet access nowadays. For example, a baseline study on media usage in 2017 found that 99% of the 18 to 19 year olds in Germany own a smartphone, of which the major part frequently watches videos from YouTube, which is by far the most popular website in that group of young adults (Feierabend, Plankenhorn, & Rathgeb, 2017). Therefore, it is not surprising that (incoming) students in higher education frequently use online videos for self-study.

Much research on video usage in higher education focuses on MOOCs and flipped classroom approaches, which have emerged as popular alternative teaching formats (e.g. Muñoz-Merino et al., 2016). MOOCs usually consist of incremental video lectures series and additional material, but have a dropout rate of up to 90% (Hew & Cheung, 2014). Besides other reasons, several studies show that students are oftentimes interested in specific subjects only to pinpoint urgent questions just in time when they occur during their learning process (cf. Henderson, Selwyn, & Aston, 2015; Hew & Cheung, 2014). This kind of video use becomes particularly relevant when students are preparing themselves for exams (Kay, 2012). The flipped classroom approaches are a format in which students typically prepare themselves for face-to-face courses by working with videos at home. Instead of just following the lecturer in subsequent face-to-face courses, these courses are attended for learning activities such as discussing difficult concepts and problem solving (e.g. Kerr, 2015). While systematic video use is practically essential in MOOCs and flipped classroom approaches, the study presented in this work examines usage behavior for the apparently much more common use of videos for self-study, complementary to traditional face-to-face courses. Besides investigating the frequency and purpose of video use by undergraduate engineering students, we examine their study-related attitude towards online videos and the way they work with these videos.

Based on the example of an undergraduate electrical engineering course (*Fundamentals of Electrical Engineering*), we also analyze the acceptance of a video production style, which integrates specific 3D animations, and the way in which students work with such videos. In this course, students have to describe electromagnetic fields by working with multiple integrals in 3D space and in different coordinate systems. Such subjects are particularly difficult for the students because they require advanced mathematical knowledge and competencies as well as comprehensive spatial reasoning in 3D space. To support the students, we have developed short videos with specific 3D animations to clarify complex connections between technical and mathematical aspects (Hennig, Mertsching, & Hilkenmeier, 2015; Hennig & Mertsching, 2017).

2. Preliminary Considerations

What are the students' general attitudes towards online videos, why do they use them and for which purposes? For the case of lecture recordings, O'Callaghan et al. (2017) answer these (and further related) questions by a comprehensive literature review: In summary, students find lecture recordings useful, see them positive, and even report an influence on their course satisfaction depending on whether such recordings are available or not. Furthermore, students use lecture recordings because it enhances their learning process and especially to fill specific knowledge gaps. As summarized by the authors, students also value the possibility to learn with their individual pace and to be able to review or skip parts of videos depending on their individual needs. The importance of these individual factors is also found by subject-related studies, for example in mathematics (Shé et al., 2017). The findings are therefore in line with the studies related to MOOCs as cited in the introduction, underlining that students particularly use online videos for individually reviewing specific subjects.

Nonetheless, lecture recordings are only one type of instructional videos. Other video production styles are also very common, for example, recordings of freehand-drawings on a tablet pc or of presentation slides, both with aligned audio commentary (Guo, Kim, & Rubin, 2014). The first part of the study presented in this work investigates the study-related use of instructional videos in general, irrespective of specific production styles or producers. The second part of the study addresses our own video production style, which integrates specific 3D animations.

The study presented in this paper addresses undergraduate engineering students and is therefore subject-related. Corresponding investigations from the literature are usually focusing on well-defined learning settings and case studies. For example, Marques et al. (2012) analyze students' video use for an application in the area of groundwater flow and point out the possibilities to visualize theoretical concepts in practice. This example underlines the high potential of video use in engineering education, where a large range of technical phenomena is not directly observable (e.g. electromagnetic fields) due to their physical nature as well as their spatial and time-dependent (dynamic) dimensions (Karapanos, Pöhnlein, & Fleuren, 2015). By using 3D animations, these processes can be visualized so that students are supported to build dynamic mental 3D models.

3. Methodology

For this survey, a paper-and-pencil questionnaire consisting of 23 questions was given to the students of a *Fundamentals of Electrical Engineering* course (8 ECTS points) at a medium-sized German university in the middle of the last lecture in winter semester

2017/18 (without prior tests of the questionnaire). Participation in the survey was voluntary and we received responses from 65 students. Parts of the following analysis are referring to different numbers of participants as missing or inconsistent answers were discarded.

The questionnaire consisted of four sections, where the first section surveyed demographic data. The student group consisted of 58 male and 7 female students. The median age of the students was 20 years ($N = 64$, mean = 20.42 years, sd = 2.57 years). With a fraction of 70.97%, most students were in their first semester and 22.58% in their second and third semester ($N = 62$). Mostly bachelor students of electrical engineering and closely related degree programs attended the course and the survey.

In the second section of the questionnaire, we used Likert scale and multiple choice questions to ask the students to evaluate our own video production style, which integrates specific 3D animations, and the way students work with such videos. Analogously, we surveyed study-related video use by the students in the third section of the questionnaire. As this might be more interesting than the 3D animations for many readers, we begin with this aspect in the next section of the paper. The fourth section of the questionnaire addressed different types of video production styles.

4. General Video Use

Among other aspects, the questions about study-related video use addressed the frequency of use, usage behavior and the purpose of use. The results are summarized in figure 1.

Frequency of study-related video use (one response possible)



Usage behavior (one response possible)



Purpose of use (multiple responses possible)

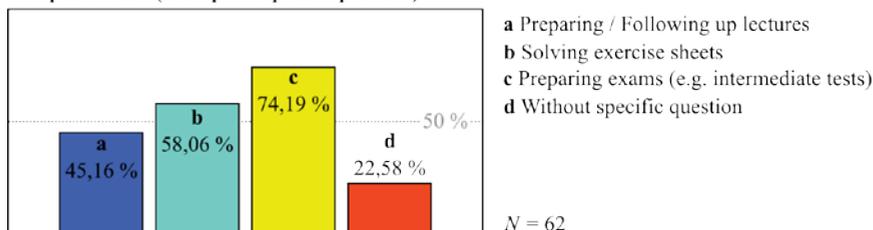


Figure 1: Investigation of study-related video use as reported by the students.

As can be seen, most students use videos at least on a weekly basis for study-related purposes. This shows that the students frequently integrate instructional videos in their learning process. Note that the questionnaire was given to the students during the lecture period, so that the subsequent examination phase did not start at that time. Students were also asked about their usage behavior when learning with videos. Here, the students could select between typically overflowing videos, watch them completely or watch them completely and additionally work with them by pause, review etc. Here, the third case is predominant. Concerning the purpose of use, most students use videos to prepare exams.

We also asked which devices the students use, when videos are watched during their learning process (multiple responses possible). Here, 90.77% reported PC or laptop use, 50.77% reported smartphone use and 32.31% reported tablet PC use ($N = 65$). Furthermore, 86.89% of the students reported to exclusively use YouTube and no other websites for watching instructional videos in their learning process ($N = 61$). This is in line with the studies that found YouTube to be the most popular website of young adults (see Introduction). Concerning the subjects, the students predominantly watch videos about mathematics (75,81%) and physics (64.52%, $N = 61$, multiple answers possible).

5. Evaluation of 3D Animations

In winter semester 2017/18, students were provided one of our short videos addressing Gauss's law in electrostatics with specific 3D animations. The video was uploaded to YouTube and has a length of 9 minutes and 5 seconds, see figure 2 for an example frame. Students were informed in the face-to-face courses as well as by mailing lists about the publication of the video. Furthermore, the video was linked from a Wiki which is integrated within the course (cf. Hennig, Mertsching, & Hilkenmeier, 2015).

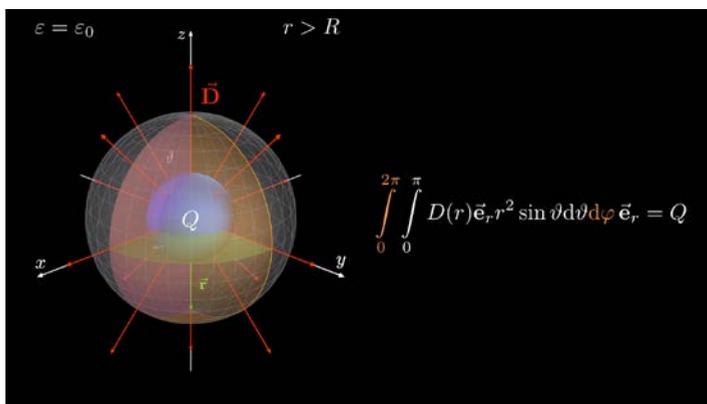
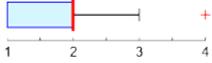
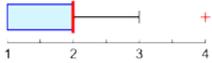
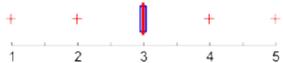
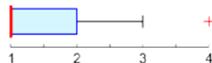
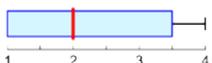


Figure 2: A frame from our video about Gauss's law in electrostatics (Hennig & Mertsching, 2017).

Using this video was voluntary and 68.75% of the students reported that they have seen it ($N = 64$). Furthermore, we asked the students who have seen this video to report the way they worked with this video (only one response possible). Here, 18.18% reported to have overflowed the video, 47.73% watched it completely and 34.09% watched it completely and additionally worked with the video systematically by pause, review etc. Here, students might work more systematically with the video for exam preparation. Based on these results, we conclude that such short videos addressing subjects that are particularly difficult for the students are extensively used.

Additionally, we asked the students to evaluate the video with regard to usefulness, comprehensibility, length, and if they plan to use the video for preparing the final written exam, depending on whether they have already seen the video or not. The results are summarized in table 1. Within the boxplots, the central bars represent the median, while the bottom and top edges indicate the 25th and 75th percentiles. The whiskers correspond to the most extreme data points which are not considered as outliers, while outliers are marked by a '+' symbol. We used the questions with four options to avoid neutral answers and to force the participants to indicate their tendency. As can be seen, the students rate the video positive, where the length is evaluated nearly optimal. Of particular interest is also the finding that most students who have seen the video are also planning to use it for exam preparation. In the fourth section of the questionnaire, we asked the students to select one of four production styles based on single example frames, which they consider most suitable for explaining integral equations, such as Gauss's law in electrostatics. Here, 47.54% selected our own production style, while only 19.67% selected lecture recordings. The remaining students selected recordings of freehand-drawings on a tablet pc (21.21%) or of presentation slides (11.48%), both with aligned audio commentary ($N = 61$).

Table 1: Students' evaluation of the video about Gauss's law in electrostatics, see text for details.

Item	Range	N	Median	Mean	SD	Boxplot
Usefulness	very helpful (1) - not helpful at all (4)	42	2	1.76	0.69	
Comprehensibility	very comprehensive (1) - not compr. at all (4)	42	2	1.74	0.70	
Length	too long (1) - too short (5)	43	3	2.95	0.65	
Exam preparation (video seen)	very likely (1) - very unlikely (4)	44	1	1.68	0.86	
Exam preparation (video not seen)	very likely (1) - very unlikely (4)	7	2	2.14	1.35	

Note that these results should be considered as a tendency only, because the students might only be familiar with our own production style in the context of such integral equations. In summary, we conclude that our specific production style is positively received.

6. Discussion and Future Work

We contribute a subject-related survey on video use by undergraduate engineering students for self-study. We are not aware of similar investigations from the literature or studies about 3D animations which explicitly clarify complex connections between technical and mathematical aspects. Therefore, this survey can help educators to understand video use by undergraduate engineering students and to develop their own specific videos. Note that we do not claim to proof *general* rules about optimal video production and refer to (Clark & Mayer, 2016) for such research. We also do not explicitly discuss or evaluate the effectiveness of video usage, for example with regard to exam results. This is part of our future work. Nonetheless, videos can have significant benefits to student learning outcomes under certain conditions (Clark & Mayer, 2016; O'Callaghan et al., 2017).

Besides a range of advantages resulting from study-related video use, there are also potential disadvantages. For example, providing videos can have negative effects on attendance and engagement in lectures (O'Callaghan et al., 2017) and restricted communication between students and lecturers can lead to further issues. On the contrary, students frequently and systematically use videos for learning with regard to their individual demands. Therefore, providing videos to complement traditional face-to-face courses is especially attractive for courses with heterogeneous students groups. Such groups

are particularly found at the beginning of degree programs in higher education as a result of different educational backgrounds of incoming students.

Another possibility to get the students to work even more systematically with (our) videos and to reflect the contents might be to integrate interactive components such as quiz-like questions (e.g. Wachtler et al., 2016).

References

- Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Hoboken, New Jersey: John Wiley & Sons.
- Feierabend, S., Plankenhorn, T., Rathgeb, T. (2017). JIM-Studie 2017: Jugend, Information, (Multi-)Media [Youth, Information, (Multi-)Media]. Medienpädagogischer Forschungsverbund Südwest. Retrieved from <http://www.mpfs.de/studien/jim-studie/2017/>
- Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of MOOC videos. *Proc. of the first ACM conference on Learning at scale*, 41–50.
- Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of ‘useful’ digital technology in university teaching and learning. *Studies in Higher Education*, 42(8), 1567-1579.
- Hennig, M., Mertsching, B., & Hilkenmeier, F. (2015). Situated mathematics teaching within electrical engineering courses. *European Journal of Engineering Education*, 40(6), 683–701.
- Hennig, M., & Mertsching, B. (2017). Innovative 3D animations for teaching electromagnetic field theory and its mathematics in undergraduate engineering. *Proc. of the 3rd International Conference on Higher Education Advances*, 625–632.
- Hew, K. F., & Cheung, W. S. (2014). Students’ and instructors’ use of massive open online courses (MOOCs): Motivations and challenges. *Educational Research Review*, 12, 45–58.
- Karapanos, M., Pöhnlein, M., & Fleuren, D. (2015). *Lernen mit Videos in den Ingenieur- und Naturwissenschaften. Ein Erfahrungsbericht aus dem Projekt Open MINT Labs [Learning with videos in engineering and natural sciences. A field report from the project Open MINT Labs]*. Retrieved from https://www.e-teaching.org/etresources/pdf/erfahrungsbericht_2015_karapanos-poehnlein-fleuren_oml.pdf
- Kay, R. H. (2012). Exploring the use of video podcasts in education: A comprehensive review of the literature. *Computers in Human Behavior*, 28(3), 820–831.
- Kerr, B. (2015). The flipped classroom in engineering education: A survey of the research. *Proc. of the International Conference on Interactive Collaborative Learning*, 815–818. IEEE.

- Marques, J. C., Quintela, J., Restivo, M. T., & Trigo, V. (2012). The use of video clips in engineering education. *Proc. of the International Conference on Interactive Collaborative Learning*.
- Muñoz-Merino, P. J., Ruipérez-Valiente, J. A., Delgado Kloos, C., Auger, M. A., Briz, S., de Castro, V., & Santalla, S. N. (2017). Flipping the classroom to improve learning with MOOCs technology. *Computer Applications in Engineering Education*, 25(1), 15–25.
- Ní Shé, C., Mac an Bhaird, C., Ní Fhloinn, E., & O'Shea, A. (2017). Students' and lecturers' views on mathematics resources. *Teaching Mathematics and its Applications*, 36(4), 183–199.
- O'Callaghan, F. V., Neumann, D. L., Jones, L., & Creed, P. A. (2017). The use of lecture recordings in higher education: A review of institutional, student, and lecturer issues. *Education and Information Technologies*, 22(1), 399–415.
- Wachtler, J., Hubmann, M., Zöhrer, H., & Ebner, M. (2016). An analysis of the use and effect of questions in interactive learning-videos. *Smart Learning Environments*, 3(1).

Transforming assessment practices in a higher education institution

Tomas, Carmen

Teaching Transformation, University of Nottingham, United Kingdom

Abstract

A review of institutional practices is presented to elicit the extent to which assessment practices really align with the principles of the standards-based paradigm. An institutional case presents the creation of a framework for practice and its use in evaluating institutional practices. Insights at institutional level suggest that mainstream practices and cultural change may need transformation. In particular, design, student engagement, marking and review of assessments may require strengthening. The ensuing institutional agenda to address central areas of concern have evolved into a range of institution-wide initiatives. The case illustrates how faculty and centre projects may work together to enhance the shared understanding of institutional “good” assessment practice and the development of communities of practice.

Keywords: *criterion referenced assessment; validity; assessment frameworks; institutional transformation.*

1. Introduction

A paradigmatic shift during the 90s concerning assessment practice saw the introduction of the standards-based paradigm for practice. This move entailed fundamental changes leaving the measurement model behind. The purpose of assessment shifted from selection to learning; the method of assessment shifted from comparing student against peers to assessing against set standards and criteria (Taylor 1994). The paradigmatic shift during the 90s was of global reach. Several phenomena reported in the literature may suggest that principles of the standards-based paradigm may not be fully adhered to in practice. Ongoing tensions between the two paradigms, and resulting incoherence in practice, has also been widely discussed (Elton and Johnston 2002; Yorke 2011; Medland 2016; Boud 2017).

Key studies and voices in the literature over a few decades show some warning signs of tensions in practice, absence of clarity in some areas. Grade inflation has been reported as a challenging issue (Bachan 2015), the gaps in establishing a learning culture in assessment are repeatedly highlighted (Jessop and Tomas 2017; Jessop and Maleckar 2016; Jessop, El-Hakim and Gibbs 2014) and lastly, the absence of clear standards in marking is also of concern (Bloxham, Hughes and Aide 2016; Boud 2017).

It is felt that establishing with greater confidence the nature of this misalignment between practice and the standards model of assessment may require more specific work. Few cross-institutional studies are available. A closer investigation is needed to establish how most productively assessment practices need developing to really align with the tenets of the standards referenced paradigm. An institutional case will aim to suggest ways of gauging the distance between principles of the standards based model and dominant practices. An illustration of how this can serve to influence institutional agendas and projects on change is presented.

2. An institutional framework to understand mainstream assessment practice

A unitary framework for practice is proposed that addresses the principles of validity in standards-based assessment. Messick's theoretical breakdown of validity (1994, 1995, 1996) considers a breakdown into steps in practice. Table 1 below maps the theoretical concepts in an assessment life-cycle framework and with proposed steps.

A series of evaluations drawing from key representatives of Faculties, across the university, has enabled the identification of mainstream steps and common considerations in practice. These are summarized in the column that indicates whether considerations expressed are commonly considered in steps that are required. This is indicated as common. Optional indicates where some practices or considerations may be left to practitioners. Unknown designates practices that are not considered at all and absent.

Whilst the proposed framework is an idealized model, the institutional summary of typical considerations reveal several limitations and areas where institutional enhancement of practices and transformation needs to take place.

Table 1 Articulation in practice of the theoretical construct and operationalisation of validity

Assessment life-cycle stage	Validity element	Step in practice	Common practice
Design stage	Content	Selection of an assessment method (task)	Common
		Task analysis determining the knowledge and skills to be revealed in the tasks - Evaluative criteria (overall attributes required of the student)	Optional or unknown
		Revision of assessment tasks that assess the same construct across a programme of study	Optional or unknown
	Structural	Quality levels and sources of difficulty	Optional
		Determining sources of difficulty of different criteria in a task	Optional
		Definition of combination rules (e.g. scoring strategy)	Optional
Communication, support and engagement	Structural and consequential	Increase student familiarisation to reduce anxiety	Optional
		Communicate to students criteria and levels; Engage students in understanding quality	Optional
Pre-marker training	Structural	Staff familiarisation: Check interpretations of levels of performance (inter-marker)	Optional
Marking	Structural	Ensure consistency during marking (intra-marker)	Optional
Feedback and marks	Consequential	Provision of meaningful feedback and criteria	Common (various approaches)
Post-marking moderation	Structural	Revision of scoring of assessment and identify rival explanations for results	Common (various approaches)
Review of task,	External	External validity of marks (analyses) (e.g.	Unknown

rubrics and results		how well marks relate to other related tasks) Consistency of marks with other performances (for an individual)	
	Substantive	Evidence base for task analysis and structural validity (post-hoc analyses)	Optional
	Content	Revision of assessment design	Optional
	Consequential	Student perception of the value of assessments Impact on self-assessment ability, motivation, lifelong learning and reflection skills	Optional
High stakes decisions	Generalizability	Consideration of similar tasks, different assessors and consideration of the consistency of student performance to drive final decisions on degree classifications	Unknown

3. The institutional transformation project

Based on the framework for practice, a purposeful programme of transformation work has been conducted. Particular stages, based on the evaluation that required revision were prioritised: design, student engagement and review stages. Priorities are ranked in order of importance as well as feasibility:

- Engagement of students in advance of assessments: communication, practice and active engagement are fundamental for practice
- Enhancing the transparency of standards, expectations and marking (design stage)
- Programme level assessment: load, design, consistency of practice

Institutional transformation is a slow process requiring multiple steps. The process of transformation has involved locally led projects with the support of the centre in setting agendas and developing the models. The phases of institutional transformation are laid out below:

Initial phase: 2014 to present (ongoing)

- Step 1 Development of the theory based framework for performance based assessments (centrally) as detailed above.

- Step 2 Agenda setting, exploration of local practice and needs

Institutional consolidation, growth and ongoing exploration (2016 onwards)

- Step 3 Assessment framework endorsed as a university level framework.
- Step 4 Ongoing liaison with Schools/Faculties and launching of new projects
- Step 5 Ongoing exploration and experimentation of alternative practices and models (e.g. moderation; peer assessment and evaluative judgement)

4. Outcomes

The framework for practice has been instrumental in enabling and supporting institutional and local strategic decisions. Local autonomy and decision making are central to the institutional approach whilst, centrally, support is offered with models and assistance with local developments. Some of the central gains include:

- greater understanding of practices
- greater consistency and growing a community of practice
- alignment of assurance reviews and systems

This joined up effort is essential to retain the essence of the principles in practice but also to enable, as an institution, to develop and share greater understanding of practice. The work is still in progress but the impact is visible with Faculty and School-wide cases of transformation of practice in place.

References

- Bachan, Ray. 2015. "Grade Inflation In UK Higher Education." *Studies in Higher Education*. doi: 10.1080/03075079.2015.1019450.
- Bloxham, Susan, Claire Hughes, and Lenore Adie. 2016. "What's The Point Of Moderation? A Discussion Of The Purposes Achieved Through Contemporary Moderation Practices." *Assessment and Evaluation In Higher Education* 41 (4): 638-653.
- Boud, D.J. 2017, 'Standards-based assessment for an era of increasing transparency' in *Scaling up Assessment for Learning in Higher Education*, Springer.

- Elton, Lewis and Brenda Johnston. 2002. "Assessment in Universities: A Critical Review of Research." Learning and Teaching Support Network. <https://eprints.soton.ac.uk/59244/1/59244.pdf>.
- Jessop, T., Y. El Hakim, and G. Gibbs. 2014. "The Whole is Greater Than the Sum of Its Parts: A Large-scale Study of Students' Learning in Response to Different Programme Assessment Patterns." *Assessment & Evaluation in Higher Education* 39 (1): 73–88. doi:10.1080/02602938.2013.792108.
- Jessop, T., and B. Maleckar. 2016. "The Influence of Disciplinary Assessment Patterns on Student Learning: A Comparative Study." *Studies in Higher Education* 41 (4): 696–711. doi:10.1080/03075079.2014.943170.
- Jessop, T., and C. Tomas. 2017. "The Implications of Programme Assessment Patterns for Student Learning." *Assessment & Evaluation in Higher Education* 42 (6): 990–999. doi:10.1080/02602938.2016.1217501.
- Medland, Emma. 2016. "Assessment In Higher Education: Drivers, Barriers And Directions For Change In The UK." *Assessment and Evaluation in Higher Education* 41 (1): 81-96.
- Messick, Samuel. 1994. "The Interplay of Evidence and Consequences in the Validation of Performance Assessments." *Educational Researcher* 23(2):13-23.
- Messick, Samuel. 1995. "Validity Of Psychological Assessment: Validation Of Inferences From Persons' Responses And Performances As Scientific Inquiry Into Score Meaning." *American psychologist* 50(9): 741-749.
- Messick, Samuel. 1996. "Validity in Performance Assessments". In *Technical Issues in Large-scale Performance Assessment* edited by Gary W. Phillips, 1-18. Washington DC: National Centre for Educational Statistics.
- Taylor, Catherine. 1994. "Assessment for Measurement of Standards: The Peril and Promise of Large-Scale Assessment Reform." *American Educational Research Journal* 31 (2): 231-262. doi: 10.3102/00028312031002231.
- Yorke, Mantz. 2011. "Summative Assessment: Dealing With The Measurement Fallacy." *Studies in Higher Education* 36 (3): 251-273. <http://dx.doi.org/10.1080/03075070903545082>

Increasing engagement and participation in a large, third-level class setting using co-teaching

Farrell, Ann Marie^a and Logan, Anna^a

^aSchool of Inclusive and Special Education, Institute of Education, Dublin City University

Abstract

This study focused on the collaborative practice of two teacher educators who implemented a co-teaching intervention with a large class of first-year student teachers. The research arose from the teacher educators' wish to increase the range and nature of participation of students in the large class setting and to model co-teaching for the students who would be expected to engage in such practice themselves in primary schools. The aims of the study were to explore the use of co-teaching in the large class context as a support for student participation and students' meta-learning about co-teaching. In three separate 50-minute workshops, students were provided with samples of a child's work and were required to work in pairs or groups of three in order to come to conclusions about his current level of performance and to develop possible learning targets arising. Data were collected using a short, online survey.

The student cohort was very positive in terms of the effectiveness of the co-teaching approach in helping them to understand the concepts and allowing more active engagement. Further, students were able to articulate their learning with regard to using the co-teaching approach. From the researchers' perspectives co-teaching was very useful in terms of increasing student participation and replicating a learning context that might be more usual with much smaller groups. Further, it allowed for provision of formative feedback both during and following the co-taught sessions that would not otherwise have been feasible. Finally, it allowed the student voice to be heard within the large class context.

Keywords: *Co-teaching; collaborative practice; initial teacher education; student engagement; large class.*

1. Introduction

Internationally, there appears to be evidence that class size is increasing in universities (Kerr, 2011; Prosser & Trigwell, 2014), giving rise to concerns about levels of student participation and engagement and, therefore the quality of teaching and learning (Cuseo, 2007; Fenollar, Roman & Cuestas, 2007). Often, it is assumed that there is only one teaching approach to be used in such a setting i.e. the traditional lecture whereby the teacher talks for the duration and the students listen. However, that assumption is under scrutiny (Prosser & Trigwell, 2014; Teaching and Educational Development Institute, 2003) with examination of a wider range of teaching approaches which could be employed. The focus of this co-teaching intervention was a class of 400 first-year student teachers who were engaged in a module focusing on inclusion of pupils with special educational needs (SEN) in a primary, initial teacher education (ITE) programme.

2. Theoretical Framework for Co-Teaching Large Classes

Reconceptualising ITE involves, amongst other things, consideration of how student teachers learn and therefore how teacher educators teach. The absence of specific education or training for teacher educators mirrors that of third level educators in other fields. *“The idea seems to be that one learns the profession through trial and error...this is highly remarkable in an area where professional development is the operative word”* (Koster & Korthagen, 2001, p. 240). Therefore, it is hardly surprising that, traditionally, the focus of teacher educators has been on themselves and their own needs rather than the needs of their students. Moreover, teacher educators are in the unique position in that they model the very practice they are trying to nurture in everything they do as well as everything they say (Hallett, 2010). This is opportunity that may not be exploited due to lack of awareness, focus on knowledge expertise and the actual structures of the teaching day in the university context.

Co-teaching is an accepted approach to effective teaching and learning in primary and post-primary settings, particularly in relation to addressing diversity of need and therefore increasing inclusion of all students (Gately & Gately, 2001). There are six accepted models (Dieker, Finnegan, Grillo & Garland, 2013) namely *station teaching*, *parallel teaching*, *alternative teaching*, *one teach - one observe*, *one teach - one assist* and *teaming* (Friend, 2016). In *station teaching* students rotate in three or more groups between teachers, each of whom is responsible for teaching part of the content in a given lesson at a station. In *parallel teaching*, the class is divided into two groups with each teacher working with one group only, while in *alternative teaching* one teacher teaches most of the class while a second teacher works with a small group providing additional support to some. In both the *one teach - one assist* and *one teach - one observe* models the class remains in one group

with one teacher in a lead role while the second teacher respectively observes or provides brief individual assistance to students as required. Finally, *teaming* is characterized by both teachers jointly working with the group integrating their input and co-constructing teaching. The application of these models may depend on several factors including the nature of content being taught and learned, the educational setting in which the learning is taking place and/or the number, type and experience of the teachers implementing the strategy. However, co-teaching in the university context is a little explored activity and it remains unclear how this typology of co-teaching might apply in higher-education (Nevin, Thousand & Villa, 2009). Furthermore, how teaching staff interact with each other in the university is poorly understood and there are “*no models for research that assess the impact on student achievement when professors co-teach*” (Nevin et al. 2009, p. 573). In the context of a teacher education programme, it is important that this deficit is addressed so that student teachers can see co-teaching being used before embarking on a career in which this is expected of them.

3. Methodology

The initial impetus for this study was the extension of the BEd from a three-year to a four-year programme, resulting in the reconceptualising and reorganisation of the input on special and inclusive education (SIE). Arising from this, SIE is addressed using explicit, permeated and specialist models. The focus of this study is on a module wherein SIE is explicitly addressed in the first year of the programme. The authors designed a co-teaching intervention with a first year Bachelor of Education (BEd): Primary Teaching cohort of students with the intention of increasing participation in a workshop-based context. We hoped this would allow students to work on some quite complex skills and concepts in relation to diagnostic assessment of an individual child’s work and writing learning targets arising from this. (See Table 1 for details).

We wished to provide hands-on experience of this type of assessment and planning at the outset of the programme so that student teachers would carry an understanding of the importance of focusing on the individual as well as the group/class from the beginning of their ITE journey. Further, we hoped that the workshop style format would provide an opportunity to use assessment for learning (AfL) techniques so that (a) formative feedback could be provided to students and (b) to inform our own teaching in terms of focus of content and teaching approaches. While the initial impetus arose from the programmatic changes, the specific aims of the study were to explore the use of co-teaching as a strategy to increase student participation in the workshops and to model co-teaching for the students who would be expected to engage in such practice themselves in primary schools. Table 1 outlines the detail of the three workshops.

Table 1: Details of Workshops, Assessment Approaches and Data Collection

Workshop Number	Workshop Focus	Assessment Approaches	Data Collection
1	Analysed a pupil profile	<i>In all three workshops:</i> Students' work was collected and was feedback provided in class and afterwards on Moodle using a sample of responses.	Students surveyed at the end of the module.
2	Analysed a child's work (diagnostic assessment) to identify patterns of accuracy and error leading to identification of strengths and needs. Four samples of work were used in-class with students working in pairs or 3s on one of four samples. All samples available on Moodle.		

Each workshop comprised three stages. First, we provided a short introduction to the topic and explained the workshop task. Then students completed the tasks in pairs and threes and finally we took feedback from students. In the absence of research relating to the implementation of the six models of co-teaching in higher education and in the spirit of an exploratory study we adopted a flexible and pragmatic approach to designing our approach. The large lecture theatre context precluded the option of dividing the class into separate groups and consequently we relied mainly on those models that involved us working together with the entire group. As such we used the *one teach - one assist*, *one teach - one observe* and *teaming* models. In the first stage of each workshop we alternated the role of lead teacher and assistant/ observer while introducing the content and explaining the task. In the second stage, while the students worked on the tasks, we each circulated observing student participation and offering assistance as required. In the final stage we used *teaming* extensively, eliciting and recording student feedback for display and providing alternative analyses and commentary on student work.

Students were invited to evaluate the intervention to determine if they believed the strategy helped them to effectively access and learn the concepts being targeted in the workshops and to ascertain what they learned about co-teaching as a strategy in itself. A short, online, questionnaire survey consisting of two likert questions and four open ended questions was used. The total number of respondents was 156, giving a response rate of 39%. Qualitative data were analyzed using a grounded theory approach (Glaser & Strauss, 1999). In total

337 responses to the questions *What did you learn about co-teaching as a strategy?*(n=191) and *How effective was co teaching in helping you to learn the concepts targeted?* (n=146) were analyzed and coded by hand to identify emerging categories. Some respondents made more than one comment in response to either or both question and therefore, their comments may have been attributed to more than one code during analysis. The key themes emerging related to the co-teacher role and relationship and student perceptions of the impact on their learning.

4. Findings

The findings are presented below under the two key themes, with data from likert questions interwoven with the qualitative data from the open questions.

4.1 Role and relationship of co-teachers

Students were asked to rate their perceptions of the familiarity of the two lecturers with the learning content and processes.

Table 2. Responses to the question ‘To what extent did you feel the two lecturers were familiar with the learning content and learning processes?’

Very familiar	Familiar	Not sure	Not very familiar	Not at all familiar
36%	52%	10%	1%	0%

Most students (88%) felt that the lecturers were ‘very familiar’ or ‘familiar’ with the content (Table 2). Responses to the question *‘What did you learn about co-teaching as a strategy?’* went some way to contextualising the qualitative findings in Table 2, particularly because of students’ insights into the relationship between the two teachers.

Fifteen per cent of students perceived that teachers needed to be very organised, have planned well and have good communication skills to be effective in the co-teaching context: *“both teachers were so prepared and organised in delivering the task”* (Respondent # 69); *“A lot of cooperation is needed. The two teachers must have a good relationship”* (Respondent #90). *It needs to be organised between people co-teaching. Both need to know their role during it in order for the strategy to be carried out effectively”* (Respondent #102). . Some students (11.5%) identified the usefulness of co-teaching in enabling the teachers to provide support and help for the students during the class. *“It*

allows the teacher to get to know pupil's abilities, as in such a big group as this module, it was easier to ask questions and get feedback." (Respondent #140) A small number of students (3.8%) referred to the equality of roles, with some commenting on the lack of equality while others perceived a good balance of interaction between the two teachers.

In the main, the range of views offered both mirrored and informed the perceptions of the two co-teachers themselves. While we understood the benefits of co-teaching and had used it to good effect before, it was always in the context of much smaller groups of up to about fifty students. We were apprehensive in terms of entering into this intervention because of the large class size and the fear that what worked with smaller groups could not be scaled up easily and might actually be very ineffective. However, as we moved through the three sessions, our confidence increased because of the high quality of work we were gathering from the students. We used AfL to inform our own teaching and could see the progress our students were making. As the students noted, we were able to provide much more focused and detailed support and feedback, both in-class and online afterwards on Moodle. In addition, we thoroughly enjoyed the experience of working with each other precisely because of the sense of support and also, because it enabled each of us to bounce ideas off each other, thereby learning from each other and enhancing our teaching skills and knowledge base.

4.2 Impact on Student Learning

Table 3 illustrates responses to the question '*How useful were the co-taught sessions to you as a learner?*' Overall, 76% of students indicated that they found the co-taught sessions useful or very useful. Again, these statistics were contextualised by the qualitative data arising from the open questions on the survey.

Table 3: Responses to the question ' How useful were the co-taught sessions to you as a learner?'

Very useful	Useful	Not Sure	Not very useful	Not at all useful
33%	53%	14%	7%	0%

Some of the data arising from the question '*What did you learn about co-teaching as a strategy?*' related specifically to student learning as well as the role of the two teachers as outlined above. Seventeen percent of students responding to this question identified the experience of gaining the insights and opinions of two people as being an important

characteristic of co-teaching. Fourteen percent identified the increased participation of students in the large class setting as important with a further 2.5% highlighting its usefulness for enabling a workshop format in the large class *“Enables a more interactive session between teacher and students. More interaction amongst peers with the topic rather than consuming information all at once.”* (Respondent #156) *“It’s an effective methodology for teachers as it encourages interaction and keeps students actively engaged.”* (Respondent #70). Some students (11.5%) perceived the model as useful to allow the teachers the opportunity to engage with and support students during the class and 2.5% cited the provision of opportunity for modelling the strategy as useful.

When specifically asked *‘How effective was the strategy in helping you to learn the concepts targeted?’* the nature of the impact on student learning from their perspective became clearer. Firstly, most of the comments (76%) could be attributed to the perception that the use of co-teaching had enhanced the learning experience. *“Very effective as the two lecturers were very knowledgeable on the topics so they were able to answer all questions. The two lecturers were on either side of the room so they could give feedback on answers.”* (Respondent #141) *“I found the co-teaching workshops very helpful. It allowed more time to discuss our feedback and share ideas, which I found particularly helpful.”* (Respondent #147). Students (22.5%) indicated that the model increased their participation and attention in the large class setting *“I found it very effective because I liked how by changing teachers I found it easier to keep my concentration.”* (Respondent #59). Ten percent of students indicated that the co-taught approach had a direct impact on what they were doing during the session. *“It was great. Because it was easier to ask questions, because there wasn’t just one teacher.”* (Respondent #128)

Fourteen percent of respondents indicated that what the teachers were actually doing during the workshops enhanced their learning. Examples of such actions were filling in gaps in each other’s commentary; management of feedback during the class; organisation of the content and materials in such a way that the student could concentrate on their learning rather than managing the materials themselves. *“Very effective. I liked when one went around getting feedback and the other person typed. If one person didn’t mention something or forgot something the other person was there to say it.”* (Respondent #148)

5. Conclusions

Overall, the perceptions of the students regarding the co-taught workshop intervention was very positive. Students noted the impact on their learning reflecting the findings of the positive impact of co-teaching on learning in post primary and primary schools (Dieker at al., 2013; Friend, 2016). Further, seeing co-teaching modelled by the two teaching staff (Hallett, 2010) allowed students to extrapolate for themselves some characteristics of the

practice. Students identified the extra support and feedback provided within and after the workshops as important to the development of their understanding of the threshold concepts of diagnostic assessment and writing learning targets. From the perspective of the co-teachers, the approach was also effective and rewarding (Nevin et al., 2009). We could provide formative feedback in a detailed and meaningful manner scaffolding student learning and aligning learning outcomes, teaching strategies and assessment within the module itself. Engagement in co-teaching certainly led to “increased feelings of worth, renewal, partnership and creativity” (Gately & Gately, 2001, p.40), directly impacting on our practice going forward.

While this was a small-scale study which is limited in that it relied primarily on self reporting by students we contend that it provides some insight into student perceptions of co-teaching. Furthermore, it led to a reorganisation of the approach the following year with a new cohort of students. This phase was also evaluated from the perspective of the student cohort but the findings arising were complemented by peer-observation and analysis of video recordings of the taught sessions. Nevertheless, further studies are needed to close the recognized gap in knowledge of co-teaching in higher education and in particular the impact on student achievement when faculty co-teach (Nevin et al., 2009).

References

- Cuseo, J. (2007). The empirical case against large class size: Adverse effects on the teaching, learning and retention of first-year students, *Journal of Faculty Development*, 21(1), 5-21.
- Dieker, L., Finnegan, L., Grillo, K., & Garland, D. (2013) Special education in the science classroom. *Science Scope*, 37, 4, 18-22.
- Fenollar, P., Roman, S., & Cuestas, P. (2007). University students' academic performance: An integrative conceptual framework and empirical analysis. *British Journal of Educational Psychology*, 77 (4), 873-891.
- Friend, M. (2016) Welcome to co-teaching 2.0. *Educational Leadership*, 73, 4, 16-22.
- Gately, S., & Gately, F. (2001). Understanding co-teaching components. *Teaching Exceptional Children*, 33, 4, 40-48.
- Glaser, B., & Strauss, A. (1999). *Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine.
- Hallett, F. (2010). Do we practice what we preach? An examination of the pedagogical beliefs of teacher educators. *Teaching in Higher Education*, 15(4). 435-448.
- Kerr, A. (2011). *Teaching and Learning in Large Classes at Ontario Universities: An Exploratory Study*. Toronto: Higher Education Quality Council of Ontario.

- Koster, B., & Korthagen, F. (2001). Training teacher educators for the realistic approach. In F.A.J. Korthagen (Ed.). *Linking practice and theory: The pedagogy of realistic teacher education*. (pp. 239-253). New Jersey: Lawrence Erlbaum Associates.
- Nevin, A.I., Thousand, J.S., and Villa, R.A. (2009). Collaborative teaching for teaching educators what does the research say? *Teaching and Teacher Education*, 25(4), pp. 569-574.
- Prosser, M., & Trigwell, K. (2014). Qualitative variation in approaches to university teaching and learning in large first-year classes, *Higher Education*, 67, 783-798.
- Teaching and Educational Development Institute (2003). *Teaching Large Classes Project 2001: Final Report*. University of Queensland: Australia.

International academic mobility: the attraction factors of Brazilians students in Spain

Kingeski, Luciano and Olivella Nadal, Jordi

Department Business Organization, Polytechnic University of Catalonia, Spain.

Abstract

The mobility of university students abroad is a phenomenon of great importance in the context of globalization and internationalization of higher education. Certain factors, such as the image of the institution, the country, the city, the evaluation of the study program, the cost, selection processes and even personal resources can determine the destination country. This article seeks to identify the attraction factors for which Brazilian university students choose Spanish universities to carry out their higher education. An exploratory study of a qualitative nature was conducted, a semi-structured questionnaire applied to twenty-eight Brazilian students of official rank: graduation, master's degree and doctorate. Data analysis was based on the assessment of attraction factors. The results indicate that the language, the tradition of the Spanish universities, the scholarships of the country of origin and the more flexible selection processes are important factors in the decision of these subjects. Spain is an option for many international students and the flow of Brazilian students to this country is significant, the authors also consider that these flows may be much larger in the future.

Keywords: *Brazilian students; academic mobility; internationalization, attraction factors.*

1. Introduction

Throughout history, we can see the gradual increase of students moving to other countries, attracted by a better academic and professional background. We live in the age of information and knowledge and the deeper part of human change is in the cultural dimension, as one of the great riches of today's societies. Thus, the increasing internationalization of all types of activities makes international experience increasingly necessary and at the same time more accessible to an increasing number of people. In the period between 1975 and 2012, the number of students who went to other countries to study higher education increased from 800.000 to 4.5 million (OECD, 2014).

In percentage terms, the United States and England are the destinations most sought by foreign students, being 16.4% and 12.6%. They also carry out an important activity to attract the same type of students: Germany, with 6.3%; France, with 6%; Australia, 5.5%; Canada, 4.9% and Japan with 3.3%. Spain currently accounts for 2.5% (OECD, 2017). In 2014-2015 approximately 49.053 study visas were issued in Spain, of which 20.062 are from Latin America and the Caribbean, representing approximately 41.64% of foreign students in Spain (OECD, 2017). Between the periods 2009 to 2012 there was an uneven evolution of Latin American students in Spain and a general fall between the years of 2012 and 2014, one of the indicative ones was the economic crisis that passed the country in this period. Despite the reduction in the flow of Latin American students in Spain, in all of them the figures are significant, being one of the first destinations of university studies. Although the percentage of Brazil and Mexico is lower than the others, the Brazilian university system is important and has the specificity of the language, and Mexico has a geographical proximity to the United States. Through these data, one perceives a new scenario in higher education.

Since the mid-twentieth century the experience of studying abroad has been exceptional, limited to groups with high economic power or high educational performance, where in the last twenty years this experience has been to acquire an increasingly common base for a higher percentage of students. As a result of this increased mobility, there are new offers of undergraduate programs, universities and new poles of attraction, especially in countries with better technology and training for business management, as in the case of new actors in this scenario, for example Singapore, United Arab Emirates, Spain and others. These countries can play an important role in the future of university education for these young people. These transformations remain intense. According to the Ministry of Education, Culture and Sport, in Spain alone, during 2014-2015, the number of offers of master's courses was 3.661, 9% more than in the previous year. Of these, 2.979 are in public universities and 709 in private universities, and 1.036 doctoral programs, of which 967 are in public universities and 69 in private universities. The issue of the internationalization of university students in Spain is little explored in academia. Currently, little is known about

students' performance, their main reasons for choosing the country, the evaluation of their experiences and their future projects, are those gaps that require the necessity of studies of this nature, given the great representation of this public. So, this article seeks to identify and analyze the reasons that lead Brazilian students to decide on the possibility of pursuing their university studies in Spain. This study is part of a research that is being developed through the Doctoral Program in Business Administration of the Polytechnic University of Catalonia (ETSEIB-UPC), which began in march 2015.

2. Review of the literature

This article confines itself to studying the attraction factors of Brazilian students, that is; Academic motivation, term adopted by many researchers. Therefore, the evolution of the concept of motivation was not explored, but it is known that the first studies began in the mid-1950s with the advent of scientific management. As for the motivations for studies abroad, several reasons may explain the rapid growth of student interest. At the individual level, overseas study helps the person to cope with the demands of the job market more successfully, also increases the international dimension at work and improves his or her career in general (TEICHLER, 2007). The following are the main studies related to specific cases.

One way to classify these factors of attraction is the contribution of (Altbach, 1998), which differentiates them from "push-pull" factors. The "push" factors operate within the country of origin before the decision to study abroad, and pull factors within the host country to make it more attractive than other potential destinations. This classification has been widely adopted by subsequent studies and continues in this work. Currently, there is a wide literature with authors who have adopted the "push-pull" fundamentals, mainly in countries such as: USA. United States, United Kingdom, Australia and China. The main authors and attraction factors identified in their studies: Altbach (1998) cost of mobility, employment rate in the host country, geographic distance, environmental environment, quality of institutions, financial support, perspectives of professional future, economic situation of the country of origin, language, intercultural training of the institution of origin, the family, interest in mobility - Mazzarol & Geoffrey (2002) the language, an estimate that a course conducted in a foreign country is better than in your home country, the ease of access to the course and, mainly, the reputation that this experience can bring in the future - Kazlauskienė & Rinkevičius (2006) "brain-drain" Professional attraction in foreign countries, socio-economic conditions. Other factors, such as ecological conditions and family reunification, play a much smaller role in this phenomenon of brain drain - Mei Li & Mark Bray (2007) the motivations in pose of the academic and professional growth, the economic benefit, the individual internationalization and the improvement of the social status - Molly (2007) Future migration opportunities after graduation education, high quality courses and the cost

of living - Bodycott (2009) significant differences were found between the role and approach of students and their parents in the first and last stage of decision making (tradition and values) - Wilkins, Balakrishnan & Huisman (2012) the study incorporates two different sets of "push-pull" factors and sought to better understand current and potential students, in order to implement segmentation techniques in their marketing activities and finally Cao, Zhu & Meng (2016) future career prospects, the quality of institutions, the cost of mobility and climate in the host country. Geographic distance emerged as an unfavorable attraction and a significant risk factor. However, the impact of the parents, the language and the intercultural training institutions of origin emerged as favorable dynamic factors. And the country's economic situation emerged as an unfavorable "push" factor.

3. Methodology

For the development of this research, in-depth interviews were conducted with Brazilian students who at the time of interviewing reside in Spain, with the objective of obtaining an official degree (master's or doctorate) in a Spanish university. So, exchange students were not considered in the study. For the election of the interviewees we looked for students who recently made the decision process in relation to the country of destination in question, so that one can think that they are well aware of the different elements of this decision at the present moment. This is what differs in general from exchange students who in most cases migrate to other countries through agreements from universities that study with the destination universities. Due to the lack of previous studies, we chose to conduct in-depth interviews, a qualitative and semi-structured approach. In this way we tried to identify aspects that could not be known at the beginning of the research. For the development of the interviews, a questionnaire was elaborated based on the factors identified in the literature. The questionnaire was structured in four blocks of questions: demographic data, country election factors, university election factors, and course selection factors. This was first applied in pilot interviews (in group and individual), then adjusted according to the results obtained from these first tests and replicated to 28 Brazilian students. This stage ends with the transcription of the audios of the interviews with the help of the *otranscribe* tool, then the interpretation and analysis of the identified factors.

4. Results

In order to get closer to these students, the following sources of contacts were used: Association of Brazilian Researchers and Students in Catalonia (APEC), Embassy of Brazil in Madrid, Center for Brazilian Studies at the University of Salamanca (CEB) and indications from other students. The students interviewed come from several regions of Brazil: Minas

Gerai, Goiás, São Paulo, Distrito Federal, Rio Grande do Sul, Paraíba, Pernambuco, Ceará, Mato Grosso do Sul, Santa Catarina, Espírito Santo, Paraná and Bahia. In relation to the sex of the interviewees, there is an inclination to the female sex (20), while the male sex (8). However, these data only inform the condition of the interviewees in this exploratory study, but cannot be considered as indicative of trends among the population of Brazilian students who move to Spain. As for the age of the interviewees, there was a wide distribution, with young students ranging from 20 years to 55 year old students. Age is an important factor in the study decision process abroad, because the trajectory, the responsibilities and the phase that each of the groups is very different. The Universities that carry out their studies in Spain: Barcelona: Polytechnic University of Catalonia and Autonomous University of Barcelona and University Pompeu Fabra, Salamanca: University of Salamanca, Zaragoza: University of Zaragoza, Valencia: University of Valencia, Cantabria: University of Cantabria, Balearic Islands: University of the Balearic Islands and Madrid: University Complutense of Madrid. With respect to the cities and provinces of origin, students from thirteen (13) different provinces were contacted. The flow of Brazilian students to Spain is not concentrated in a specific area of the country and the interest in academic mobility is made both by students from poorer areas and more developed areas in the educational field. Students from different areas of knowledge and modalities (bachelor's, technologists and engineering) were identified. The training of the interviewees in the country of origin: Business Administration, Literature, Biology, Tourism, Dentistry, Music, Social Communication, Geography, Oceanography, Physiotherapy and a more accentuated presence to the Right to Students course (5) 17, 86%. In this sample, there were (1) 3.57% undergraduate students, (17) 60.72% undergraduate and (10) 35.71% undergraduate. In relation to the area of knowledge, there is an accentuated search for courses in the areas of Human Sciences and Applied Social Sciences. Then, in the (Table 1.) the cities, courses and universities of studies in Spain are presented.

Table 1. Distribution of students by cities and courses

Distribution and cities (n:28)	Courses (Oficial names)
Barcelona (7)	Doctorado en Historia del Arte y Musicología, Máster de Criminología, Política Criminal y Sociología Jurídico-Penal (UB); Doctorado en Traducción y Estudios Interculturales (UAB); Doctorado en Derecho (UPF), (UAB); Doctorado en Políticas Públicas y Transformación social (UAB); Doctorado en Sostenibilidad , (UPC).
Salamanca (11)	Máster en Economía de la empresa, Doctorado en Economía de la empresa, Máster en Antropología de Iberoamérica, Doctorado en Antropología de Iberoamérica, Doctorado en Educación, Máster en Derecho, Doctorado en Lingüística-lengua española, Doctorado en Ciencias de los Materiales and Doctorado en Estudios Latinoamericanos (USAL).
Zaragoza (2)	Doctorado en Ordenación del Territorio (USAL).
Valencia (1)	Doctorado en Comunicación, Universidad de Valencia (UV).
Madri (1)	Máster en Microbiología y Parasitología, Universidad Complutense de Madrid (UCM).
Santander (1)	Doctorado en Ingeniería de Costas, Hidrobiología y Gestión de Sistemas Acuáticos, Universidad de Cantabria (UC).
Palma de Mallorca (1)	Máster Oficial en Neurociencias, Universitat de les Illes Balears (UIB).
Valladolid (3)	Doctorado en Lingüística Aplicada, Universidad de Valladolid, Máster en Administración de Industrias Culturales, Máster en Investigación en Ciencias de la Visión (UVA).
Logroño (1)	Grado en Administración y Dirección de Empresas, Universidad de la Rioja (UR).

UAB: Universitat Autònoma Barcelona; UB: Universitat de Barcelona; UPC: Universitat Politècnica de Catalunya; UPC: Universitat Pompeu Fabra; USAL

Source: Interview data

4.1. Interview Results

This analysis was carried out from the main factors identified in the previous studies and these were adapted to the specific case and grouped in a simple scale of 3 levels (zero, 1 and 2) that it was possible to obtain the results for each factor. The following are the main factors identified in the in-depth interviews and the first conclusions of the study: - Selection process: The difficulties of entering postgraduate programs in Brazil are a factor mentioned by many of the interviewees (22). The number of vacancies is limited, analysis of the academic trajectory and the rigidity of the selective processes were highlighted by the interviewees. - Country choice: Spain was the first choice for half of the students (14). The others sought other countries: England, USA and Germany. However, the difficulty of the language and the mobility costs (tuition, fees and lodging) were the barriers presented by them. Portugal was also evaluated as an option by (3), but for these, the changes would not be as significant in their curriculum. - University rankings: Only (7) of the students worried about this item. Factors such as tradition and prestige of Spanish universities were important to them at the time of the decision. All interviewees believe that obtaining a degree at a university abroad can be a differential when returning to their country of origin. - Influence of the environment: The indication of the country, the university and the course, most of the students (24), mentioned that their decision process occurred with the indication of teachers in their environment, research groups and friends. - Language: One of the most important factors mentioned in this decision process, where mentioned how, very important to carry out their studies abroad. Of the total of (28) students, only one of them has the TOEFL (Test of English as a Foreign Language) certificate, which is one of the requirements made by many graduate programs in Brazil. - Scholarships: Only (2) carry out their post-graduate studies with their own resources. All others are financed by Santander Bank and Foundation Capes / CNPq. - Cost of mobility: Spain has a lower cost of living compared to countries such as the United States and England, which are the main destinations for foreign students in the world, a factor taken into account by virtually all at the moment of decision-making. - Tradition and prestige: The tradition and prestige of Spanish universities were identified by all the interviewees.

5. Conclusions

This in-depth analysis with 28 Brazilian university students points to aspects considered fundamental in the decision-making process for studies abroad, in particular the country of Spain. Considering the subject in question, its relevance in the academic world is perceived by an empirical study and a contribution to existing literature, however, it is necessary to cover other identified gaps and also to be exploited by different researchers. Through the theoretical review, it is possible to identify and analyze the international mobility in differ-

ent countries and compare it with the reality of this particular case, especially to the specific cases that adopt the "push-pull" fundamentals. Similarities of some of the attraction factors of these studies are observed, for example: Mazzarol & Goffrey (2002) with the importance of language, more flexible selection processes and good reputation in the country of origin after the experience, Li & The importance of the environment (family and friends) for decision making, and finally Molly (2007) and Cao, Zhu & Meng (2016) with Mey & Bray (2007) "social status", Bodycott (2009) and Chen & Zimitat the concern related to the cost of living. In particular, the study by Altbach (1998) was fundamental for the organization of the data collection instrument (semi-structured questionnaire) and for the identification and analysis of the attractiveness factors of Brazilian students in Spain, where it was noted interviews the importance of the factors of attraction such as: interest in the country Spain for studies abroad as a highly relevant option, scholarship systems, the influence of the environment, the cost of mobility and approach to the language of origin.

5.1 Limitations and Future work

One of the limitations of this type of research is the difficulty of obtaining the information of the subjects, in this case, the location of the students and the contact becomes difficult and limited, insofar as the institutions and organizations (universities and embassies) are not authorized to provide specific information about them. One of the obstacles faced by students of this type of human mobility is that there is little data to measure it, so that, in order to know more about the trajectories of the students after finishing the studies, qualitative type, focused on disciplinary areas and educational levels (Trejo and Sierra, 2014). So it is necessary to implement different approach strategies. (SANDOVAL, 2014). The exploratory nature of research, rather than definitive and conclusive answers, leaves open a number of questions, the answers of which require further analysis. Therefore, the next step of this research is to contrast the data through a quantitative sample that has been applied in recent months (December 2017 to March 2018).

Finally, the nature of the research, rather than definitive and conclusive answers, leaves open a number of questions, the answers of which require further analysis. Therefore, the next step of this research (in development), is to compare the data through a quantitative sample (mixed method) to a greater number of students with these same characteristics.

References

- Altbach, P. G. (1998). *Comparative Higher Education: Knowledge, the University, and Development*. Hong Kong: Comparative Education Research Centre; The University of Hong Kong, p. 240.

- Bodycott, P. (2009). Choosing a higher education study abroad destination: What mainland Chinese parents and students rate as important. *Journal of Research in International Education*, 8(3), 349–373. DOI: 10.1177/1475240909345818
- Cao, C., Zhu, C. and Meng, Q. (2016). A Survey of the Influencing Factors for International Academic Mobility of Chinese University Students. *Higher Education Quarterly*, 0951-5224.
- Chen, C.H., Zimitat, C. (2006) "Understanding Taiwanese students' decision- making factors regarding Australian international higher education". *International Journal of Educational Management*, Vol. 20 Issue: 2, p.91-100.
- Kazlauskienė, A., & Rinkevičius, L. (2006). Lithuanian “brain drain” causes: Push and pull factors. *Engineering economics*, 46(1), 27-37.
- Li, M. and Bray, M. (2007). Cross-Border Flows of Students for Higher Education: Push–Pull Factors and Motivations of Mainland Chinese Students in Hong Kong and Macau. *Higher Education*, 53(6), pp. 791–818.
- Mazzarol, T., Soutar, Geoffrey N. (2002). The “Push-Pull” Factors influencing international student selection of education destination. *International Journal of Educational Management*.
- Ministerio de Educación y Deporte. Datos y cifras del sistema universitario español. Disponible em: <http://www.mecd.gob.es/educacion-mecd/areas-educacion/universidades/estadisticas-informes/datos-cifras.html> Acesso em: 28 de janeiro de 2016.
- Molly, Y. (2007). What attracts mainland Chinese students to Australian higher education. *International Journal of Educational Management*.
- OECD (2014) *Education at a Glance 2012: OECD Indicators*. Paris: OECD Publishing.
- OECD (2017) *Education at a Glance 2015: OECD Indicators*. Paris: OECD Publishing.
- Sandoval, María C.P. (2014). La Movilidad de Estudiantes de Posgrado de Venezuela y México a Canadá: Un Estudio Exploratorio. *Revista Latinoamericana de Educación Comparada*.
- Teichler, U. (2007). *The Flexible Professional in the Knowledge Society: New Demands on Higher Education*. Project Supported by the VI Framework Programme of the EU, pp. 199–220. Maastricht: Maastricht University.
- Trejo, A.P. y Sierra-Paycha, C. (2014), “Gestión de la movilidad estudiantil en Estados Unidos. Dimensionando a los estudiantes colombianos y mexicanos”, *Journal Camino Real, Estudios de las Hispanidades Norteamericanas*, Instituto Universitario de Investigación en Estudios Norteamericanos “Benjamin Franklin”. Universidad de Alcalá, 6, número 9.
- Wilkins,S., Balakrishnan,M.S.& Huisman,J. (2012). Student Choice in Higher Education: Motivations for Choosing to Study at an International Branch Campus, *International Journal of Educational Management*.

Increasing significance of external quality assurance in higher education: current strategies applied by European agencies

Sánchez Chaparro, Teresa and Gómez Frías, Víctor

Department of Engineering Management, Universidad Politécnica de Madrid, Spain

Abstract

Quality assurance of higher education programmes and institutions has been one of the cornerstones of the Bologna process since its creation. However, after more than one decade of implementation of the European quality assurance framework, many national systems are suffering from the so-called “evaluation fatigue”. From a thorough revision of key sectorial sources, this paper identifies a number of strategies currently being tested by European quality assurance agencies aimed at increasing significance and reducing bureaucracy of external quality assurance processes.

Keywords: *External quality assurance; Quality assurance agencies; Impact; Higher Education*

1. Introduction

Quality assurance of higher education programmes and institutions has been one of the cornerstones of the Bologna process since its creation. Quality assurance has the primary mission of building mutual trust among Higher Education Institutions and other stakeholders all over Europe (Bergan, 2011). Together with other structural elements, such as the European Qualification Framework and the European Credit Transfer System, quality assurance constitutes the foundation for a smooth mobility of students and graduates along the EHEA (EHEA, 2005).

The particular European approach to quality assurance is specified in a key document, the “Standards and Guidelines for Quality Assurance in the European Higher Education Area” or ESG (ENQA et al., 2015). A first version of the ESG was initially presented and approved at the Bergen Ministerial Conference in 2005 (EHEA, 2005). An updated version of the standard was released and approved ten years later at the Ministerial Conference in Yerevan (EHEA, 2015). This document reflects a consensus among all the organisations concerned with the promotion and implementation of quality assurance in the European Higher Education Area.

The ESG makes a distinction between “internal quality assurance” (IQA) –the quality assurance (QA) practices and strategies put in practice by higher education institutions to ensure their own educational quality– and “external quality assurance” (EQA) –the strategies and processes implemented by external bodies (a.k.a quality assurance agencies).

Many of these bodies have been developed since the beginning of the century and are now well established in the majority of EHEA countries. ENQA –the European Network for Quality Assurance in Higher Education– is a membership association whose members are the external quality assurance bodies officially recognized in each country. As of February 2018, ENQA included 52 members in 29 EHEA countries.

While the ESG makes it explicit that the major responsibility of QA lies within HEIs (IQA), EQA and QA agencies have a major role as control and enhancement actors. They assist the institutions in implementing their internal quality assurance systems and, in certain occasions, play a leading role in the introduction of quality assurance innovations.

The development and acceptance of these external bodies have not been simple. Stakeholders, and academics in particular, tend to resist any quality procedures that are perceived as disconnected of their primary teaching and research activity (Harvey and Williams, 2010; Newton, 2002). After a number of evaluation cycles, many national systems are suffering from the so-called “evaluation fatigue” (Schwarz and Westerheijde, 2007). The recent economic crisis has increased the sensitivity of the sector, the government and the general public towards a reduction of bureaucratic burden and a

rationalization of resources, which has even lead to the suppression or merger of quality assurance agencies in various countries (Walsh, 2012).

In this context, quality assurance agencies have felt the need to explore new strategies aimed at increasing the added value of EQA processes over the core teaching and learning activity. After explaining the most recent developments introduced by the 2015 version of the ESG, this paper takes stock of the most recent strategies adopted by quality agencies in order to rationalize resources and increase significance of their EQA processes all over Europe.

2. Major changes introduced by the updated 2015 version of the ESG

While the nature and structure of the ESG have remained essentially the same, the updated 2015 version introduces new core notions with the intention of increasing the impact and significance of the standard. The most substantial changes introduced are:

- The student-centred learning (SCL) paradigm, a learning approach that puts the learner at the centre (Boyer, 1990; Machemer and Crawford, 2007), has been adopted as an explicit requirement.
- The scope of quality assurance has been expanded to include the full student life cycle (such as student admission, progression, recognition and certification). With regard to institutional recognition practices, the standard makes it explicit that they should be in line with the principles of the Lisbon Recognition Convention and rely on cooperation with the national ENIC-NARIC centres.
- New requirements on transparency and management of information have been introduced, such as the publication by the agencies of the “full” reports by the experts or the collection, analysis and use of relevant information by the higher education institutions for the effective management of their programmes.

3. Current strategies of QA agencies to increase significance of their EQA processes

After a number of evaluation cycles, many quality assurance agencies have undergone reforms aimed at increasing efficiency and significance of their national external quality assurance frameworks and at incorporating the new criteria established by the new version of the ESG.

The trends explained below have been identified after a thorough revision of key sectorial sources, such as the communications, posters and key note speeches at the ENQA general assemblies and the trends and developments presented at the largest annual gathering of the

European higher education quality assurance, the European Quality Assurance Forum (EQUAF).

3.1. Diversity of approaches and objectives

In the past, many national external quality assurance frameworks have been developed following two alternative monolithic approaches: institutional versus programme-oriented. Similarly, quality assurance agencies have frequently positioned themselves in the control versus enhancement dichotomy and tend to consider that these two objectives are difficult to combine and belong to different organizational cultures (Sánchez et al., 2011).

Agencies are now breaking these binary schemes. Recent reforms all over Europe have set up new EQA frameworks that apply a diversity of approaches and objectives. This is the case of the new EQA model recently implemented in Sweden, which comprises institutional reviews, programme evaluations and accreditations and thematic evaluations and focus both on output and internal processes (Boström and Kettis, 2016). The French-speaking part of Belgium provides another example, as the system is currently shifting from a purely programmatic enhancement-oriented approach to a combination of institutional and programme assessment and the introduction of some accountability elements (Aubert and Duykhaerts, 2017). In the same vein, the new review model currently being implemented in Ireland combines multiple objectives (effectiveness, accountability and enhancement) and multiple dimensions (institution, system and thematic) (Lynch, 2017).

3.2. Risk based approach

Several agencies in Europe have recently reported to be in the process of developing risk-based approaches. Under this philosophy, a system of key indicators that are carefully monitored is used to predict the outcome of external quality assurance reviews. Institutions are applied EQA processes of different depth and intensity depending on the result of the risk assessment. This practice tries to address the unavoidable “evaluation fatigue” by the institutions and, at the same time, is bound to increase effectiveness of the EQA system.

In the field of quality assurance, two countries –Norway and United Kingdom– have headed this trend that is currently being explored by many European countries, even though the development of national systems of risk indicators are not yet fully tested and developed (Griffiths and Halford, 2015; Lund, 2018).

Several practical challenges to the application of risk-based approaches for regulatory purposes have been documented in literature (Black, 2005 and 2008; Black and Baldwin, 2012; Rothstein et al., 2006). Indeed, previous experiences outside Europe have been problematic. The Australian agency (TEQSA) attempted a risk-based approach to quality assurance in higher education in 2012. The initial approach led to strong complaints from

the sector and resulted in the publication of a simplified and more robust regulatory risk framework (TEQSA, 2012 and 2016).

3.3. Focus on enhancement

A clear trend in external quality assurance is the effort by many QA agencies to include an enhancement element into their external quality assurance procedures. Agencies put in place various strategies, which normally involve the introduction of a more flexible and conversational evaluation format that substitutes or complements a more formal step-by-step control-oriented evaluation or accreditation exercise. This increased flexibility enables to liberate resources and concentrate in substantial aspects (student-centred learning, sector-specific aspects, societal implications), which is bound to increase the impact of the EQA processes.

An example is the so-called “appreciative approach” implemented in Flanders since 2014, a flexible evaluation scheme whose most relevant characteristics are contextualization, the postponement of judgements, the focus on relevant aspects, the continuous dialogue and the co-creation of insights (Aerden et al., 2016).

In Finland, the QA agency (FINEEC), with a long tradition of enhancement-led institutional evaluations and after two in-depth reviews of institutional audits, has launched in 2018 a new audit model. The new approach is built on an idea of a higher education institution as an open system and a learning organization. The focus is on student centred learning and on the societal impact of higher education, including the interaction with stakeholders at various levels (FINEEC, 2017).

Another example is the “critical friend” approach developed in the field of higher music education. Within this philosophy, annual visits by “critical friends” (external experts that are considered to be an international authority with regard to the content of the programmes reviewed) are combined with a lighter version of regular review visit by the quality assurance agency. This experimental approach has shown to be effective with regards to reducing the bureaucratic load of higher education institutions and creating a stronger involvement of teachers in quality assurance processes. Indeed, the “critical friend” has been said to act as a proxy, a trained peer-specialist that speaks the same language as those working and studying in the institutions and is bound to bridge the gap between quality assurance, teachers and students (Prchal and Messas, 2016).

3.4. Information management and analytics

Increasingly, agencies are developing analytic capacities that enable them to produce reports and information that are useful for the enhancement and development of national higher education systems. Specifically, agencies are implementing this analytic dimension through the development of quantitative studies and indicators at the system and

institutional level, which contribute to build evidence-based decision and management systems. An example is the assessment of the research and teaching activities of university departments conducted by the Catalan Quality Assurance Agency (AQU-Catalunya) using quantitative research available in a public information system compiling key information of all universities in Catalonia. Within this experience, AQU-Catalunya has conceived a reporting system to facilitate the accessibility and interpretation of the data by higher education institutions (Prades et al., 2015). In a similar vein, the French accreditation body for engineering programmes (Commission des Titres d'Ingénieur, CTI) has developed, in collaboration with its stakeholders, a set of public indicators which mean to characterize a particular HEI. The main objective of this initiative, in place since 2013, is to provide meaningful and trusted information to the general public regarding the HEIs and their accredited programmes (CTI, 2017).

4. Conclusions

After more than one decade of implementation of the European quality assurance framework, it seems that practices are evolving in the external quality assurance sector. This paper, which is part of a wider reflexion from the authors on quality assurance significance and impact, has presented a selection of strategies currently being tested by European quality assurance agencies aimed at increasing significance and reducing bureaucracy of external quality assurance processes.

The application of diversified risk-based approaches seems to be one of the cornerstones of this new trend. The modulation of the intensity of EQA procedures in relation to the perceived risks saves resources and time, which can then be devoted to the introduction of an enhancement dimension and a focus on substantial aspects (such as student centred learning or societal aspects). However, the estimation of risks is a difficult task and some of the most advanced QA agencies are still trying to fine-tune their risk assessment capabilities.

Indeed, the application of risk-based approaches needs the development of powerful analytic capacities, requirement which is, incidentally, consistent with the increased focus on transparency and information management introduced by the 2015 version of the ESG. It also requires the careful consideration of some well documented challenges and difficulties. Further reflexion is required to really assess the feasibility of this promising approach to the quality assurance sector.

References

- Aarden, A. et al. (2016). NVAO's Appreciative Approach, a new philosophy to strengthen internal and external quality assurance. *11th European Quality Assurance Forum* 17–19 November.
- Aubert, A. and Duykaerts, C. (2017). How to get ready for change? *12th European Quality Assurance Forum Responsible QA – committing to impact*. Latvia 23-25 November.
- Black, J. (2005). The emergence of risk-based regulation and the new public management in the United Kingdom. *Public Law*, (Autumn). pp. 512-549.
- Black, J. (2008). Risk Based Regulation: Choices, Practices and Lessons Being Learned. In: *Risk and Regulatory Policy: Improving the Governance of Risk*. Organization for Economic Co-operation and Development, Paris.
- Bergan, S. (2011). Building Trust. *Quality and Trust: At The Heart of What We Do. A Selection of Papers From The European Quality Assurance Forum*. Bruxelles: European University Association. pp. 52 – 57.
- Boyer, E.B. (1990). *Scholarship Reconsidered. Priorities of the Professoriate*. New York: The Carnegie Foundation for the Advancement of Teaching.
- European Higher Education Area (2005). *Communique of the Conference of Ministers responsible for Higher Education 2005*. Bergen, Norway. EHEA.
- European Higher Education Area (2015). *Communique of the Conference of Ministers responsible for Higher Education 2015*. Yerevan, Armenia. EHEA.
- Boström, T. and Kettis, A. (2016). Introducing a new national QA system in Sweden. A discussion on opportunities and challenges. *11th European Quality Assurance Forum*. 17–19 November.
- CTI (2017). CTI's certified data, an enhancement tool for quality culture. *8th ENQA General Assembly*, Sèvres, 26-27 October.
- ENQA, ESU, EUA, EURASHE (2015). *Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)*. Brussels, Belgium.
- FINEEC (2017). FINEEC's audit model promotes societal impact. *8th ENQA General Assembly*, Sèvres, 26-27 October.
- Griffiths, A. and Halford, E. (2015). Zen and the art of risk assessment: what are the implications of a system of risk-based quality assurance for higher education in England? *10th European Quality Assurance Forum*, London 19-21 November.
- Harvey, L. and Williams, J. (2010). Fifteen Years of Quality in Higher Education: (Part Two). *Quality in Higher Education*. 16(2). 81-113.

- Lund, O. (2018). Using risk analysis and indicators to assure programme quality in institutional reviews. *Institutional and Programme Reviews: Towards New Combinations, ECA-NVAO Seminar*, The Hague, 1 February.
- Lynch, O. (2017). A new model for external review of quality in a diverse higher education area. *12th European Quality Assurance Forum Responsible QA – committing to impact*. Latvia 23-25 November.
- Machemer, P.L. and Crawford, P. (2007). Student Perceptions of Active Learning in a Large Cross-Disciplinary Classroom'. *Active Learning in Higher Education*, 8:1, pp.9-30.
- Newton, J. (2002). Views from below: academics coping with quality. *Quality in higher education*. 8(1). 39-61.
- Nuffic (2017). *FAIR report*. The Hague, Netherlands.
- Prades, A. (2015). Big (and small) data meets quality assurance. *10th European Quality Assurance Forum*, London 19-21 November.
- Prchal, M. and Messas, L. (2016). How to make quality assurance processes more meaningful to teaching staff – a proposal from the field of music. *11th European Quality Assurance Forum* 17–19 November.
- Rothstein, H.F., Irving, P., Walden, T. and Yearsley, R. (2006). The Risks of Risk-Based Regulation: Insights from the environmental policy domain. *Environment International*, vol 32, no. 8, pp. 1056-1065.
- Sánchez Chaparro, T., Duykhaerts, C., Carette, G., Coessens, M. and Remaud, B. (2011). Combining evaluation and accreditation cultures: A collaboration between AEQES and CTI for the joint evaluation and accreditation of civil engineering programmes in the French community of Belgium in 2012-2013. *INQAAHE seminar on Connecting European and Global Experiences*, Brussels, 4-5 December.
- Schwarz, S. and Westerheijden, D. F. (Eds.) (2007). *Accreditation and Evaluation in the European Higher Education Area*. Springer.
- TEQSA (2012). *Regulatory Risk Framework*. February .
- TEQSA (2016). *Risk Assessment Framework*. February.
- Walsh, P. (2012). The Qualifications and Quality Assurance Authority of Ireland (QQAI) an amalgamated agency responsible for overseeing changes in the qualifications and quality assurance of Irish further and higher education. *Presentation to CHEA International Seminar*, Washington DC, 26 January.

Pre-school Education Degree students' prior knowledge and perception of digital competence

Gamito, Rakel^a; Aristizabal, Pilar^b and Vizcarra, Mariate^c

^aDidactic and school organization, University of the Basque Country (UPV/EHU), Spain,

^bDidactic and school organization, University of the Basque Country (UPV/EHU), Spain

^cDidactics of musical, plastic and body expression, University of the Basque Country (UPV/EHU), Spain

Abstract

Currently Information and Communication Technologies (ICTs) are necessary for everyday life. That is why digital competence is one of the eight key competences for lifelong learning established by the European Parliament in 2006. In this regard, DigComp is the European framework of digital competence and includes five areas and twenty-one digital subcompetences: Information and data literacy, Communication and collaboration, Digital content creation, Safety and Problem solving. Knowing Pre-School Education Degree students' prior knowledge and perceptions of digital competence is important to strengthen future teachers' digital skills. This work has examined and explored Pre-School Education Degree students' digital competence level. Results have provided concepts and ideas to guide the work to strengthen future teachers' digital skills and to guarantee digitally competent teachers. Pre-School Education Degree students' have good skills in Information and data literacy and Communication and collaboration areas but need training in skills related to Digital content creation, Security and Problem solving.

Keywords: *Digital competence; DigComp; Pre-School Education Degree, Pre-School Education teachers; Prior Knowledge; Perception.*

1. Introduction

Based on Bauman's (2006) metaphor, the current context is liquid and technology is part of that state. Speed of Information and Communication Technology's (ICT) and Internet's development has been extraordinary (Rial, Gómez, Braña, & Varela, 2014). In a few years being continuously online has become part of the academic, professional and personal everyday life (INTEF, 2016).

Therefore, digital competence is one of the eight key competences for lifelong learning established by the European Parliament and is defined in European Digital Competence Framework, also known as DigComp.

It was on December 18, 2006 when the European Parliament and the Council of the European Union defined, after a long evaluation process, the European framework of reference on lifelong learning. It included the eight key competences "which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment" (2006/962 / CE, p. 13).

One of the eight key competences identified is digital competence because today ICTs are essential elements in the processes of innovation, expansion and job creation. According to this document, "digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication" (2006/962 / CE, p. 14).

Subsequently, in order to provide a more robust definition based on scientific evidence and, in turn, create a common language between Education and labor market, the European Commission published in August 2013 DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe. This project was carried out together with the Institute for Prospective Technological Studies (IPTS) and the Joint Research Center (JCR) to define accurate and official areas and descriptors of digital competence (Ferrari, 2013). Then, it has become the frame of reference for various curriculars, initiatives and/or certificates (INTEF, 2017).

Recently, the updated DIGCOMP 2.0: The Digital Competence Framework for Citizens has been published (Vuorikari, Punie, Carretero, & Van Den, 2016). As in the previous proposal, the new document includes five areas and twenty-one digital subcompetences: Information and data literacy, Communication and collaboration, Digital content creation, Safety and Problem solving (table 1).

Table 1. The DigComp Conceptual reference model

Competence areas	Sub-competences
1. Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content
	1.2 Evaluating data, information and digital content
	1.3 Managing data, information and digital content
2. Communication and collaboration	2.1 Interacting through digital technologies
	2.2 Sharing through digital technologies
	2.3 Engaging in citizenship through digital technologies
	2.4 Collaborating through digital technologies
	2.5 Netiquette
	2.6 Managing digital identity
3. Digital content creation	3.1 Developing digital content
	3.2 Integrating and re-elaborating digital content
	3.3 Copyright and licences
	3.4 Programming
4. Safety	4.1 Protecting devices
	4.2 Protecting personal data and privacy
	4.3 Protecting health and well-being
	4.4 Protecting the environment
5. Problem solving	5.1 Solving technical problems
	5.2 Identifying needs and technological responses
	5.3 Creatively using digital technologies
	5.4 Identifying digital competence gaps

Source: DigComp 2.0: The Digital Competence Framework for Citizens (Vuorikari, Punie, Carretero, & Van Den, 2016).

Consequently, digital competence is currently an essential educational element. ICTs have the potential to impact on people's thought, action and representation (García del Dujo & Martín, 2002), but this requires that teachers have “the necessary training in that competence” (INTEF, 2017, p. 5) to use technology in an innovative way (Area, 2008).

In other words, integrating ICTs in a pedagogical way is a challenge that requires training. Therefore, it is important to know Pre-School Education Degree students' digital competence level to be able to work more effectively and strengthen future teachers' digital skills.

As a consequence, the present work has responded to the following aims:

1. Examine Pre-School Education Degree students' prior knowledge of areas and subcompetences that make up the digital competence according to DigCom..
2. Explore the perception that Pre-School Education Degree students have about their own digital skills according to the different areas proposed by DigComp.

2. Method

Examine students' prior knowledge and perceptions is necessary to make a constructive teaching-learning process (Lerner, 1996). In this regard, and because students build knowledge by interpreting their perceptions or experiences (Huber, 2008), this research was based on evidence of productions, verbal interactions, dialogues and answers. All of this was obtained directly and from a practical and reflexive position.

The work was attended by 67 Pre-School Education Degree second grade students (during the 2017/18 academic year at the Education and Sport Faculty of the University of the Basque Country (UPV / EHU) located in Vitoria-Gasteiz (Álava).

Data collection was made, first of all, dividing participants into 20 groups of 3 or 4 members grouped randomly, and subsequently, individually. In the first phase of development, students were asked to define one of the five areas of digital competence according to DigComp: Information and data literacy, Communication and collaboration, Digital content creation, Safety and Problem solving. To do this, students worked cooperatively and based only on their prior knowledge of digital competence.

Next, oral presentation of productions and later collective dialogue were aimed at exploration of associations and meanings, allowing to know what the group involved think or feel, their perceptions, strengths and shortcomings (Krueger, 1991). These productions were compared and completed with DigComp framework to achieve a more detailed perspective on digital competence.

Finally, students' personal digital skills in DigComp subcompetences were assessed by an individual online questionnaire and using a scale from 1 to 5 (1: insufficient; 2: sufficient; 3: good; 4: very good; 5: excellent).

Information obtained was processed individually and jointly. Firstly, answers and assessments of each area were analyzed separately and then they were studied together.

This has facilitated the interpretation, offering an overview of the set of prior knowledge and perception of digital competence (Barton, 2006).

3. Results

The results are organized around the five areas of digital competence included in DigComp framework:

In relation Information and data literacy area, it is where Pre-School Education Degree students involved show high knowledge and say that they have a good command of it (3.37 out of 5). They identify information not only as text, they also give great importance to data in audiovisual format: "information can be obtained through writing, videos or photographs" (group 1 and group 4).

At the same time, future teachers highlight the importance of contrasting sources to confirm the accuracy of searches: "we must verify that the information is reliable and, for that, it is necessary to consult different sources and use trusted sources" (group 4). Students involved believe that the subcompetences referring to Information and data literacy are a great help to, mainly, do academic work: "as students, these subcompetences allow us to find information more quickly and to be able to perform the works in a more precise way" (group 1).

56.7% believe that their skill in browsing, searching and filtering information is very good and 37.3% good. However, perception of digital contents' evaluation competence as well as the storage and recovery competence is lower. There are more those who assess their skill in these subcompetences as good (50.7%) instead of as very good (37.3%).

Describing Communication and collaboration area, future teachers involved set aside subcompetences related to engagement, digital identity and/or netiquette to focus only on interaction options, sharing information and/or work in groups: "skills in digital communication and collaboration allows us to interact, share interesting material and work in groups" (group 8). Likewise, this area is defined from a technical point of view. Students mention many tools such as social networks, instant messaging applications and/or learning platforms (virtual classrooms) instead of the multiple strategies used in interaction and collaboration processes to describe Communication and collaboration competence.

The description matches the results of the students' personal perception concerning the area. Interacting through digital technologies and sharing digital information and contents are the subcompetences that have obtained best results. Nearly half (47.8%) believe that their skills in communicate and/or share digitally is very good and, even, part (16.4%) assess it as

excellent. On the contrary, assessment of netiquette is low. 19.4% have rated their skill in the Internet's behavior standards as sufficient and 10.4% as insufficient.

In Digital content creation area, something similar happens. To describe the area, students involved only list subcompetences directly related to creation and they obviate copyright, licenses and/or programming: "creating audio-visual content, texts... for teaching and sharing" (group 11). In addition, students focus creation more on tools than on strategies and the majority of tools that they mention are basic commercial office automation packages.

Likewise, while assessment of subcompetences related to development and integration of digital content is good (60.45%) or very good (27.45%), a certain lack of training regarding copyright and programming is perceived. Much of future teachers involved indicate sufficient skill in licenses and programming (29.9% and 20.9%, respectively) and even a part rate it as insufficient (4.5% and 7.5%, respectively).

Security also has many deficiencies. Although its definition is one of the most complete and general perception of skill in the area is good (3.00 out of 5), Security is the only area that has obtained insufficient assessment in all its subcompetences. Many students believe that they are only sufficiently skilled protecting their devices (17.9%), personal data and digital identity (13.4%), health (20.9%) and environment (17.9%). Between 1.5% and 3% affirm that their skill in security measures is insufficient and they indicate formation about the Internet security as improvement proposals.

Results of Problem solving area also indicate not a good perception. Describing the area, students involved focus on resolution of technical problems and, in many cases, on digital security: "we must know how to solve technical problems such as viruses or attacks and it is important to establish rules of use and security "(group 19). In turn, they do not include or mention any subcompetence related to innovation and/or creativity and it is quite high the percentage (between 25.4% and 32.8%) of future teachers that assess their skill in problem solving only as sufficient.

4. Discussion and conclusions

In general, Pre-school Education future teachers' knowledge and assessment of digital competence of are good (3.16 out of 5) but there are differences between areas and/or subcompetences, as in many similar studies.

Pre-School Education Degree students have a great knowledge and high level skill in Information and data literacy (3.37 out of 5) and Communication and collaboration (3.31 out of 5) areas, as Ferrés, Aguaded-Gómez, & García-Matilla's (2012) studies.

Instead, coinciding with Gabarda, Rodríguez, & Moreno (2017), future teachers' knowledge and skills on Digital content creation (3 out of 5), Security (3.25 out of 5) and Problem solving (2.87 out of 5) areas are lower. Students think that they need training session, mostly, on online security.

Likewise, the global vision that future teachers have of digital competence is eminently instrumental (Gutiérrez & Serrano, 2016). Describing many of the areas, students involved have forgotten strategies to focus on the use of specific tools.

Therefore, it is necessary to develop training proposals aimed at strengthen Pre-School Education Degree students' digital competence in order to guarantee digitally competent teachers. It is important to work skills and strategies related to creative, engaging, safe and responsible use of ICT.

References

- 2006/962/CE, Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. *Official Journal of the European Union*, L394, 18 December 2016.
- Area, M. (2008). La innovación pedagógica con TIC y el desarrollo de las competencias informacionales y digitales. *Investigación en la escuela*, 64, 5-17.
- Barton, K. C. (2006). *Research methods in social studies education: Contemporary issues and perspectives*. Connecticut: IAP
- Bauman, Z. (2006). *Modernidad líquida*. Buenos Aires: Fondo de Cultura Económica.
- Ferrari, A. (2013). *DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe*. Seville: Joint Research Centre. Institute for Prospective Technological Studies. doi: <https://doi.org/10.2788/52966>
- Ferrés, J., Aguaded-Gómez, I., & García-Matilla, A. (2012). Digital competence in students of educational degrees. Analysis of future teachers' competence and perception. *ICONO* 14, 10(3), 23-42. doi: <https://doi.org/10.7195/ri14.v10i3.201>
- Gabarda, V., Rodríguez, A., & Moreno, M.D. (2017). La competencia digital en estudiantes de magisterio. Análisis competencial y percepción personal del futuro maestro. *Educatio Siglo XXI*, 35(2), 253-274. doi: <https://doi.org/10.6018/j/298601>
- García del Dujo, A & Martín, A.V. (2002). Caracterización pedagógica de los entornos virtuales de aprendizaje. *Teoría de la educación*, 14, 67-92.
- Gutiérrez, I. & Serrano, J.L. (2016). Evaluation and development of digital competence in future primary school teachers at the University of Murcia. *New approaches in educational research*, 15(1), 53-59. doi: <https://doi.org/10.7821/naer.2016.1.152>
- Huber, G. (2008). Aprendizaje activo y metodologías educativas. *Revista de Educación*, special numer 2008, 59- 81.

- INTEF, Instituto Nacional de Tecnologías Educativas y de Formación de Profesorado (2016). *Uso de las tecnologías por niños de hasta 8 años. Un estudio cualitativo en siete países*. Retrieved from <https://goo.gl/Na7kKt>
- INTEF, Instituto Nacional de Tecnologías Educativas y de Formación de Profesorado (2017). *Common Digital Competence Framework for Teachers. October 20017*. Retrieved from <https://goo.gl/Aaocqf>
- Krueger, R. A. (1991). *El grupo de discusión: guía práctica para la investigación aplicada*. Madrid: Pirámide.
- Lerner, D. (1996). La enseñanza del aprendizaje escolar. Alegato contra una falsa oposición. En VV.AA., *Piaget-Vigotsky: contribuciones para replantear el debate* (pp. 69-117). Buenos Aires: Paidós.
- Rial, A., Gómez, P., Braña, T., & Varela, J. (2014). Attitudes, perceptions and Internet and social networks use among Galician teens. *Anales de psicología*, 30, 642-655. doi: <http://doi.org/10.6018/analesps.30.2.159111>
- Vuorikari, R., Punie, Y., Carretero, S., & Van de Brande, L. (2016). *DigComp 2.0: The Digital Competence Framework for Citizens*. Luxembourg: Publications Office of the European Union. doi: <https://doi.org/10.2791/11517>

Audiovisual content as a learning aid for Business English learners: developing and validating a Matrix

Carvalho, Tiago^a; Almeida, Pedro^a and Balula, Ana^b

^aDigimedia, Universidade de Aveiro, Portugal, ^bCIDTFF, Universidade de Aveiro, Portugal.

Abstract

Audiovisual content (AVC) consumption, namely in Online Collaborative Platforms (OCP), like YouTube©, has been growing, mostly for entertainment purposes. Additionally, AVC has been regularly used to support educational contexts, either in formal local scenarios or to support online courses. But educational practitioners lack a structured place to find which AVC to use for each learning objective. This context provided the opportunity to develop an OCP to support crowd mapping of AVC and to serve as an online AVC aggregator for teachers and learners. This paper reports on a proposal for Business English training. This OCP needs to be sustained by a Matrix which crosscuts AVC according to parameters identified in the literature review. Experts in the fields of English as Foreign Language Didactics and Educational Technologies were asked to validate the Matrix in its cataloging and searching features. Data was gathered via semi-structured interviews and treated by means of content analysis. The data analysis suggests that, even though it may be improved, the Matrix allows for accurate cataloging. The concept of the OCP was validated and deemed as a learning aid with potential. The following steps include the design and construction of a prototype of the OCP.

Keywords: *Audiovisual Content; Digital Platforms; English as Foreign Language; Didactics*

1. Introduction

Online Collaborative Platforms (OCP) that serve as a repository for Audiovisual Content (AVC), like YouTube®, have seen constant growth of users. According to this global platform's press releases¹, over one billion people use YouTube® for several reasons, being the most prominent one entertainment, amounting to over one billion hours of viewed AVC. With this potential, it is no wonder that English as Foreign Language (EFL) learning videos proliferate, with users and institutions dedicating whole channels to EFL – like B.B.C. or British Council. However, too much choice of AVC presents a problem: educational practitioners lack a structured place to find which AVC to use for each learning objective.

This context provided the opportunity to conceive and develop a doctoral research project to implement an OCP to support crowd mapping of AVC and to serve as an online AVC aggregator for teachers and learners. This OCP is meant to be a valuable tool for (in)formal EFL learning scenarios, with two primary functions: **i.** to support crowd mapping of AVC, and **ii.** to serve as an online AVC aggregator for teachers and learners of Business English (BE). The development of such a platform has to be grounded on a mapping Matrix, which crosscuts AVC and BE learning objectives. Ergo, this mapping Matrix will address several AVC features, not only at the structural, situational or communicational level, but also as to the language proficiency level (according to the Common European Framework of Reference for Languages², and communication skills associated to BE. Conceptualizing and developing this Matrix was Phase 1 of the project.

Phase 2 consisted of an expert validation of the Matrix, and the most relevant results of this Phase will be addressed in this paper. Thus, the choice of the expert panel, as well as the decisions to collect and treat the data will be depicted in the methodology section. The discussion section focuses on the constraints experts identified during their trial of the Matrix and the possibilities to overcome them to embody the Matrix into the OCP successfully.

2. State of the art

The theoretical background of this research project attempted to provide a reliable basis to unite published knowledge in three fields: **i.** EFL didactics (specifying the theoretical grounds for BE); **ii.** the tendencies of AVC consumption (specifying the published practices of using AVC in English didactics; and **iii.** the role of OCPs in autonomous language learning.

¹ See <https://www.youtube.com/yt/about/press/>

² see <https://www.coe.int/en/web/common-european-framework-reference-languages/level-descriptions>

One can initiate this revision of the state of the art with the measure in which AVC is still a highly-favored form of entertainment. Consumer statistics published by Nielsen (2014)³ indicate a growth of hours dedicated to AVC consumption in all demographics. Google (2016)⁴ adds statistics about the different ways of viewing over one billion hours of AVC⁵, namely using computers or mobile devices, as well as pairing the mobile devices with AVC consumption. Using YouTube© as a reference, one can also highlight that the most searched AVC are related to music, movies and User Generated Content (UGC); 4% of uploaded content addresses science and technology; and 40% of YouTube© views are done on mobile devices⁵. In conclusion, all data points to the fact that AVC, as an entertainment form, is consumed massively, using several platforms, on a global scale.

Adding to the previous conclusion there is the fact that for economic, political and social reasons, English is the “*lingua franca of the modern globalized world*” (Crystal, D. 2005, p. 1). This fact can also be confirmed by the amount of English speaking AVC on repositories and television program grids of Portuguese channels.

The entertainment power of AVC has raised the curiosity of EFL researchers. Such a wide variety and range of AVC provided theoretical approaches to using AVC for EFL didactics. McNulty & Lazarevic (2012) list some advantages of using AVC in English didactics like: synchronous communication exposure, non-verbal communication, paralinguistic cues and a more efficient understanding of meaning. However, Bahrani et al. (2014) identify some of the constraints relating to the same issue, like: biased cultural content, unsuitability of genre or exposure to irrelevant/difficult vocabulary. Platforms like FluentU (www.fluentu.com) use AVC from online repositories as the leading learning aid in their structured training courses for adult EFL learners. Moreover, platforms like Future Learn (www.futurelearn.com) and Khan Academy (<https://pt-pt.khanacademy.org/>) invest in their own production of AVC for their training courses.

Researchers also studied the effect of using collaborative platforms in the teaching/learning of EFL. Being a technology that rose with the evolution of Web 2.0, this topic is still in need of additional study. Nevertheless, video-based Massive Online Open Courses got positive responses in a study by Bárcena et al. (2014), and Duolingo (www.duolingo.com), a mobile collaborative language learning platform, was positively reviewed by Hockly (2015). This theoretical background, confirmed the need for the OCP under development, leading to the presentation and execution of this research project.

³ See <http://ec.europa.eu/eurostat/documents/3433488/5281333/KS-SF-09-044-EN.PDF/82cd034b-a65f-47ca-8f62-6285ad593c20>

⁴ See https://www.consumerbarometer.com/en/graph-builder/?question=M8&filter=country:portugal%7CC1:16_24.25_34.35_44

⁵ See <https://www.socialmediatoday.com/social-business/mind-blowing-youtube-stats-facts-and-figures-2017-infographic>

3. Development of the Matrix

This Matrix is an aggregation of markers considered essential to catalog AVC which targets educational needs of BE learners. To identify these markers, an exploratory study was conducted in the literature and online AVC repositories and aggregators. Thus, the Matrix was designed and developed considering data collected in **i.** the state of the art, – here one gathered AVC features valued by EFL researchers, like type of AVC, subtitles, or new content feedback; **ii.** the European Common Framework of Reference⁶ – to legitimize the proficiency levels and the communicative contexts; **iii.** published research studies on AVC and on EFL didactics to collect elements that learners of EFL valued when watching AVC as an aid to their learning⁷ – like accents, fluency, or vesimilitude; and **iv.** exploratory studies of OCP’s connecting AVC and EFL to verify how these platforms were constructing their search queries, and how they indexed the AVC and the lesson plans.

Afterwards, using the tool Google Forms©, the Matrix evolved into a set of questions about AVC, thus inviting users to attribute the markers to the content, i.e., an indexation of content but focused on both AVC and learning objectives. Figures 1, 2, 3 and 4 provide examples of markers, how these markers were transformed into a questionnaire and their answer options.

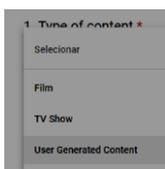


Figure 1 – Choosing the type of the AVC



Figure 2 – Defining the target audience

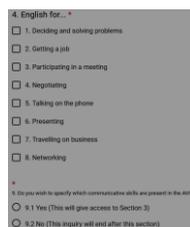


Figure 3 – Choosing the Communicative Skills



Figure 4 – Specifying the Communicative Skill

The questionnaire that derives from the Matrix is divided into three sections, and all questions are to be answered after the viewing of a single AVC. Section 1 asks about information about the general identification elements of the AVC and the reason why it was uploaded. Here, one answers questions about the “Type of AVC” (Figure 1) “Title”, “Year”, “Description” and “URLs”. Section 2 asks about AVC meta-data and linguistic markers: “Genre”, “Duration”, “Target audience” (Figure 2), “Communicative Skills” (Figure 3), “English level”, “Subtitles”, “Content Feedback” and Communicative Contexts. Section 3

⁶ See <https://rm.coe.int/16802fc1bf>

⁷ These elements were collected from Carvalho & Almeida (2015)

is an optional section that asks users to specify the Communicative Skills⁸ of the AVC (Figure 4).

Grounding the OCP on this Matrix allows both the cataloging and the search for AVC. Moreover, it will legitimize the primary functions of the OCP (see introduction). This Matrix's development was in tune with all the information collected from the exploratory work mentioned in the beginning of this section.

4. Methodology

After the development Phase, an experimental and validation Phase of the Matrix was carried out. Getting a variety of expert viewpoints about its accuracy was fundamental. It was also an opportunity to gather recommendations to embody the Matrix in an OCP. This need for expert perspectives led to the choice of the methodological process: Expert panel validation.

Data were collected using three instruments. i.e., **i.** an observation grid, which was used by the researcher to evaluate the Experts' reactions to the Matrix *in loco*; **ii.** a survey elaborated under the Atrakdiff⁹ methodology for evaluation of products; and **iii.** a semi-structured interview, to collect the experts' viewpoints and recommendations. The gathered data were treated as qualitative data by means of content analysis¹⁰.

One of the first decisions in selecting a review panel is to define the necessary expertise of its members. Experts can be identified by specific characteristics, i.e., "*An expert has documented (...) experience with the target population; achieved professional certification in a related topic area (...); or initiated research on the topic area*" (Davis, 1992, p. 1). Using these perspectives, the following criteria to select experts for the panel were outlined. Namely, their expertise in **i.** EFL didactics; **ii.** EFL learning with AVC; **iii.** AV consumption; **iv.** development-research methodology; **v.** use of OCP's in educational contexts.

Furthermore, the interview was also used to gather data about their beliefs and opinions. According to Harrell & Bradley (2009), the type of interview that best suits the intended purpose is the semi-structured interview, once it allows for a more systematic treatment of the data, and it is flexible enough to select, mid-interview, subjects that need further deepening. With a balanced amount of control and a set of open questions, the semi-structured interview can also accommodate new (*in vivo*) items. Therefore, interviewing experts was fundamental to **i.** identify the interviewees' global perception concerning the

⁸ The Communicative Skills adopted by the Matrix were collected from Carvalho, Almeida, Balula (2017).

⁹ See <https://www.uid.com/en/publications/attrakdiff>

¹⁰ This methodological procedure was influenced by Ghiglione & Matalon's (2001) terminology concerning content analysis.

mapping accuracy and range of the Matrix; **ii.** validate the linguistic formulation and variables included in the Matrix; **iii.** validate the modules’ considered; **iv.** validate the tool used to search mapped AVC. Experts were also asked to provide opinions on how to operationalize the Matrix in an OCP, pinpointing possible threats to the platform – by predicting user behavior – and suggesting strategies to overcome the identified threats.

To facilitate the data analysis and respect the experts’ anonymity, first, a code was defined for each interviewee – Ed1, Ed2, Et1, and Et2; second, the interviews were recorded and transcribed in full; and, finally, treated resorting to Content Analysis. In the latter, the **objectives** and a set of **categories** were defined beforehand whereas the **subcategories** were defined *in vivo*, resulting in the following category structure (see Table 1).

Table 1. Categories of the content analysis according to the defined objectives

Objectives	Categories	Subcategories
1. <i>Objective 1</i> – to identify the interviewees’ global perception concerning the mapping accuracy and range of the Matrix	1.1. Mapping accuracy	1.1.1. Structure 1.1.2. Content
	1.2. Range	1.2.1. Types of AVC 1.2.2. English proficiency
2. <i>Objective 2</i> – to validate the linguistic formulation and variables included in the Matrix	2.1. Linguistic accuracy	2.1.1. Questions
		2.1.2. Variables
3. <i>Objective 3</i> – to validate the modules’ considered	3.1. Suitability	3.1.1. Purpose of question 3.1.2. Relevance of questions
	3.2. Organization	3.2.1. Sublevels 3.2.2. Misplaced questions
4. <i>Objective 4</i> – to validate the tool used to search mapped AVC	4.1. Filters	4.1.1. Criteria
	4.2. Result display	

The meetings with the Experts consisted of three moments. In the first moment, the Expert, or Interviewee (Ie), watched a video. Then, the Ie used the questionnaire to catalog the video, while being observed by the Interviewer (Ir). This task was carried out a second time, and at the end of the task, Ie filled out the AttrakDiff questionnaire. Finally, Ir asked scripted questions about the experience. In the second moment, the Ie experimented with the search questionnaire, guided by the Ir. The Ir provided a video as a possible search result, which Ie watched. Ie was asked about the search tool, the quality of the filter and the information to be displayed in a search result. In the third moment, Ir asked questions about the operational aspects to embody the Matrix in an OCP. After the interviews with the four Experts, there was enough data to address the objectives.

5. Discussion

The discussion section will focus on expert feedback directed to the Objectives listed in the previous section. The discussion will address the questions that Experts considered to be needing improvement. The sub-categories that were validated, like “*Structure*” (1.1.1.), “*Content*” (1.1.2.), “*Types of AVC*” (1.2.1.) or “*English Proficiency*” (1.2.2.) will not be discussed.

Regarding “*Suitability*” and in terms of “*Purpose of questions*” (see Table 1, 3.1.1.), Et1 disagreed on using the question about “*Title of video*” (Figure 5) to write the actual title the video has on the repository it was uploaded from. Et1 states that “*The title should be the ‘didactic’ reason why I’m including the AVC in the platform*”, because this OCP’s purpose is not to index AVC by title but rather by why the user considered this worthy of sharing.

The question “*Relevance of questions*” (Table 1, 3.1.2.) Subcategory 3.1.2. was addressed by Ed2, who used the example of the question about “*Genre*” (Figure 6) to inquire the need and relevance of so many options to answer some of the questions: “*I don’t know if all that is here is equally relevant.*”

Concerning “*Sublevels*” (3.2.1.), Ed1 and Et2 addressed the subjectivity of the sublevels for the “*Target-audience*” (Figure 2) question. For Ed1, the chosen options need to be reviewed as they will create doubt on mainly teenage learners’ perception: “*Juvenile? Adult? Teenagers normally have problems. From 18 one is already an adult*” (Ed1).

As for “*Misplaced questions*” (3.2.2.), Et1 pinpointed the lack of relevance of the “*Description of the AVC*” (Figure 7) question. To this expert, the description is “*critical for this cataloging!*”, which means that it needs a more highlighted position in the questionnaire and also to lose its optional status.

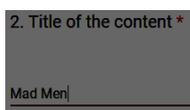


Figure 5 – Copying title of AVC



Figure 6 – Choosing Genre

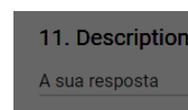


Figure 7 – Describing the AVC

Concerning the display of search results (Table 1, 4.2.), Experts suggest that the OCP present more than one result, even if it does not match the search criteria by 100% (Et1, Ed2). Experts also suggest showing basic information about the AVC on the result list, namely “*relevance towards the search criteria*” (Et2), “*the communicative situation and the level. Eventually the duration*” (Et2). Additionally, the results list should also present the number of times the AVC was cataloged (Ed2).

For the issues raised, seven solutions were equated: **i.** to create a user profile which can collect much of the information that the questionnaire asks for – e.g. preference for “*Genre*” and for “*Communicative contexts*”; **ii.** to provide three levels of cataloguing, direct, basic and advanced; **iii.** to eliminate irrelevant questions from the questionnaire (for instance, if a user chooses a UGC, the OCP will not ask about the episode, season or producer); **iv.** to add the option “*others*” in some of the questions. There is also the possibility to add an item for “*comments*”, to add information not provided by the Matrix’s questionnaire (it is necessary that these additions do not conflict with the issue of “*too many sublevels*”; **v.** to change the item “*Title of the video*” to “*Purpose of the video*” with an explaining pop-up balloon clarifying that the information to be written would be the didactic purpose(s) of this video; **vi.** to make “*Description*” a mandatory and highlighted question of the cataloguing process; **vii.** changing the question from “*Target audience*” to “*Age groups*” and the sublevels would be the ones proposed by the manuals and online platforms of EFL learning, namely: “*Young learners*”; “*Teenage learners*”; “*Adult learners*”.

The experts were also asked to identify some threats to consider in the operationalization process of the OCP. One of the pinpointed threats was the possibility that the crowdsourcing element of the platform may not function due to a lack of participation by the target users (because “*cataloging is a dull task*” (Et1)”. Moreover, users need to see an apparent value of the OCP for their teaching/learning practice and be rewarded for their work (Ed2, Et2). To circumvent these threats, the technological Experts suggested that the OCP should be developed with gamification features that will provide users with the participation rewards. Other contribution strategies proposed were: creating a business model, connecting the OCP with educational institutions, and integrating social interaction features.

6. Conclusions

Phase 2 of this research project consisted of asking experts for the validation of the core concept of the OCP, for feedback about the Matrix, and for suggestions about incorporating the Matrix in the OCP. After following all methodological procedures and subsequent analysis of the data, it was clear that all experts saw value in the development of this OCP, thus giving their validation to the global scope of the research.

Moreover, the Experts did not consider any items of the Matrix to be redundant. The main concerns about the questionnaire are the unnecessary amount of answer options and a rigidity of some questions. Still, all items were considered relevant for the mapping and search process. Some of the items were highlighted as more significant, which is relevant

when organizing the mapping questionnaire in the OCP – ideally with three levels of mapping.

On an operational level, Experts shared some strategies to circumvent the threats they pinpointed to the OCP, like using gamification features, develop a business model to guarantee user participation, promote cooperation with educational institutions and develop social interaction features between the target-users.

Among the opportunities that Experts recognized in the project, one can mention the value it would bring in extracurricular contexts, namely putting the focus of choice on the learner, thus making the learner responsible for the progress of his/her learning. Another opportunity is related to the enrichment of the teaching/learning context with rich and free material provided by the online AVC repositories. This last opportunity can also be transported to the classroom context, reinstating the importance of AVC as an aid in EFL classes.

6.1. Future work

Future work on this project will consist of two further Phases. The objective of the next Phase is the construction of the OCP's prototype, taking into consideration the feedback shared by the Expert Panel. The research team will complement this development with continuous reflection, by providing guidelines and improvement suggestions. The team will test the OCP and define the AVC which will be used in the validation process planned for Phase Four.

The purpose of Phase Four will be the validation of the OCP by EFL teachers and BE learners, i.e., the target-users of the platform. In this Phase, the target-users will have the chance to utilize a prototype of the OCP. Users will map AVC using the prototype and provide feedback on this experience. This Phase will be a test to the OCP but also a Phase of data collection, in which participating teachers and learners will be sample crowds.

References

- Bahrani, T., Tam, S. S., & Zuraidah, M. D. (2014). Authentic Language Input Through Audiovisual Technology and Second Language Acquisition. *SAGE Open*, 4(3), 2158244014550611.
- Bárcena, E., Read, T., Martín-Monje, E., & Castrillo, M. D. (2014). Analysing student participation in Foreign Language MOOCs: a case study. *EMOOCs 2014: European MOOCs Stakeholders Summit*, 11-17.

- Carvalho, T., Almeida, P. (2015). Matriz primária de características de conteúdo AV procuradas por aprendentes de Inglês língua estrangeira, *COIED 2015*, Unpublished.
- Carvalho, T., Almeida P., Balula A. (2017). Categorization of Business English Communicative Skills: A Proposal, *EDULEARN17 Proceedings*, pp. 6542-6549.
- Crystal, D. (2005). *The stories of English*. Penguin UK.
- Davis, L. L. (1992). Instrument review: Getting the most from a panel of experts. *Applied nursing research*, 5(4), 194-197.
- Ghiglione, R., & Matalon, B. (2001). The Survey—Theory and Practice. *Publisher Celta, Oeiras*.
- Harrell, M. C., & Bradley, M. A. (2009). *Data collection methods. Semi-structured interviews and focus groups*. Rand National Defense Research Inst santa monica ca.
- Hockly, N.(2015). Developments in online language learning. *ELT Journal*, 69(3),308-313.
- McNulty, A., & Lazarevic, B. (2012). Best practices in using video technology to promote second language acquisition. *Teaching English with technology*,12(3),49-61.

Teaching to teach with a LMS: The experience at University of Perugia

Filomia, Maria; Santucic, Valentino; Vinti, Gianluca; De Santis, Giovanni Maria Perfetto; Falcinelli, Floriana; Frenguelli, Giuseppe; Lorenzi, Carlo; Moriconi, Alessio; Siepi, Donatella; Valori, Furia; Ranucci, David; Milani, Alfredo; Marianelli, Massimiliano

University of Perugia, Italy.

Abstract

A Learning Management System (LMS) is nowadays a pivotal element in the education environment of a modern university. However, though it generally has a beneficial and positive impact on the education, a part of the teachers is sometimes reluctant to adopt a LMS because of the perceived usage difficulty. Therefore, it is clear that a key step in order to spread the use of a LMS is to teach to the teachers how to use it and which benefits their teaching activities can gain. In this paper, we report and analyze the experience we had at University of Perugia. An e-learning course has been released to the (approximately) 1000 teachers of the university with the aim of introducing them to the basic tools provided by the LMS. Importantly, the course has been created and delivered by means of UniStudium, i.e., the Moodle-based LMS deployed in our university. This allowed us to collect interesting quantitative and qualitative data that have been elaborated and analyzed. The analysis shows that the activities carried out reached a prominent percentage of teachers, by also providing us important suggestions and hints to guide our future activities in this direction.

Keywords: *online training; higher education; professional development*

1. Introduction

Combinations of traditional and modern ICT and e-learning education methodologies are generally considered to greatly improve the learning process (Matukhin & Zhitkova 2015, Herlo 2014, Ranieri et al. 2018, Filomia 2016). In this scenario, academic institutions are increasingly playing a key role by introducing policies and initiatives to support teaching quality and to achieve the objectives of the Bologna Process (Surssock, et al. 2010, Veiga, A. & Amaral A. 2009, Sin 2012).

In this paper, we report and analyze the experience we had at the University of Perugia (UniPG). This experience is part of a project called PRO3, funded by the Italian Ministry of Education, and it has been held between November and December 2017. A self-paced online course has been released to the UniPG faculty members with the aim of introducing them to the tools provided by *UniStudium*, i.e., the UniPG learning management system. The aim is to provide to the academic teachers an environment where the learning process integrates technology enhanced strategies and face-to-face activities. The interaction capabilities of the e-learning environment promotes academic enhancement and innovation in learning and teaching activities according to Bologna Process and Dublin's Descriptors (Sin 2012). Therefore, this study also aims to investigate if and how an online self-paced course can be considered an appropriate training tool for a university teacher.

2. The Self-Paced Online Course

The aim of this activity is to provide basic and intermediate knowledge to UniPG teachers on the use of the tools implemented in the Moodle platform of our university, namely, UniStudium. The activity has been conducted by creating a online course made available to teachers through UniStudium itself. Therefore, UniStudium is both the subject and the means by which the course has been delivered to teachers.

The course has been designed as a sort of “virtual book” and it is composed by five chapters, i.e., five macro-topics of increasing difficulty covering an above-average use of the UniStudium tools. Each chapter is then divided in different paragraphs.

Paragraphs have been conceived as web pages and are implemented using the Moodle *page* activity. All the pages contain both a textual description and a video-tutorial. Then, pages belonging to the same chapter are grouped together in the same section of the course (the topic-based course layout of Moodle has been adopted). A clarificatory illustration is provided in Figure 1.

The five chapters are:

1. *First steps*, which provides basic informations such as how users access the system and how courses are organized.
2. *Create teaching material*, where the main Moodle resources are described.
3. *Student access control*, where instructions to limit or extend the audience of a Moodle course are provided.
4. *Interaction with the students*, which describes the main Moodle activities such as forum, assignment and quiz.
5. *Advanced tools*, where it is described how to monitor student engagement.

All the content has been released in a “single shot”. Due to the very variegate level of e-learning knowledge among UniPG teachers, this choice allowed to accommodate the expectations of both the teachers who never seen an LMS before and the teachers using it on daily basis.

In the days immediately following its deployment, the course has been publicly presented through a series of “physical” meetings organized on every department of our university.

In order to collect data for this analysis, the following actions have been carried out:

- completion tracking has been enabled on every single page/paragraph,
- the time spent inside the course by every teacher is recorded,
- teachers are invited to provide a feedback by means of an anonymous questionnaire,
- teachers are invited to provide suggestions and highlight criticalities by means of a discussion forum,
- attendance to presentation meetings has been recorded.

In particular, the anonymous questionnaire, created by means of the feedback module of Moodle, allowed us to have an indication of the teachers agreement on the course content and its practical utility for the teaching activity. The questionnaire is mainly composed by Linkert-type questions, i.e., questions with five possible answers labeled from 1 to 5 and where 1 represents a *strong disagreement* while 5 is a *strong agreement*. Furthermore, teachers are also invited to express their suggestions through a text field.

3. Findings

Two analyses have been conducted. The quantitative analysis aiming to gauge the number of attendees is described in Section 3.1, while the analysis of the anonymous questionnaire is provided in Section 3.2.

3.1 Quantitative analysis

Objectives of this analysis are to assess how many teachers have attended the course and which topics have received more interest. These data have been also disaggregated and observed on the different areas to which the teachers belong.

Each teacher is considered to have attended the course if and only if at least one of the following four criteria has been satisfied:

- a) the teacher has attended the presentation meeting,
- b) the teacher has submitted a feedback through the anonymous questionnaire (though answers are anonymously collected, submission information is anyway recorded),
- c) the teacher has completed (i.e., viewed) at least five paragraphs of the course,
- d) teacher activity on the platform has been recorded for at least one hour.

In criterion (c), the minimum number of five paragraphs, over a total of 19, has been considered because we think it is a reasonable threshold allowing to simultaneously take into account both principiant and more expert users. Moreover, criterion (d) considers a threshold of one hour because it is approximately the total duration of the video-tutorials embedded in the course pages.

The absolute and percentage quantities of teachers who attended the course are provided in Table 1. Note that the number of attendances has been disaggregated both for teachers areas and basing on the satisfied criteria.

Table 1 shows that the course has been attended by almost 412 teachers, i.e., almost the 40% of the university teachers. Moreover, four areas over six have a percentage of attendance greater than 45%, while the only two critical areas are medicine and economy-law-political science, thus suggesting that future initiatives are particularly needed for the departments of these areas.

Table 1. Attendance data

Teachers Area	Teachers	Attendances	Crit. (a)	Crit. (b)	Crit. (c)	Crit. (d)
Agriculture and Veterinary	139	90 (65%)	56	55	60	47
Economy, Law and Political Science	184	45 (24%)	43	11	11	7
Engineering	131	60 (46%)	10	40	54	45
Humanities	137	68 (50%)	32	34	53	34
Medicine	224	24 (11%)	11	10	16	7
Sciences	237	125 (53%)	50	86	112	73
University total	1052	412 (39%)	202	236	306	213

Furthermore, for each paragraph, the number of teachers that have read it (or watched its video-tutorial) has been recorded. For the sake of space we briefly discuss these data without providing tabular details. The main consideration is that the number of reads in the first and second chapters are around the 20% greater than in the last three chapters, thus suggesting that the first part of the course is likely to be enough for a principiant user.

3.2 Anonymous questionnaire

The questionnaire has been completed by a total of 236 teachers divided as follows: 39.16% associate professors, 29.72% assistant professors, 13.99% full professors, and 4.55% adjunct professors. The results show that 87.41% (agreed or strongly agreed) of teachers found the online course helpful to learn. The textual presentation of the course was clear (60.84% strongly agreed) as well as the video-tutorials (61.19% strongly agreed). The interaction with the course contents was simple and intuitive (88.81% agreed or strongly agreed) and the course was easy to follow (92.31% agreed or strongly agreed).

The full detail of the answers is shown in Table 2.

Table 2. Teachers's degree of agreement on course content

Sentence text	Opinion Categories	Percentages %
I found the course helpful to learn how to better use the UniStudium platform	Strongly disagree	1.75
	Disagree	2.80
	Neither agree or disagree	8.04
	Agree	32.17
	Strongly agree	55.24
The textual presentation of tools was clear	Strongly disagree	0.70
	Disagree	1.05
	Neither agree or disagree	5.59
	Agree	31.82
	Strongly agree	60.84
The video tutorial of tools was clear	Strongly disagree	1.40
	Disagree	2.10
	Neither agree or disagree	5.24
	Agree	30.07
	Strongly agree	61.19
The interaction with the course contents is simple and intuitive	Strongly disagree	1.05
	Disagree	2.80
	Neither agree or disagree	7.34
	Agree	35.31
	Strongly agree	53.50
I find the course easy to use	Strongly disagree	1.05
	Disagree	1.05
	Neither agree or disagree	5.59
	Agree	31.47
	Strongly agree	60.84

The second group of sentences is focused on teachers' perception about of knowledge transfer to improve teaching practices. The results showed that the teachers improved online platform skills (74,83 % agreed or strongly agreed) and that they consider Unistudium a useful support for their teaching practice (76,23% agreed or strongly agreed) 59,9% (agreed or strongly agreed) of Unipg teachers believe that the e-learning environment can improve students motivation, and 70,63% (agreed or strongly agreed) believe that the e-learning environment can create a new custom relationship. This is show on table 3.

Table 3. Teacher’s degree of agreement on course content in terms of knowledge transfer to concrete teaching practices

Sentence text	Opinion Categories	Percentages %
After this course I believe that I will use the Unistudium platform more in my teaching practice	Strongly disagree	3.15
	Disagree	2.80
	Neither agree or disagree	19.23
	Agree	30.77
	Strongly agree	44.06
After this course I believe that UniStudium can support me to create a more profitable relationship with the students	Strongly disagree	3.50
	Disagree	4.20
	Neither agree or disagree	21.68
	Agree	35.66
	Strongly agree	34.97
After this course I believe that UniStudium can support my students’ motivation to learn	Strongly disagree	5.94
	Disagree	9.44
	Neither agree or disagree	24.48
	Agree	29.72
	Strongly agree	30.42
After this course I believe that UniStudium can support my teaching practice	Strongly disagree	2.80
	Disagree	3.85
	Neither agree or disagree	17.13
	Agree	33.92
	Strongly agree	42.31

4. Conclusion

The data collected and the analyses presented in this paper show that the self-paced online for UniPG teachers generally had a positive impact. Considering that this is the first initiative of this type in our university, a good number of attendees has been reached (39% of UniPG teachers) and, most importantly, teachers clearly express their satisfaction with respect to course content and how it is delivered to them. Finally, our research has also shown that the modern technologies provided by the Moodle LMS are considered simple to use and very useful in improving teaching activities.

References

- Bologna Follow-Up Group (2005). Framework for Qualifications of the European Higher Education Area. Copenhagen.
- Filomia M., (2016). Il blended learning: una possibilità per la formazione. in Falcinelli F, Moschini M. (2016). Progettazione, gestione e coordinamento dell'oratorio. Franco Angeli. Milano
- Herlo D.,(2014). Improving efficiency of learning in Education Master Programs, by blended learning. *Procedia- Social and Behavioral Sciences*. 191, 1304-1309
- Matukhin D., Zhitkova E. (2015). Implementing Blended learning Technology in Higher Professional Education. *Procedia- Social and Behavioral Sciences*. 206 ,183-188
- Ranieri, M. Raffaghelli J.E., Pezzati. (2017). Digital resources for faculty development in e-learning: a self-paced approach for professionale learning. *Italian Journal of Educational Technology*, [Available at: <<http://ijet.itd.cnr.it/article/view/961>>.
- Rizzitello M.(2017). Design Recommendations for Self-Paced Online Faculty Development Courses. *TechTrends*, 61, 77-86
- Sin, C. (2012). Academic Understandings of and Responses to Bologna: a three-country perspective. *European Journal of Education*, 47 (3), 392-404.
- Sursock, A. & Smidt, H. (2010). Trends 2010: a decade of change in European higher education. Brussels: European Universities Association.

NeuroBoricuas: a novel approach for incorporating neuroscience education in schools of Puerto Rico

Bravo-Rivera, Christian^a; Diaz-Ríos, Manuel^d; Aldarondo-Hernández, Ariadnaⁱ; Santos-Vera, Bermery^b; Ramos-Medina, Liorimar^k; De Jesús-Burgos, María Inés^c; Bravo-Rivera, Héctor^d; Torrado, Aranza^d; Cabezas-Bou, Ernesto^d; Cruz-Lopez, Fabiola^c; Colón-Mercado, Jenniferⁱ; Otero-Rivera, José^f; Rolon-Reyes, Kimberleve^d; Mendez-Gonzalez, Miguel^c; Ferrer-Acosta, Yancy^l; Zayas-Santiago, Astrid^a; Tejada, Flavia^m; Merced, Amelia^c; Quintero-Martínez, Zarcaly^g; Landívar, Alicia^k; Colon-Cruz, Luis^d; Crooke-Rosado, Jonathan^d; Rivera-Aponte, David^m; Acevedo-Canabal, Agnes^d; A Sosa-Lloréns, María^d; Quijano-Rivera, Eduardo^h.

^aDepartment of Neuroscience, Cold Spring Harbor Laboratory, United States. ^bDepartment of Physiology, Ponce School of Medicine and Health Sciences, Puerto Rico. ^cDepartment of Biology, University of Puerto Rico, Puerto Rico. ^dDepartment of Anatomy and Neurobiology, University of Puerto Rico, Puerto Rico. ^eDepartment of Microbiology, University of Puerto Rico, Puerto Rico. ^fDepartment of Computer Engineering, University of Puerto Rico, Puerto Rico. ^gDepartment of Psychiatry, University of Puerto Rico, Puerto Rico. ^hCommunity Service Center, Universidad Metropolitana de Puerto Rico, Puerto Rico. ⁱ Carlos Albizu University, Puerto Rico. ^jDepartment of Physiology, University of Puerto Rico, Puerto Rico. ^kEstancia Montessori, Puerto Rico. ^lDepartment of Neuroscience, University Central del Caribe, Puerto Rico. ^mDepartment of Biochemistry, Universidad Central del Caribe, Puerto Rico.

Abstract

Puerto Rico is in dire need of transforming its education system to counter the current economic recession and ensure a future with talented Puerto Ricans at the forefront of scientific research and technology development. Here we present a group of neuroscientists and educators, the NeuroBoricuas, committed to revolutionize the scientific culture of Puerto Rico by incorporating neuroscience research training and inquiry-based activities in public and private schools. We carry out our vision through diverse methods, such as community outreach activities, where we promote neuroscience literacy using diverse learning activities. In parallel, we are designing a neuroscience course and textbook with educators to be implemented in schools. We also established neuroscience laboratories in K-12 schools and trained science teachers to manage such laboratories, using equipment from the company "Backyard Brains". These laboratory experiences are integrated into the academic curriculum in high schools and the equipment is also available for students interested in designing their independent research projects. Lastly, we are expanding a network of committed scientists who partner with educators to help nurture future neuroscientists early in their academic endeavors. Here, we describe our trajectory and our approach to transform scientific education in Puerto Rico.

Keywords: *Puerto Rico; Science; Community; Outreach; Backyard Brains; NeuroBoricuas.*

1. Introduction

Puerto Rico is an United States territory located in the Caribbean with an estimated population of 3.4 million inhabitants (US Census Bureau, 2016). Currently, the Island is going through an economic recession that threatens its development. It is estimated that about a thousand Puerto Ricans leave the island each week on one-way flights. It ranks as the seventh country with the greatest proportional loss of population in the world (Kilpatrick, 2015). Most migrants are young people seeking employment opportunities in the United States (Lopez-Alicea, 2015). In 2013, most Puerto Ricans who migrated outside Puerto Rico were between 5 to 29 years old (Puerto Rican Institute of Statistics, 2013). It was previously estimated that by 2020 about 300,000 Puerto Ricans would have emigrated (Marazzi Santiago, 2016), but this number is expected to be much higher now because of a sudden massive exodus (100-200K) in response to last year's hurricanes, Irma and Maria (Torres-Gotay, 2017). Therefore, it is imperative that we produce initiatives that promote the retention of young talent of Puerto Rico.

Scientific research drives the development of technologies and acquisition of knowledge that benefits society. Research in biomedical sciences serves to characterize the workings of human physiology, to characterize diseases and to improve clinical treatments. Scientific research also serves as an excellent platform for education, where students learn in a dynamic context and are part of scientific discovery. In the process of scientific research, students learn to self-educate and undergo scientific reasoning, which is an excellent model for problem-solving. Therefore, scientific research serves as a platform to develop knowledgeable, well-informed citizens of public service, such as future educators, researchers, and health professionals.

An emerging field in life sciences, neuroscience, has been growing in Puerto Rico, such that 5 of 7 R01 / R37 grants (one of the major grants from the National Institutes of Health, USA) awarded in Puerto Rico are related to neurosciences. Some of the neuroscience topics currently researched in Puerto Rico are the neuronal mechanisms of drug addiction and alcohol dependence, neuronal basis of emotional learning and memory, organization of neural circuits that produce behavior, spinal cord regeneration, environmental pollution effects and behavior of endogenous animals of Puerto Rico, among other fields of neuroscience. Regrettably, Puerto Ricans in general are unaware of Puerto Rican contributions to science and technology. Students are unaware of scientific training opportunities. The idea that people need to leave Puerto Rico for quality education in science and engineering is a common misconception. In addition, many students are not familiar with the role of scientists or the academic track leading to a career in science.

To educate, guide and recruit future Puerto Rican scientists, we have developed an initiative where we empower the Puerto Rican youth to seek roles in science and technology

development. We achieve this by merging the university academia with schools in Puerto Rico. The NeuroBoricuas initiative attained strong traction and it is succeeding in having a positive impact towards transforming the scientific culture in Puerto Rico. Here, we share how our initiative originated, how it grows, and how it can be replicated in other regions.

2. History of NeuroBoricuas

Long before it was known as Puerto Rico, the Taínos, the natives that lived in the island, called it Borikén. Boricuas, which stems from Borikén, is a popular way Puerto Ricans proudly self-identify. We therefore named our group, consisting of mainly neuroscientists, NeuroBoricuas. When we first started NeuroBoricuas, we were a group of ten people, including graduate students, postdoctoral scientists, technicians and professors. Our main goal was to train school teachers on how to incorporate neuroscience teachings in their courses, and to manage a neuroscience laboratory in their school. We presented our project proposal for the first time at the Annual Puerto Rico Neuroscience Conference in December 2016, where we recruited faculty and the members of our education panel in NeuroBoricuas. The first school we contacted was CROEM, a public boarding school in the west area of Puerto Rico that specializes in math and sciences. Students in this school are highly competitive and are considered among the top of the island, which made them suitable to be our pilot student cohort.



Figure 1. Inception of NeuroBoricuas. Left: The NeuroBoricuas Initiative started with a meeting at the University of Puerto Rico where we brainstormed ideas about how to empower students and educators to teach neuroscience in schools of Puerto Rico. Right: We shared our plans with other colleagues during the Puerto Rico Neuroscience Annual Conference, where many became new NeuroBoricuas.

We invited CROEM teachers and student leaders to the University of Puerto Rico School of Medicine in December 2016, where NeuroBoricuas gave lectures on basic neuroscience and a workshop on how to use equipment from Backyard Brains for their neuroscience laboratory. Using social media, we resorted to crowdfunding for acquiring the neuroscience laboratory equipment for CROEM. In January 2017, a team of NeuroBoricuas visited CROEM at Mayaguez, Puerto Rico, to install the first neuroscience laboratory in a Puerto Rican school (“Inauguran laboratorio de neurociencias”, 2017). The inauguration started with remarks from representatives from the local government and the

department of education, as well as world-renowned neuroscientist, whom endorsed our initiative. All the students and faculty from CROEM participated in the inauguration event.



Figure 2. Inauguration of the first neuroscience laboratory in a Puerto Rican school. Left: Dr. Gregory J. Quirk, a prominent neuroscientist, lecturing the CROEM Community about the importance of science in Puerto Rico and endorsing the NeuroBoricuas initiative. Center: Ribbon-cutting of the neuroscience laboratory in CROEM. Right: CROEM students and NeuroBoricuas performing demonstrations of their newly-acquired neuroscience laboratory equipment during the inauguration.

A week after the lab inauguration, a team of NeuroBoricuas, had an outreach kiosk during the Fiestas de la Calle San Sebastián, one of Puerto Rico's most iconic street festivals. Dozens of NeuroBoricuas came together to deliver a community outreach to whole families that were attending the street festival in Old San Juan, Puerto Rico. The different presentation stations used equipment from Backyard Brains (detailed in the section below), neuroscience research and neuroanatomy with a human brain (Cruz, 2017).



Figure 3. Neuroscience outreach in popular street festival in Puerto Rico. Left: NeuroBoricuas from different institutions gathered together to participate in an outreach activity targeting Puerto Rican families enjoying a massive street festival in Old San Juan, Puerto Rico. Right: Hundreds of festival attendees engaged in presentations from NeuroBoricuas and learned about the brain and neuroscience research.

Both the inauguration of CROEM's neuroscience laboratory and the outreach kiosk at Fiestas de la Calle were widely covered by the Puerto Rican press, both written and broadcasted. Both events were also shared on social media and inspired a significant number of people to join NeuroBoricuas. The press and social media exposure reached teachers, students and school principals that then reached out to us to collaborate with NeuroBoricuas. As of now, we have over 150 members of NeuroBoricuas in 18 universities in Puerto Rico, and 20 collaborating schools.

3. Partnering with Backyard Brains

Because of our collaboration with Backyard Brains, partner schools and universities benefit from acquiring the lab equipment kit at a discounted and affordable price. The lab kit includes equipment for activities with people and insects. One component allows for the recording of nerve signaling in insects, generally in earthworms, or in the legs of cockroaches or grasshoppers (Marzullo and Gage, 2012; Dagda et al 2013). Electric activity of these nerves can be observed and measured through a free Backyard Brains application in a laptop, tablet or smartphone. Several types of experiments can be done with this set-up, such as measuring neural responses to sensorial stimuli, temperature changes and pharmacological agents, to name a few. Other components are suitable for non-invasive recording of neural signals that control the heart rhythm (electrocardiogram), neural activity from the brain cortex (electroencephalogram), and neural signals that control muscles (electromyogram). The kit also includes two modules of interface technology: a human-to-human interface and a human-to-machine interface. In the human-to-human interface module, neural signals from a person's arm motor neurons (sender) are registered in the interface, which has an electrical output that can stimulate the arm muscles of another person (receiver). The human-to-machine interface module allows a person to control a mechanic claw with neural signals from arm motor neurons. These interface modules serve as a great introduction to biotechnology. Additionally, the kit includes an apparatus that converts any smartphone into a high-power microscope.

These modules have a programmable Arduino integrated, such that these are modifiable. These Arduinos serve as a great opportunity for students to learn about programming, a skill highly relevant in scientific careers. Backyard Brains also provides the modules in disassembled parts, to allow students to engage in the challenge of building the equipment themselves. This serves as a great introduction to electronics and learning about how the system works. These modules are simple to use, such that high school students can become proficient in using these in a short time.

4. NeuroBoricuas in K-12 Schools

On our NeuroBoricuas' board, we have a School Coordinator who oversees all interactions between NeuroBoricuas and schools. Students, teachers, principals and parents reach out to us through our webpage, Facebook page, or email to inquire about collaborating with NeuroBoricuas. If students or parents make the approach, we ask them to provide us with the principal's or a teacher's contact information. We then proceed to discuss our collaboration agreement with the school representative. The collaboration agreement states that there must be a team of teachers and a team of students engaging in NeuroBoricuas activities. The team of teachers are trained to manage a neuroscience laboratory in their

school by NeuroBoricuas volunteers. The team of students organizes a NeuroBoricuas' school club, which they manage themselves. In this club, students organize outreach activities within and outside of their school. They also discuss research articles in self-moderated journal club discussions. The main objectives of these clubs are to empower students to engage in scientific inquiry and to start developing collaborative attitudes regarding research.

The NeuroBoricuas' club at CROEM school has already engaged in multiple outreach activities in a region often overlooked outside the metropolitan area. These students helped teach school educators to use the Backyard Brains laboratory equipment in the NeuroBoricuas workshop intended for teachers from schools in the west area of Puerto Rico. This was a powerful sight; students felt empowered to teach what they had recently learned, including their teachers. Teachers not only learned about neuroscience and the equipment, but also about what Puerto Rican students can achieve. These CROEM students also showcased the neuroscience laboratory equipment to the press during the lab inauguration, which served as evidence to Puerto Rican educators that students are ready for this next step in their education.



Figure 4. NeuroBoricuas Students' club at CROEM high school. Left: Students from the NeuroBoricuas club at CROEM visiting a school to teach students about neuroscience. Center: The students also taught the teachers about neuroscience. Right: The students discussing research articles in a journal club meeting moderated by themselves. This journal club is commonly practiced by research teams in their laboratories.

We have a team of NeuroBoricuas that majored in education that are designing a neuroscience introductory course for high schools. This course will include a laboratory component, so students will learn about neuroscience in the classroom and with hands-on experiments using their laboratory equipment. We are, also, working on a textbook for this course through a collaboration where Puerto Rican neuroscientists who are coming together to collaborate to cowrite the different chapters.



Figure 5. NeuroBoricuas Workshop for school educators. Left: Participants of the NeuroBoricuas workshop for teachers from the west of Puerto Rico. Led by Dr. Miguel Mendez-Gonzalez. Center: Participants of the NeuroBoricuas workshop for teachers from the north and east of Puerto Rico. Led by Zarcaly Quintero and Dr. Manuel Diaz-Rios. Right: Participants of the NeuroBoricuas workshop for teachers from the south of Puerto Rico. Led by Dr. Bernmary Cruz and Dr. Maria de Jesus.

5. NeuroBoricuas Chapters in Universities

In our NeuroBoricuas' board, we have a University Coordinator that oversees all interactions between NeuroBoricuas and university chapters. One of our major targets are university students and professors. We encourage them to organize an institutional NeuroBoricuas chapters, where as a student's association they can convene and expand the mission of NeuroBoricuas. Members of these chapters actively participate in outreach activities and in workshop for teachers that recently joined NeuroBoricuas. We use questionnaires to assess the efficacy of our teaching methods and the teachers' appraisal. Additionally, they host visitors in research labs to learn about neuroscience research in Puerto Rico and they visit schools and communities to teach neuroscience as well. They also serve as judges at scientific fairs in schools and assist students with their research projects. These chapters also recruit schools nearby their institutions and oversee the training of educators of to manage the neuroscience laboratory. Another role these NeuroBoricuas have is to represent our initiative at different symposia and increase our reach.



Figure 6. NeuroBoricuas Workshop for university students and professors. Left: First massive workshop where over a hundred volunteers became NeuroBoricuas as they received training on how to use Backyard Brains equipment and perform neuroscience outreach activities. Center: Initiation of the NeuroBoricuas Chapter at the University of Puerto Rico-Cayey. Right: New NeuroBoricuas joined the neuroscience outreach activity in the San Sebastian street festival in January 2018.

6. Conclusions and Future Directions

Here, we propose a model in which the university academia can merge with schools to enhance scientific education. Our long-term goal is that scientific inquiry will reach people's homes through students, and science and technology will be highly regarded by Puerto Ricans. This shift in scientific culture would result in a government shift as well, because people would start to elect politicians that prioritize education and the advancement of science. Soon, we will organize a NeuroBoricuas symposium where the clubs and chapters can meet and share their results and experiences. We propose to collaborate with engineering departments to teach programming and technology skills in our workshops. Regarding our reach, we plan to create alliances with scientists from other Latin-American countries with the same goals, share our initiative and organize a Latin-American Brain Week, where partner schools and universities will combine efforts in neuroscience outreach activities. Lastly, we will continue to recruit Puerto Ricans living abroad, so they can have an impact in their respective communities.

Acknowledgements

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References

- Inauguran laboratorio de neurociencias (2017). El Nuevo Dia. January 12, 2017. [<https://www.elnuevodia.com/ciencia/ciencia/nota/inauguranlaboratoriodeneurociencias-2280435/>]
- Cruz F. (2017). Los NeuroBoricuas de la CROEM en la Sanse. El Post Antillano. January 19, 2017. [<http://elpostantillano.net/economia-solidaria/18696-2017-01-19-13-16-05.html>].
- Dagda RK, Thalhauser RM, Dagda R, Marzullo TC, Gage GJ. (2013). Using crickets to introduce neurophysiology to early undergraduate students. *J Undergrad Neurosci Educ.* 2013 Oct 15;12(1):A66-74. eCollection 2013.

- Kilpatrick K. (2015). Puerto Rico's economy, crime to blame for middle class exodus. Al Jazeera. July 28, 2015. [<http://alj.am/lwny>].
- López Alicea K. Publican el Perfil del Migrante. (2015) El Nuevo Dia. February 8, 2015. [<https://www.elnuevodia.com/noticias/locales/nota/publicanelperfildelmigrante-2005257/>]
- Marazzi Santiago M. (2016). Migración neta a los Estados Unidos alcanza record histórico. Instituto de Estadísticas de Puerto Rico. May 1, 2016. [<http://www.estadisticas.gobierno.pr/iepr/LinkClick.aspx?fileticket=38FafYENIXg%3D&tabid=39&mid=590>].
- Marzullo TC, Gage GJ. (2012). The SpikerBox: a low cost, open-source bioamplifier for increasing public participation in neuroscience inquiry. PLoS One. 2012;7(3):e30837. doi: 10.1371/journal.pone.0030837. Epub 2012 Mar 21.
- Torres-Gotay B. Dramática reducción poblacional luego del paso de María. El Nuevo Dia. November 4, 2017. [<https://www.elnuevodia.com/noticias/locales/nota/dramaticareduccionpoblacionalluegodelpasodemaria-2371581/>].
- U.S. Census Bureau (2016). Population of Puerto Rico. [<https://www.census.gov/data/datasets/2017/demo/popest/detail-puerto-rico.html>].

Action Learning in the neighbourhood of Benicalap (Valencia): an innovative teaching and learning experience in an International Development Master

Pellicer-Sifres, Victoria^a; Boni, Alejandra^a; Leivas Vargas, Monique^a; Wassel Antich, Vania^b

^aIngenio (CSIC – UPV), Universitat Politècnica de València, Spain, ^b Independent Consultant

Abstract

This article aims to analyze an innovative teaching and learning experience carried out by the “Development Cooperation Master’s Degree” taught at the Politechnical University of València (UPV), Spain. During two weeks, the students of the Master carried out an Action Learning process in the neighborhood of Benicalap (Valencia), with the aim to explore how the housing conditions in the neighborhood influence on the youth’s learning and aspirations. The process was developed with the participation of three local organization. As outputs of this research, some proposals for improving the neighbourhood were presented to several actors from Benicalap. University exercised then a part of its social responsibility, moving lessons from the classroom to the street. In turn, UPV students acquired social and technical skills for their personal and professional development.

Keywords: *Action Learning, Development, Cooperation, Learning, Youth’s aspirations*

1. Introduction

This article aims to analyze an innovative teaching and learning experience carried out by the “Development Cooperation Master’s Degree” (*Master Universitario en Cooperación al Desarrollo –from here, the Master-*) taught at the Polytechnical University of València (UPV), Spain.

During two weeks (from the 29th of May 2017 to the 9th of June 2017), the students of the Master carried out an Action Learning process in the neighborhood of Benicalap (Valencia), with the aim to explore **how the housing conditions in the neighborhood influence on the youth’s learning and aspirations**. The process was developed with the participation of three local organisations: “Ultramarins 154” (a cultural, playful and gastronomic association); “Casa Caridad” (a non-profit charity association) and the Benicalap Institute of secondary education (from here, IES Benicalap).

1.1. The Development Cooperation Master’s Degree

The Development Cooperation Master’s Degree of the UPV is intended to contribute towards the training of development professionals who may in turn act as agents for change in the different places and contexts where they operate. As agents for change, these professionals ought to develop qualities such as the ability to understand and practice citizen participation, the need to have a global approach and knowledge, and attitudes which allow them to position themselves in a critical but also transforming standpoint in the area of development in general, and of international development cooperation in particular (Boni et al, 2016).

Therefore, during the planning of their educational itinerary (the Master’s programme) alternative methodologies that develop and implement these capabilities are strongly considered and included. Because of that, the methodology of “Action Learning” (hereinafter AL) was incorporated, since it was considered that learning processes outside the classrooms, embedded in a context with real and close problems, are more likely to contribute to the development of this critical and reflexive practice.

1.2. Action Learning, as an innovative methodology for critical learning

AL is defined as a learning process that is applicable to situations where participants face complex problems and learn by exploring new opportunities, instead of applying the routines of pre-established systems (Pedler and Burgoyne, 2008). This type of learning also has an ethical dimension (De Carli and Kinnear, 2015), whereby the experiences of the participants are part of a wide range of activities that can contribute positively to the initiatives of the local organizations participating in the AL. The contribution can be in the form of generating products (such as research reports) or initiating processes (eg dialogue

and mobilization) that are relevant to the needs and aspirations of the participating organizations.

1.3. Benicalap and the three local organisations involved in the AL

Currently, in Benicalap there is a high rate of families in risk of social exclusion: according to the Valencia City Council study on vulnerable areas (2016), 27.7% of the population of Benicalap is considered living in a vulnerable situation. The great majority of the population work in sectors that need low qualification. The social fabric (social organisations, associations, etc) is weak and disconnected from youth people. The historical and cultural heritage of the neighborhood is neglected by the public administration and there are quite a lot of abandoned lots.

From the above explained, we can easily deduct that the fact of including the point of view of the organisations from Benicalap is an essential requirement to be able to identify, understand and analyze the problems, as well as to be able to elaborate realistic and relevant action proposals. In our experience, three organizations from the Benicalap neighborhood participated: Ultramarins 154 (they collaborated by making available all his infrastructure for the realization of the different activities), Casa Caridad (they participated on the AL through their Nursery School) and IES Benicalap (they get involved on the AL through three classrooms).

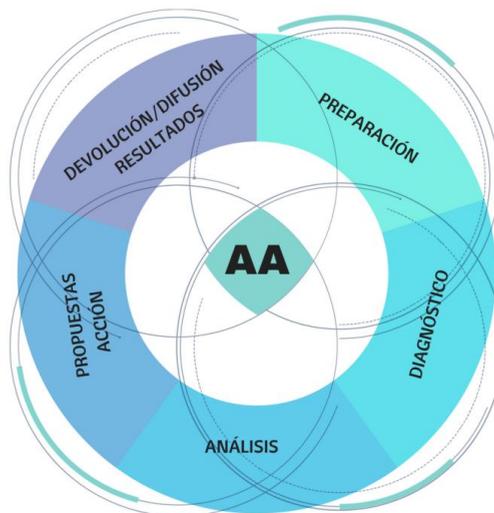


Figure 1. Phases of Action Learning process

2. Methodology: the process of AL in Benicalap

The AL process was planned based on five main phases that took place during the fifteen days of the investigation: 1) Preparation; 2) Diagnosis; 3) Analysis; 4) Proposals for action and 5) Return / dissemination of results. In Figure 1, they are represented graphically.

Phase 1: Preparation

In this phase (days 1-2), the group became familiar with the neighborhood and with the actors with whom each group would work. A first tour of the neighborhood was made to know its reference places (transect technique) and the representatives of the different organizations met. The theoretical elements that would guide the investigation and the work agenda were presented.

Phase 2: Diagnosis

In this phase (days 2-7) the classroom was divided in 4 groups, in order to gather the information to answer the research questions about “how the housing conditions in the neighborhood influence on the youth’s learning and aspirations?”. The techniques used for this were:

- Questionnaires
- Participatory workshops
- Personal narratives
- Semi-structured interviews
- Participant observation
- Since the context of each group varied from one group to another, that meant that not all the groups used the same research techniques. For more detail, see Table 1

Table 1.

Técnica	G1	G2	G3	G4
Initial tour	1 collective tour	5 tours	1 collective tour	1 collective tour
Questionnaires	1 initial Q. 1 final Q.	---	21 Q.	70 Q.
Participatory workshops	---	---	1WP	9 WP
Personal narratives	---	---	---	8 Narratives
Semi-structured interviews	25	12	9	4
Participant observation	During all process	During all process	During all process	During all process

Figure 1. Research techniques during diagnosis phase

Phase 3: Analysis

In this phase (days 6-11) the information collected was analyzed and the results of the research were obtained. Throughout this phase, spaces were planned to share the preliminary and final findings with the rest of the groups.

Phase 4: Proposals for Action

This phase (days 8-12) was worked in parallel with the former phase. The preliminary findings allowed to obtain first ideas of proposals for action, which were discussed and complemented with the organizations.

Phase 5: Return and dissemination of results

In this phase (days 13-15) the dissemination materials of the project results were prepared: 2 posters explaining the process and 3 posters that synthesized the results. In addition, a video summary of the experience was prepared.



Image 1. Public presentation and space of debate with neighbors from Benicalap

The final day of the AL process ended with a public presentation of the results. In the square of the neighborhood, the 5 posters were exhibited, the video was presented and a dialogue space was created between the participants of the process and the neighbors from Benicalap. This was a key moment to share learnings and impressions, as well as to reflect on how the AL process could be contributing to improving the welfare of the young people of Benicalap.

3. Learnings and conclusions

In this section, we briefly present main reflections and conclusions about learnings acquired during the AL process:

Regarding public space in Benicalap:

All the groups involved during the AL process coincide in stating that the public resources available to the Benicalap neighborhood are insufficient and that they are not aligned with young people interests or with families' assisting to Casa Caridad needs.

Regarding housing conditions

Also in this issue, a greater public investment seems necessary to improve the conditions of the Institute (there were not thermal confort inside the classrooms) and the public transport

network to Benicalap (evidences found difficulties for arriving to Casa Caridad using public or economic transport).

Regarding Learning Aspirations

People interviewed during the process consider the capability of learning as an instrument to find a job, or to have economic stability. During the AL intervies, values as justice, common good, participation, collectivity or sustainability were quite absent. Master students reflections suggested that it was a consequence of a societal model built upon mindsets such as individualism, consumption, money as an indicator of personal success, etc. They highlighted the importance of promoting activism initiatives in order to engage young people and contribute to foster their critical point of view and their participation and implication in society.

Regarding network among different actors

The AL conclusions highlighted the importance of connecting public and private Benicalap organizations, such as Ultramarins 154, the Benicalap IES, Casa Caridad, etc. The strenghten of networks between these organizations would be very relevant for two main objectives:

- To collectively reclaim public investment in infrastructure for leisure and youth participation.
- To generate solid alliances and promote actions in order to involved young people

The AL, as a process to acquire relevant learning for development practitioners

During the evaluation of this initiative, the Master's students considered that it has been a process where they have learnt relevant issues for their professional career as a development practioners. Among all learning acquired, they highlighted the following four issues as the most important learning, and they emphasized the fact that these learnings couldn't have been acquired through a classical learning methodology "inside the classroom":

- Collective learning, which means learning that couldn't be acquired without being embedded in a group (active listening, work in groups, empathy, conflict resolution, etc...)
- Learning about facilitation skills
- Awarness about the relevance of informal spaces for learning and dialogue

Our final conclusion is that this AL initiative has really contributed to the learning of the students of the master's degree, and that undoubtedly this learning has been more complex and deeper due to the fact that it has been obtained through the practice itself.

References

- Boni A., Calabuig C. and Pellicer-Sifres V. (2016) "Transforming the system from within: the experience of the Development Cooperation Master of the Universitat Politècnica de València" in *Socially Just Pedagogies, Capabilities and Quality in Higher Education* (In press). Palgrave Macmillan.
- De Carli, B. y Kinnear, M. (2015) Learning amidst urban practices: reflections on Architecture Sans Frontières, *Charrette* 2(1), pp. 46-56.
- Oficina d'Estadística de l'Ajuntament de València (2016): *Àrees vulnerables a la ciutat de València*. Valencia. Disponible en: <http://www.valencia.es/ayuntamiento/webs/estadistica/CatPub/files/Arees%20Vulnerables.pdf> [Accesado el 01 de junio de 2017]
- Pedler, M. y Burgoyne, J.G. (2000) *Handbook of Action Research: Participative Inquiry and Practice*. London: Sage.

Realignment Course in Mathematics: design of an online valuable experience for students

Barana, Alice; Bogino, Alessandro; Fioravera, Michele; Floris, Francesco; Marchisio, Marina

Department of Mathematics, University of Turin, Italy.

Abstract

Supporting students in the transition from secondary school to university is an important action to be taken in order to increase the number of people with tertiary education degrees; it has positive consequences on the citizens' working perspective and on the national economic growth. To this purpose, in the academic year 2014/2015 the University of Turin started the Project Orient@mente, a platform of self-paced open online courses aimed to guide students in the choice of a scientific university program. This paper focuses on the design of the Realignment Course in Mathematics, provided by the platform and aimed at the self-paced review and integration of knowledge that students are required to acquire during secondary school. Materials are created and structured according to the User Experience Design for Learning, with the aim of providing a valuable learning experience to students. Contents are delivered through an accessible learning management system integrated with an advanced computing environment and an automatic assessment system. Data from the usage of the activities and from the results of the online tests are analyzed in order to validate the design choices and the coherent structure of the course.

Keywords: *Automatic Assessment; Design for Learning; E-Learning; Mathematics Education; Realignment Course; Self-paced open online courses.*

1. Introduction

For all European countries which subscribed Europe 2020 agreements, increasing the number of people who completed tertiary education should be a major goal finalized to improve the citizens' working perspectives and the national economic growth (European Commission, 2015). In Italy, the number of enrolments to universities has registered a growing trend for the last five years, even if less than 30% of students graduates on time and the same amount abandons University before graduating. STEM subjects (Science, Technology, Engineering and Mathematics) are the most attractive, earning 36% of enrolments in the last academic year, a growing percentage for the last 4 years; nevertheless, they register the highest number of abandons – beyond 35% – and the lowest rate of on-time graduations (less than 15%) (ANVUR, 2016) (MIUR, 2017).

In the light of these data, it is clear that tertiary education needs actions for orienting students in the choice of an appropriate university area and for guiding them through the first years, especially in scientific courses where the “hard subjects” such as Mathematics or Physics are prevalent in the curricula. Many universities, in Italy as well as around the world, have chosen blended or e-learning modalities to deliver orienting or refresh courses, in order to actively engage a wider number of students (Calidoni, et al., 2009) (Urbonaite, et al., 2013). In this scenery the Project Orient@mente started at the University of Turin (Italy) in the academic year 2014/15 and it is currently underway. The Project consists in the development of a platform for the fruition of self-paced open online courses (<http://orientamente.unito.it/>). It is aimed to support three main valuable actions for students who intend to apply to a scientific program at the university: guidance to the university offer, automated testing of basic concepts and competences, self-paced review and integration of knowledge acquired during secondary school (Barana, et al., 2017). In line with the three purposes, three different kinds of self-paced open online courses have been developed:

- orienting courses with information about the study courses and future careers;
- testing courses to verify students' basic knowledge and skills and to enhance their awareness about their initial situation;
- realignment courses to strengthen their competences and fill the gaps in their preparation.

The online courses are structured according to educational models grown thanks to the experience and the research in e-learning and digital asset carried out by the University, especially in the use of a learning management system integrated with an advanced computing environment and an automated assessment system (Brancaccio, et al., 2015)

This paper focuses on the design of the Realignment Courses (RC), which pay great attention to providing users a valuable learning experience. The RC in Mathematics is

analyzed in the light of models of learning design from the literature; the discussion is supported by data from the activities usage.

2. State of the art

Technologies and virtual learning environments can facilitate good learning experiences through systems for computer mediated communication and collaboration, cognitive tools for knowledge representation and construction, environments for problem solving, simulation and case-based learning (Jonassen, et al., 1995). In particular, the structure of learning environments, the possibilities of interaction, immediate feedback and assessment promote the development of metacognition and self-regulation, which are at the core of learning processes (Persico & Steffens, 2017).

In the design of web-based learning activities, it is important to place the learner at the center of the learning process. Thus, models based on the user experience achieve a great effectiveness in the delivering of learning. The University of Waterloo has developed the “User Experience Design for Learning Honeycomb” (UXDL Honeycomb), a design framework for creating online courses which relies on theories of information architecture and user experience (University of Waterloo). According to the UXDL Honeycomb, in order to provide valuable and interesting learning experiences, contents should be:

- useful for the learning process. In particular, they should help the learner avoid cognitive overload, select, organize, and integrate information, process new materials and construct a schema;
- desirable: in order to create a positive approach to learning, which positively influences motivation, materials should be visually appealing and they should promote reflection;
- accessible, to accustomize to everyone’s needs;
- credible, which relates to the quality: respect for academic integrity, consistency of the activities with the outcomes, professional appearance, barrier-free learning;
- intuitive: materials should be easy to find when navigating the course, and easy to use or self-explanatory.

3. The Realignment Courses

Orient@mente’s Realignment Courses consist of four self-paced open online courses respectively on Biology, Chemistry, Physics and Mathematics. They can be addressed to three main different aims: helping students attend the lessons of the first year of university courses, helping students pass their first university exams and reducing the dropout rate of the first year of university. Students can attend them to review, reinforce and integrate their basic knowledge on the discipline, to fill the gaps in their initial preparations and to prepare for the admission tests.

The design of the RCs has been conducted according to the strategies pointed out by the User Experience Design for Learning model. The design of the four RCs followed similar methods; however, disciplinary needs led to slightly different choices of tools and materials, therefore the following analysis will focus on the RC in Mathematics.

The whole structure of the RCs is conceived to make them **useful**: in fact, the courses are highly structured, composed of a list of modules in turn split into smaller submodules which focus on specific topics. The purpose is to break contents into shorter and student-controlled chunks instead of giving a long and continuous presentation of material; thus, students are facilitated in selecting, organizing, and integrating new materials with relevant prior knowledge. In addition, explorative and interactive materials fill the courses in order to foster generative processing and help students actively construct new concepts.

The experience of navigating through the online courses wants to be **intuitive** for learners with the goal to make content and activities easy to find and easy to use. The design of the interface and the underlying technology are invisible.

To create valuable online courses for every type of learner, **accessibility** is provided first of all by the course design and it's checked periodically with an online validator and monitor, who checks whether materials are aligned to the official guidelines for accessibility of web-pages (MIUR, 2013). Moreover, the default platform aspect uses the high-legibility font EasyReading®, which maximizes the website legibility by simplifying the reading for dyslexic students, and looking good for everyone. To the purpose of making its structure clear and of setting shared expectations between students and instructors, at the top of each RC there are a general description of the learning outcomes and a mind map of the topics covered. Similar descriptions are also inserted within modules and submodules. To facilitate the learning process (and to adapt to the widest range of learning styles), each topic is presented in different modalities, such as texts, video lessons, tests and interactive files. More specifically, lessons are organized according to a regular pattern consisting of the following activities:

- Theory – usually printable or online readable books, made with Moodle books;
- Explore – interactive activities of exploration or simulation, created with Maple, an Advanced Computing Environment integrated within Moodle, which allows several types of representation, computation, simulation and interaction;
- Applications – Moodle pages with theory applications and curiosities;
- Quizzes – automatically assessed online tests made through Maple TA, a system particularly suitable for STEM. It supports open mathematical answers graded independently of their form, algorithm-based variables and immediate feedback;
- Exercises with their solutions – downloadable and readable online sheets.

At the end of every module there is a final test on the whole module's theory (Figure1). All these aspects of careful organization and design are fundamental to gain learners' trust and make courses **credible**. The quality of materials and activities is also guaranteed by the whole process of design of the courses. The process was based on team-working and modeled on the Deming cycle: plan–do–check–act (Walasek, et al., 2011). Preliminary studies and planning with managers and digital experts from the University have been carried out to define suitable instruments and methodologies. Contents were created in collaboration with professors. The platform developers continuously adjust the materials and the services offered according to feedback collected from users through specific and ever-open surveys.

Lastly, the courses' structure and appearance make them **desirable**. The order and clarity of the pages contribute to their appealing look and to offer a visual image of the learning path to cover; activities and tests foster meta-reflection and self-regulation, which are key points to promote motivation and the achievement of learning outcomes. In fact, with online tests, students can work independently and whenever they want: immediate automatic feedback allows them to acknowledge their level of preparation. Algorithm-based questions with multiple attempts allow students to repeat reasoning, not results, until mastered, additionally offering many chances of drills for the admission tests (Barana & Marchisio, 2016).

Modulo 1: linguaggio, numeri e simbologia matematica

Questa sezione è dedicata al linguaggio e alla simbologia matematica, indispensabili per poter affrontare lo studio della materia. Vengono forniti elementi base relativi alla teoria degli insiemi, elementi di logica ed esempi di traduzione dal linguaggio quotidiano a quello simbolico. Vengono anche trattati gli insiemi numerici e la loro struttura.

- 1.1 Elementi di teoria degli insiemi e logica
 - Esplora 1.1 Gli insiemi
 - Applicazioni 1.1 Un rompicapo tra logica e vita quotidiana
 - Esercizi 1.1 Ulteriori esercizi di logica
 - Test 1.1
- 1.2 Numeri
 - Esplora 1.2 Operazioni tra numeri
 - Applicazioni 1.2 Dal linguaggio quotidiano alla simbologia matematica
 - Esercizi 1.2 Ulteriori esercizi sui numeri
 - Test 1.2
- Test modulo 1



Figure 1. Structure of a module. Source: Orient@mente platform (2018).

4. Analysis of the Realignment Course in Mathematics

Since its opening on July 14th, 2015, Orient@mente registrations have been following a regularly increasing trend, reaching 10135 users. Similarly, enrollments to the RC in Mathematics have been growing to reach 1052 users since its opening on, 2015 October 20th, 2015 (data are updated to January 15th, 2018). The materials of the RC are frequently visited by users: the total number of logs (accesses) to the course and to the sections amounts to 61134; the logs to the resources of the RC of Mathematics are reported in Table 1.

Table 1. Resources and activities logs

Resource or activity	Logs (absolute frequency)	Logs average (daily)
Book	101462	110.77
Maple Worksheet	3099	3.38
Page	3021	3.30
MapleTA quiz	5881	6.42
PDF Files	10705	11.69

Source: Report from Orient@mente's platform (2018)

In order to evaluate the effectiveness of the design of the activities, their coherence with the modules' learning objectives and their consistency with the assessment, an analysis on the results of the online tests has been conducted. We considered all the results to the tests inserted at the end of each submodule and module, in a scale from 0 to 10, selecting the best result for each student in case of repeated attempts (users have unlimited attempts for the tests). For each result, we have considered whether the user had completed the other activities or used the other resources in the same module before attempting the test. We obtained two groups: Group 1 is composed of the results of users who have carried out the test without taking advantage of the resources and activities in the RC; Group 2 is composed of learners presenting log-data from the activities and resources of the module. In the 9 modules there are 27 tests, each one attempted by a number of users which ranges from a minimum of 46 to a maximum of 462 (average: 150). The sample size considered is 4052; 518 belong to Group 1 and 3534 to Group 2. Table 2 shows the average results to the tests of the two groups: it is clear that students who used the activities before the test did better than those who completed the test just relying on their own knowledge. The statistical significance of the difference between the two groups is confirmed by an analysis of covariance (ANCOVA) carried out on the results of the two groups, using the means of the results of the tests as covariate variable ($p=0.007$, squared eta = 0.1).

5. Synthesis of the results and discussion

The statistics shown in the previous section highlight that the activities in the RC of Mathematics are frequently used by students; moreover, they are inserted within a well-designed learning path, they are consistent with learning outcomes and assessment and they help students in the revision of the contents. Emphasis to the relation between learning outcomes and assessment is given to further motivate students and to help them understand the importance of the resources and activities of the course. Therefore, the RCs can be a valid tool for students transitioning from high school to university, allowing them to reinforce their competence. The continually increasing number of enrolments and usage of the course confirms that it is employed by students. Similar results are also achieved in the other three Realignment Courses, even though their analysis is beyond the purposes of this paper. Moreover, the interactive activities and online tests allow some good practices, that are to assess the achievement of learning outcomes throughout the learning experience and to make assessments become a part of the instructional process. Thus, the RC can pursue several goals that are not strictly related to disciplinary contents, such as the enhancement of the ability to self-evaluate and self-regulate one's learning and the development of digital competences.

Table 2. Results of the tests of the RC in Mathematics for the two groups of users

Groups	Frequency	Average result	Standard deviation
1	518	6.67	2.40
2	3534	7.07	2.56
Total	4052	6.96	2.43

6. Conclusion

Orient@mente is not simply a static archive of materials. Challenged to actively try and explore, students can become more aware of their attitude, knowledge and skills, and face with more self-confidence the transition from high school to University. The clear structure of RCs promotes self-organization and everyone is left free to make use of its contents according to their needs. It also has a positive influence on time management, which is key factor not only to succeed at university, but also to succeed at work. The courses can be enjoyed not only by students who are going to enroll to the University of Turin, but by everyone who wants to start a scientific program in any university, since the disciplinary requirements and transversal competence needed are similar everywhere.

In the past three years, Orient@mente has opened many possibilities of research in several directions: strengthening connections with other social university e-learning environments, studying the role of automatic assessment in improving learning, extending similar opportunities to other disciplines. The research is still ongoing; for example, some materials of the RC of Mathematics are going to be renewed by using innovative tools to deliver the theoretical contents, such as slideshow systems that allow to insert questions and interactive activities in the theory section, embedding them at appropriate moments: students can grasp key concepts before moving on. As a consequence, effectiveness of the quizzes and interactive files will be further maximized.

References

- ANVUR (2016). *Rapporto biennale sullo stato del sistema universitario e della ricerca*.
- Barana, A., & Marchisio, M. (2016). Ten good reasons to adopt an automated formative assessment model for learning and teaching Mathematics and scientific disciplines. *Procedia - Social and Behavioral Sciences*, 228, 608–613.
- Barana, A., Bogino, A., Fioravera, M., Marchisio, M., & Rabellino, S. (2017). Open platform of self-paced moocs for the continual improvement of academic guidance and knowledge strengthening in tertiary education. *JE-LKS. Journal of E-Learning and Knowledge Society*, 13(3), 109-119.
- Brancaccio, A., Demartini, C., Marchisio, M., Palumbo, C., Pardini, C., Patrucco, A., & Zich, R. (2015). Problem Posing and Solving: Strategic Italian Key Action to Enhance Teaching and Learning of Mathematics and Informatics in High School. *Proceedings - International Computer Software and Applications Conference (COMPSAC 2015), Volume 2*, 845-850.
- Calidoni, P., Gola, E., Isu, G. C., & Satta, R. (2009). Orientamento e riallineamento universitario on-line: progettazione e prova di servizi nel progetto UniSOFIA. *Italian Journal of Educational Research* (2-3), 19-26.
- European Commission (2015). EUROPE 2020 - A strategy for smart, sustainable and inclusive growth. *Europe 2020: an Overview, Annex 1*.
- Jonassen, D., Davidson, M., Collins, M., Campbell, J., & Haag, B. B. (1995). Constructivism and Computer-Mediated Communication in Distance Education. *American Journal of Distance Education*, 9(2), 7-26.
- MIUR (2013). Decreto 20 marzo 2013: Modifiche all'allegato A del decreto 8 luglio 2005 del Ministro per l'innovazione e le tecnologie, recante: «Requisiti tecnici e i diversi livelli per l'accessibilita' agli strumenti informatici». (Prot. 195/Ric). (13A07492).
- MIUR (2017). *Focus "Gli immatricolati nell'a.a. 2016/2017 il passaggio dalla scuola all'università dei diplomati nel 2016"*.
- Persico, D., & Steffens, K. (2017). Self-Regulated Learning in Technology Enhanced Learning Environments. In E. Duval, M. Sharples & R. Sutherland (Eds.), *Technology Enhanced Learning* (115-124). Springer.

- Urbonaite, V., Winkler, S., & Körner, A. (2013). Various Usage of Maple T.A. in Mathematics, Modelling and Simulation. *ERK - International Electrotechnical and Computer Science Conference*, 173-176. Portoroz.
- Walasek, T. A., Kucharczyk, Z., & Morawska-Walasek, D. (2011). Assuring quality of an e-learning project through the PDCA approach. *Archives of Materials Science and Engineering*, 48(1), 56-61.
- University of Waterloo, Center of Extended Learning (CEL). *User Experience Design for Learning*. Retrived from <http://cel.uwaterloo.ca/honeycomb/index.html>

Creativity in liberal education before and after study commencement

Van Goch, Merel

Institute for Cultural Inquiry, Utrecht University, The Netherlands

Abstract

In today's society, creativity is an important quality. Creativity is defined as the ability to produce something novel and valuable as defined within a social context and it involves skills such as divergent thinking, problem solving and perspective taking. This study assesses the creative potential of students before and after commencement of an interdisciplinary, liberal undergraduate program. In between measurements, students followed a course in connective thinking through creative reading and writing. The results showed that students' creative potential developed over time. Implications for theory as well as practice are discussed.

Keywords: *creativity; liberal education; interdisciplinarity; connective thinking; students*

1. Introduction

In today's society, creativity is an important, if not crucial, quality (Plucker, Beghetto, & Dow, 2004; Sternberg, 2003). Creativity is considered a 21st century skill, necessary to enter today's job market. Higher education institutions should thus map and foster students' creativity (Livingston, 2010), and research into *how* higher education institutions can map and foster students' creativity is needed (Kleiman, 2008; Plucker et al., 2004).

Here, creativity is defined as: "the interaction among *aptitude, process, and environment* by which an individual or group produces a *perceptible product* that is both *novel and useful* as defined within a *social context*" (Plucker et al., 2004). The social context that is referred to in this definition is higher education. Creativity is an integral part of the philosophy of liberal, interdisciplinary education. In liberal education, breadth and depth of study are combined, enabling students to encounter multiple perspectives and interpretations throughout diverse research fields. Indeed, students in an interdisciplinary undergraduate program find their education, themselves and interdisciplinarity inherently creative (Van der Lecq, 2016). Critical thinking, higher-order thinking skills, meta-cognitive reflection, problem-solving and analysis, are skills in which interdisciplinary students excel, compared to their peers (Haynes & Brown Leonard, 2010). It is not clear, however, whether interdisciplinary studies create or attract creative students, or whether they do both. Therefore, the current study investigates the development of creativity of students before and after undergraduate study commencement.

Given the societal significance, it's important to gain insight into how creativity develops and can be stimulated in higher education. This study hypothesizes that students in interdisciplinary liberal education develop creativity through aspects of their interdisciplinary education, here, a course in connective thinking through creative reading and writing. The current study is part of a larger longitudinal study tracking several aspects of interdisciplinary students' development from before study commencement until after graduation. This substudy limits itself in time to students' development – from before study commencement, i.e., at orientation day, until the first semester, i.e., after the first course in connective thinking through creative reading and writing – and limits itself in design by only tracking students' creative development. The course teaches connective thinking through close-reading texts from multiple research fields that students have to connect with each other and with the course theme in their own essays. Students' age, sex and occupation at the time of their orientation in the program are related to creativity scores on two creativity tasks (Torrance, 1966; Urban & Jellen, 1996). Note that although creativity is operationalized here as scores on two creativity tasks, the definition of creativity is much broader than just that (Plucker et al., 2004; Kleiman, 2008).

Not only will insights in how creativity develops contribute to the scientific debate on the development of creativity and the impact of formal instruction (Plucker et al., 2004), it will also inform classroom teaching and hence benefit students.

2. Methods

2.1. Participants, procedure and analysis

All prospective students who were at the orientation days of a liberal arts and sciences program at a Dutch research university were invited to participate in the current study. This resulted in an initial sample of 299 students (mean age = 19 years; 59% female). At that time, 45% was enrolled in high school, 28% was taking a gap year, 19% was enrolled in higher education (16% at a research university and 3% at a university for applied sciences). The other 8% either did something else or did not list an occupation. Of the 299 students participating at the first time of measurement, 230 students (77%) enrolled in the program. At the second time of measurement, 181 students of the initial sample (79%) were assessed again. In addition, 16 students who did not participate in any orientation day, but who were enrolled in the program at the time of the second measurement, were included in the study. Thus, in the end, this study could distinguish four groups of participants:

- students who were enrolled in the liberal arts and sciences program and who participated in both measurements (Group 1, 181 students),
- students who were enrolled in the program and only participated in the first measurement (Group 2, 51 students),
- students who participated in the first measurement but did not enroll in the program (Group 3, 67 students), and
- students who were enrolled in the program, who did not participate in the first measurement, but only participated in the second measurement (Group 4, 15 students).

Participants' creativity scores were first measured at the orientation days in the Spring before study commencement (Time 1), through two tasks. Students who did enroll in the program followed a course in connective thinking through creative reading and writing in the Fall of the academic year. The second time of measurement of this study took place in the last lecture of the connective thinking course (Time 2). Again, two tasks were administered. All tasks were administered plenary but individually, and anonymously. All data was scored independently by two research assistants; interrater reliability was high (> 95%).

The dependent variables in the analyses were the two creativity tasks at the two times of measurement. Independent variables included age, sex and occupation of the student groups. Additionally, the student groups themselves were considered independent variables.

2.2. Measurements

2.2.1. Torrance Test for Creative Thinking

The Unusual Uses subtest of the standardized Torrance Test for Creative Thinking (TTCT; Torrance, 1966) was used to measure students' verbal divergent thinking. In the test, students were asked to elicit as many unusual uses of a common object as possible, within a given time frame (10 minutes). In one version of the test, cardboard boxes were the object (used at Time 1); in the other version, tin cans (used at Time 2). Answers were scored on three measures: fluency, flexibility and originality. These three subscores were combined into a total score, which was used for the analyses.

2.2.2. Test for Creative Thinking – Drawing Production

The standardized Test for Creative Thinking – Drawing Production (TCT-DP; Urban & Jellen, 1996) was used to measure creative potential holistically. Students were provided with an incomplete drawing and were asked to finish it, in fifteen minutes. The incomplete drawing consists of a big square with several fragments in it, and one fragment outside the box. Two versions of this task exist: they are similar, but are mirror images of each other. Drawing productions were scored on fourteen different aspects, such as completions of the fragments, connections between the fragments, use of the fragment outside the box, humor and speed. These subscores were summed; the total score was used for the analyses.

3. Results

3.1 Descriptives and correlations

Descriptive statistics of the four different participant groups and the total sample can be found in Table 1. The occupation of students in Group 4 was not available. Relatively many students in Group 2 were enrolled in higher education and the average age of students in this group is higher than in other groups. Group 3 seems to entail relatively many students who visited the orientation days while still in high school and there were more women in this group than in any other group.

Before the main analyses, mean scores and correlation coefficients were calculated to inspect the data. The mean scores on both creativity tasks seemed to be higher at the second moment of measurement (Table 2). The correlation coefficients between the dependent variables show that, although ranging from weak to strong, all creativity scores were significantly correlated to each other (Table 3), even though the two creativity tasks measured different aspects of creativity, and even though different versions of the same tasks were used at the different moments of measurements.

3.2 Main analyses

3.2.1. Time 1

Table 1. Descriptive statistics.

	<i>N</i>	mean age	% women	% enrolled in high school at Time 1	% enrolled in higher education at Time 1	% taking a gap year at Time 1	enrolled in the program at Time 2?
Group 1	181	18.88	60	45	18	33	yes
Group 2	51	19.45	59	39	33	24	yes
Group 3	67	18.66	75	58	16	25	no
Group 4	16	20.56	63	n/a	n/a	n/a	yes
Total	315	19.01	63	45	19	28	-

Table 2. Mean scores (and standard deviations) per participant group on both creativity tasks at both moments of measurement.

	Time 1 TTCT	Time 1 TCT-DP	Time 2 TTCT	Time 2 TCT-DP
Group 1	43.18 (16.249)	32.71 (10.875)	54.67 (23.871)	37.92 (11.155)
Group 2	47.85 (19.298)	33.74 (12.040)	n/a	n/a
Group 3	41.67 (16.740)	33.39 (10.992)	n/a	n/a
Group 4	n/a	n/a	47.56 (19.586)	37.00 (10.777)
Total	43.69 (17.021)	33.04 (11.076)	54.24 (23.646)	37.78 (11.098)

Table 3. Correlations between dependent variables.

	1.	2.	3.	4.
1. Time 1 TTCT	-			
2. Time 1 TCT-DP	.131*	-		
3. Time 2 TTCT	.637**	.187*	-	
4. Time 2 TCT-DP	.168*	.442**	.189*	-

Note. * = $p < .05$; ** = $p < .01$

TTCT. One-way ANOVAs were conducted to analyze the effects of age, sex and occupation on the TTCT scores. At Time 1, there were no statistically significant differences on the scores for students' age ($F(10,249) = .888, p > .05$) or sex ($F(1,258) = 2.276, p > .05$). Students' scores on the TTCT were statistically significant different for distinct occupations ($F(2,251) = 31.98, p = .043$). Students who were taking a gap year scored lower than students who were enrolled in secondary or higher education.

TCT-DP. With regards to the TCT-DP scores at Time 1, no effects of students' age ($F(10,283) = .801, p > .05$) or sex ($F(1,292) = .852, p > .05$) were found. Again, students' occupation did have a significant effect on the creativity score ($F(2,285) = 3.050, p = .049$). However, in contrast to the results of the previous analysis, students who were enrolled in secondary education scored lower on this creativity test than students who were enrolled in higher education or who were taking a gap year.

Group comparisons. To investigate whether students who did and students who did not enroll in the program differed in terms of creativity scores, Groups 1 and 2 were compared to Group 3. An independent-samples t-test revealed that these groups did not differ significantly in terms of TTCT scores ($t(258) = 1.058, p > .05$) and TCT-DP scores ($t(292) = .292, p > .05$). This suggests that creativity scores and whether students enrolled are not related.

3.2.2 Time 2

TTCT. At Time 2, there were no effects of age ($F(9,175) = .793, p > .05$), sex ($F(1,183) = .100, p > .05$) or occupation ($F(2,159) = .251, p > .05$) on students' TTCT scores.

TCT-DP. Regarding TCT-DP scores at the second moment of measurement, there were no effects of age ($F(9,185) = .151, p > .05$) or occupation ($F(2,169) = .031, p > .05$). A statistical significant difference on TCT-DP scores was found for sex ($F(1, 193) = .6452, p = .012$): women scored higher than men.

Group comparisons. Scores on both creativity tests were compared for Group 1 and Group 4. Group 1 participated in both times of measurements and hence filled out similar creativity tests twice, whereas Group 4 only participated in the second moment of measurement. An independent samples t-test showed that these groups did not score significantly differently on the TTCT ($t(183) = 1.154, p > .05$) and on the TCT-DP test ($t(193) = .294, p > .05$). This seems to indicate an absence of a retest effect.

3.2.3. Development over time

For Group 1, paired-samples t-tests were conducted to compare students' creativity scores over time. There was a significant difference in the scores on the TTCT at Time 1 ($M = 42.92$, $SD = 16.296$) and at Time 2 ($M = 54.83$, $SD = 24.638$; $t(140) = 7.44$, $p < .0001$). There was also a significant difference in the scores on the TCT-DP at Time 1 ($M = 32.79$, $SD = 10.880$) and at Time 2 ($M = 37.90$, $SD = 11.267$; $t(174) = 5.79$, $p < .0001$). These results suggest that students' creativity scores increased over time.

4. Discussion

This study investigated the development of students' creative potential before and after study commencement of an interdisciplinary undergraduate program. Before study commencement, age and sex did not influence creativity scores, but occupation did. After the connective thinking course, women showed greater creative potential on one creativity test than men. Furthermore, the results showed that students' creativity increased over time: after the course in connective thinking, students scored higher on creativity tasks. Whether students did or did not enroll after visiting the orientation day seemed not to be related to their creativity scores.

Students' occupation before study commencement was found to influence their scores. However, these results appear to be contradictory: on one test, students who were taking a gap year scored significantly lower, whereas on the other test, students who were in secondary education scored significantly lower than the other students. This may have to do with the nature of the administered tests. The test in which high school students scored lower focused on figural, holistic creative potential (Urban & Jellen, 1996), and the test in which gap year students scored lower focused on verbal, divergent thinking creative potential (Torrance, 1966). Secondary education may focus more on factual knowledge teaching, explaining these results. A gap year, in which students either work, travel, or combine work and travel, may cause students to 'unlearn' more strict characteristics this test is scored on (. Future research should elaborate on these differences (Martin, 2010).

On one test, at one moment of measurement, women scored higher than men. Females have been shown to score higher than males on cognitive tasks more often. However, since there is much debate in the literature about these kind of sex differences (Miller & Hapern, 2014; Stoet & Geary, 2015), and since these sex differences did not occur across the board in this study, these results should be interpreted with caution and further research investigating these differences in-depth is necessary.

The improvement in creativity scores over time suggests that students' creative potential increased, possibly due to the connective thinking course that students took in between the two moments of measurements. In this course, students learned to find connections between

seemingly unrelated insights and to look at topics from multiple perspectives. Students were trained to come up with multiple potential essay topics (divergent thinking) and then explore one topic in depth within one essay (convergent thinking). These convergent and divergent thinking skills were also tested in the creativity tests, thus, scores may reveal this progress (Van der Lecq, 2016; Haynes & Brown Leonard, 2010). Alternatively, the mere fact that students were enrolled in higher education, or even, that they matured in the months between measurements, may have led to an increase in scores. The results seem not to be influenced by a retest effect: students who took the creativity tests for the second time (albeit a different version of the same test) did not score higher than students who took the tests for the first time.

In conclusion, the current results suggest that students' creativity develops over time. Future research should focus on collecting larger longitudinal datasets, to investigate exactly which aspects of higher education foster students' creativity, and whether interdisciplinary programs create or attract creative students, such that higher education institutions can educate students to become creative problem-solvers, ready to conquer today's job market.

References

- Bull, K. S., Montgomery, D., & Baloch, L. (1995). Teaching creativity at the college level: A synthesis of curricular components perceived as important by instructors. *Creativity Research Journal*, 8(1), 83-89.
- Haynes, C., & Leonard, J. B. (2010). From surprise parties to mapmaking: Undergraduate journeys toward interdisciplinary understanding. *Journal of Higher Education*, 81(5), 645-666.
- Kleiman, P. (2008). Towards transformation: conceptions of creativity in higher education. *Innovations in Education and Teaching International*, 45(3), 209-217.
- Livingston, L. (2010). Teaching creativity in higher education. *Arts education policy review*, 111(2), 59-62.
- Martin, A. J. (2010). Should students have a gap year? Motivation and performance factors relevant to time out after completing school. *Journal of Educational Psychology*, 102(3), 561.
- Miller, D. I., & Halpern, D. F. (2014). The new science of cognitive sex differences. *Trends in Cognitive Sciences*, 18(1), 37-45.
- Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational Psychologist*, 39(2), 83-96.
- Sternberg, R. J. (2003). *Wisdom, intelligence, and creativity synthesized*. Cambridge University Press.
- Stoet, G., & Geary, D. C. (2015). Sex differences in academic achievement are not related to political, economic, or social equality. *Intelligence*, 48, 137-151.

- Torrance, E. P. (1966). *The Torrance Tests of Creative Thinking*. Princeton NJ: Personnel Press.
- Urban, K. K., & Jellen, H. G. (1996). *Test for Creative Thinking - Drawing Production (TCT-DP)*. Swets Test Services.
- Van der Lecq, R. (2016). Self-authorship characteristics of learners in the context of an interdisciplinary curriculum. Evidence from reflections. *Issues in Interdisciplinary Studies*, 34, 79-108.

Dyslexic students: from language learning to language testing

Pelleriti, Margherita

Language Centre, University of Modena and Reggio Emilia, Italy.

Abstract

This paper will focus on the delicate issue of assessing the language proficiency of dyslexic students in a foreign language, namely English. These learners are usually considered a sub-group of test takers because of their specific learning differences. An overview of dyslexia will be presented, shedding light on the difficulties encountered by dyslexic students during their learning process. Some of the accommodations used during the learning process will be illustrated, along with the accommodations and/or modifications allowed during language testing. Attention will also be paid to fairness and validity represented by accommodations. Moreover, the special requirements allowed by international examination boards during their high-stakes tests will be analysed. Finally, this paper will illustrate what the Italian Law takes into account for dyslexic students and how it is applied at the University of Modena and Reggio Emilia, Italy.

Keywords: *dyslexia; SpLDs; language testing; learning differences; accommodations; testing validity.*

1. Dyslexia: a brief overview

Dyslexia has only recently received the due attention it deserves and it is now internationally recognised, also thanks to accredited associations, such as British Dyslexia Association (<http://www.bdadyslexia.org.uk/>), European Dyslexia Association (<http://www.eda-info.eu/>), International Dyslexia Association (<https://dyslexiaida.org/>). Dyslexia is a neurological disorder, a genetic, inherited condition, so probably it has always existed but in the past nobody was able to recognise and, consequently, diagnose it (<http://www.bdadyslexia.org.uk/>). Dyslexia is not a disease – so there is no cure for it – and it is not concerned with psychology, as pointed out in the BDA’s website. Dyslexia is one manifestation of what is known as “specific learning difficulties” (SpLDs) and according to the BDA, it is quite common (about 10% of the population in the United Kingdom). Furthermore, there are different grades of severity – what Turner and Pughe (2003) call the “continuum of dyslexia” (pp. 5–6) –, so that each single case should be individually observed and analysed.

However, some features are common to all dyslexic students: difficulties in attention control, reduced working memory, difficulties in reading (Turner & Pughe, 2003). Reading aloud can be extremely challenging for them, especially if they are also expected to understand the meaning of what they are reading. Seymour (2005, as cited in Mortimore et al., 2012) points out that such a difficulty is even more severe in languages which are not transparent, such as English. Dyslexic students have problems with sound-letter association also in their L1, consequently this hurdle can become even harder for them in L2. In English, for instance, Davies and Richie (2003, as cited in Mortimore et al., 2012) remind us that there are 44 phonemes which are represented by more than 120 graphemes. Dyslexic students also find very challenging to remember new vocabulary and to learn grammatical rules. They can benefit a lot from multi-sensory teaching (Schneider & Crombie, 2003; Turner & Pughe, 2003), for example involving body movements and touch, since kinaesthetic-tactile learning helps them stay focused, catching their attention and increasing their chance of storing and retrieving information (Schneider & Crombie, 2003). Finally, accuracy in spelling remains a big hurdle for dyslexic students who can be helped if they are explicitly taught how and why letters relate one another. Such an understanding will provide support in order to predict the most probable way to spell a word (Turner & Pughe, 2003).

2. Dyslexic students and accommodations

Students with SpLDs and their specific needs have long been neglected. Only recently they have received more attention, also thanks to the efforts by the European Commission in order to make language examinations accessible to students with specific learning

differences. Such a need has become even stronger considering the important social impact language examinations have, since in Europe they are also used as prerequisites for being admitted to university, graduating, getting a job (Kormos & Smith, 2012). Despite their difficulties, dyslexic students can be helped by adopting some accommodations, which are alterations – previously approved – to the default testing conditions (Hansen, Mislevy, Steinberg, Lee, & Forer, 2005). These modifications are only meant to bridge the gap by removing the barriers encountered during their foreign language learning process and related assessment, since those hurdles are unfair to dyslexic students due to their neurological deficit.

Butler and Stevens (1997, as cited in Li & Suen, 2012) distinguish two major categories of accommodations: the first concerns modifying the test (e.g., assessing in the native language, reducing linguistic complexity, providing additional examples), whereas the second requires modification of the test procedure (e.g., granting extra testing time, administering the test in separate rooms/in small groups/in several sessions, allowing breaks during the test, reading aloud).

Kormos and Smith (2012) prefer to make a distinction between accommodations and modifications, depending on the impact they have on the test construct. In particular, accommodations will not badly affect the construct of the test, whilst modifications will have an adverse impact on its validity. An example of modification can be represented by the read aloud arrangement to dyslexic students in a reading comprehension test. If the focal construct includes the ability to decode a text, then reading aloud will unfairly advantage that sub-group of test takers.

Bearing these distinctions in mind, there are several ways to help dyslexic students. For instance, if they are asked to perform a reading comprehension task, the passage can be divided into shorter bits or the reading text as a whole can be shortened. Comprehension questions should not contain grammatical structures which are notably considered harder for dyslexic students, such as the use of passive forms. Moreover, they should be asked to demonstrate they are able to look for key information (reading for gist), as opposed to searching for specific content (reading for detail). In addition, since their sight can also be concerned because of blurred vision, justified texts should be avoided for dyslexic students and they should be provided with texts written not only in larger fonts and with more spacing, but also on coloured paper. As a matter of fact, the background colour (as opposed to the usual white paper) helps dyslexic students to better distinguish letters and their contours (BDA's website). Should the text be administered on a computer, it would be possible to provide monitor overlays (BDA's website). Considered their difficulties in attention control, dyslexic students should be allowed frequent supervised breaks and, whenever possible, they should be assessed in a very quiet place with no or very limited distracting elements. In addition, they should also be allowed extra time to perform a task,

especially because students with SpLDs sometimes use part of the extended time in order to just understand the task instructions (Kormos & Smith, 2012).

When asked to write, dyslexic students should not be penalised for their often illegible handwriting and/or for spelling mistakes. Dyslexic students could therefore be provided with word processors and spell checkers. Nonetheless, whenever possible, it would be better to transform the writing task into an oral production (Kormos & Smith, 2012), even if also spoken language can be problematic for dyslexic students. As a matter of fact, they need more time and energy in order to formulate their thoughts, so it would be advisable to avoid the straightforward question-and-answer method. This means that dyslexic students should not be put under pressure and that they should be allowed some time in order to prepare their answers, even if they are delivered orally (Turner & Pughe, 2003).

As far as listening comprehension is concerned, this is a very challenging task for dyslexic students because of the difficulties they face with it. For instance, dyslexic students have reduced phonemic awareness, consequently it is hard for them to perceive differences between sounds, such as long vowels against short ones (Turner & Pughe, 2003); it is difficult for them to remember longer bits of conversation, so that it would be better to shorten the listening passages, exactly as it happens with reading comprehension (Kormos & Smith, 2012). It is even more challenging if dyslexic students are expected to listen to a passage and answer the related questions at the same time, especially if they are open-ended (Kormos & Smith, 2012). In this case, the possible accommodations to adopt might be represented by asking dyslexic students questions in their native language and by allowing them to answer again in their native language. This is something similar to the dual language version of a test, as referred by Abedi (2014). Furthermore, answers might also be provided orally, where open-ended questions are expected, or by administering multiple-choice items, provided that they are not negatively formulated or particularly and deliberately tricky. Finally, considered their shorter memory span and their reduced attention control, dyslexic students should be allowed to perform listening comprehension tasks in separate rooms, far from any potential distraction.

In order to accommodate students with special needs, computers have been used more and more thanks to their versatility and flexibility. Their use is now widespread also in tests, since technology can help solve several accessibility issues which still remain in paper-and-pencil tests (Kormos & Smith, 2012). The advantages computers can offer concern, for instance, the opportunity to provide several accommodations to be employed at the same time and within the test itself, including the adjustment of the font size on the computer screen or self-voicing applications. In addition, computer-based tests allow consistency and uniformity in delivering the accommodations required (e.g., read-aloud) in order to satisfy the individual needs of each single user (Abedi, 2014). This is even more evident when human readers are asked to read aloud the options of a given item, since they might

emphasise the right answer, giving unintentional cues to the students, altering the construct of what is being measured (Abedi, 2014). Moreover, in computer-based tests, dyslexic students will not be required to transfer their answers on separate answer sheets, avoiding the risk of potential mistakes while transferring their answers (Kormos & Smith, 2012).

Finally, it is worth noticing that Thompson, Johnstone, and Thurlow (2002) have tried to suggest a universal test design for large-scale assessment. Their idea is that tests should be designed with disabled learners in mind; in this way, since tests would be more flexible and hence appropriate for any student, accommodations would be no more necessary. Unfortunately, considering the great variety of disabilities, their different levels of severity, the heterogeneity in test takers with their strengths (e.g., sometimes they can also somehow compensate for a deficit) and weaknesses, the universal test design might not be the solution to specific learning difficulties. Consequently, individualised considerations when granting accommodations are highly recommended (Kormos & Smith, 2012).

3. Accommodations and testing validity

Accommodations have also represented a very big concern for assessors and language testers, since they might undermine the fairness and validity of assessment and language testing (Hansen et al., 2005). As a matter of fact, accommodations should not give dyslexic students an advantage over their fellow students who are not allowed to use them. Accommodations should only be a fair opportunity for dyslexic students to show their knowledge and ability (Hansen et al., 2005; Li & Suen, 2012).

Li and Suen (2012) compared the effects of test accommodations on the test performance of both English Language Learners (ELLs) and non-ELLs. They applied a meta-analysis using hierarchical linear modelling, which revealed that test accommodations had positive effects only on ELLs (i.e., their test performance was improved), whereas the non-ELLs outcomes were substantially unaffected by the accommodations. This is exactly the way accommodations should work in order to be considered valid, by levelling the playing field only for those students somehow concerned by a deficit. Such a behaviour is also known as “interaction hypothesis”, that is, valid accommodations will improve the scores only for the students who need them, leaving unaffected the outcomes of those students who do not necessitate accommodations (Hansen et al., 2005, p. 110).

Abedi (2014) mentions some studies on computer-based assessments with accommodations, such as extra testing time, read aloud, option to modify font size. The results showed that the test validity was not compromised, since the focal construct was unaltered and therefore preserved.

Hansen et al. (2005) try to define their target population, since for a validity argument sensitive to test accessibility it is of paramount importance to recognise the many differences which exist within the several populations of test takers. Then, Hansen et al. (2005) identify the knowledge, skills, and other attributes (KSAs) they need for their study, making a clear distinction between focal and ancillary KSAs. The status of being focal or ancillary depends on the definition of the targeted proficiency; consequently, a KSA may be focal for a given targeted proficiency and ancillary for another. Focal KSAs cannot be modified, whereas it is possible to change ancillary requirements in order to make a test more accessible to disadvantaged students. Furthermore, since defining the targeted proficiency is a deliberate choice, this means that for validity issues all test takers will be assessed against that same definition, independently of any disability or deficit they might have.

4. International examination boards and accommodations

Depending on the severity of their disorder and their level of motivation, dyslexic students can represent potential test takers for international examination boards. This is why the latter have contemplated the opportunity for students with special needs to require accommodations.

Kormos and Smith (2012) have analysed the accommodations provided by Cambridge ESOL (at the time of their writing), TOEFL iBT, Pearson Educational Tests. They have pointed out that some accommodations are commonly shared, such as the ones concerning the response format, the use of a word processor, of a scribe, of extra testing time, of supervised breaks, and of transparent coloured overlays.

The author of the present paper has also investigated other international examination boards, namely Trinity College London (Trinity) and IELTS. Concerning Trinity, they have devoted a web page (<http://www.trinitycollege.com/site/?id=2933>) to special needs requests, where they state the importance of treating each student individually and of avoiding any form of discrimination, while preserving the quality of their examinations at the same time. Candidates are only asked to send all the relevant supporting documentation at least 28 days before the examination date. Should the information provided not be satisfactory, the request for accommodations may be refused.

IELTS (<https://www.ielts.org/book-a-test/special-requirements>) also state they make every effort in order to accommodate test takers with special needs and a whole web page (<https://www.ielts.org/book-a-test/special-requirements/learning-difficulties>) is devoted to specific learning difficulties, like dyslexia; in particular, extra time, supervised breaks, computer, enlarged print copies are mentioned as arrangements. However, compared to

Trinity, they need a longer notice period – six weeks for the extra time and three months for a modified version of the test. Finally, it is worth noticing they state that spelling and grammar mistakes are marked in the same way as all other test takers.

5. Dyslexia in Italy

In Italy there is a national association (<https://www.aiditalia.org/>) which deals with SpLDs and dyslexia is recognised by the Law No. 170 promulgated in 2010 (http://www.istruzione.it/esame_di_stato/Primo_Ciclo/normativa/allegati/legge170_10.pdf). According to the guidelines provided in 2011 by the Italian Ministry of Education, University and Research (MIUR) (<http://www.miur.gov.it/documents/20182/198444/Linee+guida+per+il+diritto+allo+studio+degli+alunni+e+degli+studenti+con+disturbi+specifici+di+apprendimento/663faecd-cd6a-4fe0-84f8-6e716b45b37e>), special accommodations must be offered to dyslexic students, also during evaluation and assessment, including high-stakes tests. For instance, they can be allowed the use of information technology (such as word processors, electronic dictionaries), of 30% extra time (a percentage defined “reasonable” by the Ministry), and they can also be granted reduced workload (e.g., less exercises, shortened version of a test), although preserving the same standards in terms of quality. As far as foreign languages are concerned, the guidelines include a section (i.e., 4.4) devoted to them. In particular, whenever possible, they recommend choosing a more transparent foreign language and oral communication should be privileged. Furthermore, if deemed necessary because of very severe dyslexia and/or comorbidity, dyslexic students may also be exempted from studying a foreign language (MIUR Decree No. 5669/2011, http://www.istruzione.it/esame_di_stato/Primo_Ciclo/normativa/allegati/prot5669_11.pdf). Nevertheless, this may represent a controversial issue, since further education of dyslexic students might be compromised due to a different school leaving certificate – as stated in the Decree Law No. 62/2017, Article 20, Clause 13 (<http://www.gazzettaufficiale.it/eli/id/2017/05/16/17G00070/sg>) – which denies them the right to enroll at university.

At the University of Modena and Reggio Emilia (UNIMORE), there is an office (<http://www.asd.unimore.it/site/home.html>) devoted to help and guide dyslexic students. They submit their supporting documentation to that office and they have interviews with the people working there. During their academic career, they are also tutored by peer and senior students who are previously trained by specialised University staff. It is plausible to deduce that learners with SpLDs attending university (i.e, higher education which is not mandatory in Italy) should not be very severe dyslexic students. Although the rules and regulations of the Italian Law are applied, it is worth noting that these are usually general

and standardised, while each learner with SpLDs is an individual with his/her own peculiarities, strengths and weaknesses. As a consequence, despite the big efforts already made by the office, whose work is also well appreciated nationwide, the support service for dyslexic students might be improved by promoting more awareness and dialogue with the lecturers dyslexic students will encounter during their academic career, as recommended by Kormos and Smith (2012), while preserving the quality standards of academic learning and examinations. Such a need becomes even stronger when a foreign language, namely English which is compulsory in every course of studies, should be assessed. UNIMORE is also the project leader of the European Erasmus+ project “TIDE - new Tools for Inclusion of Dyslexic studEnts” (<https://project-tide.eu/>), aiming at collecting best practice and writing guidelines for inclusion of dyslexic students, in particular from school to university in order to promote their advances and success in higher education (i.e., a higher rate of dyslexic students attending university and graduating).

6. Conclusions

Dyslexia has only recently received the attention it deserves. Despite their neurological disorder, dyslexic students can succeed in activities such as reading, learning a foreign language, but also passing exams and graduating. This can be made possible thanks to some accommodations only meant to avoid a bias towards this particular group of learners and/or test takers, avoiding at the same time to provide an unfair advantage to them.

The accommodations provided to dyslexic students during a test could be compared to the metaphor of eyeglasses. There are some people who need to wear them because of a deficit in their sight; in this way, they can continue to drive safely, to read, to watch TV. Nevertheless, the simple fact of wearing eyeglasses does not mean that the world (i.e., the test construct) is different and that people who do not need to wear them will be somehow disadvantaged or advantaged in what and how they can see around them (i.e., the test). As a consequence, eyeglasses (i.e., accommodations) will only make the world and everyday activities accessible to the individuals (i.e., dyslexic students) who need them, removing the barriers that a deficit in sight might cause.

In conclusion, further research (especially on accommodations and validity issues) and more awareness would be needed and advantageous. This would also be beneficial in order to promote more inclusion of dyslexic students in higher education.

References

- Abedi, J. (2014). The use of computer technology in designing appropriate test accommodations for English Language Learners. *Applied Measurement in Education*, 27 (4), 261–272. doi: 10.1080/08957347.2014.944310
- Hansen, E. G., Mislevy, R. J., Steinberg, L. S., Lee, M. J., & Forer, D. C. (2005). Accessibility of tests for individuals with disabilities within a validity framework. *System*, 33, 107–133. doi: 10.1016/j.system.2004.11.002
- Kormos, J., & Smith, A. M. (2012). *Teaching languages to students with specific learning differences*. Clevedon, UK: Multilingual Matters.
- Law No. 170. (2010). Retrieved April 29, 2018, from http://www.istruzione.it/esame_di_stato/Primo_Ciclo/normativa/allegati/legge170_10.pdf
- Li, H., & Suen, H. K. (2012). Are test accommodations for English language learners fair? *Language Assessment Quarterly*, 9(3), 293–309. doi: 10.1080/15434303.2011.653843
- MIUR. (2011). Decreto Ministeriale N. 5669 del 12 luglio 2011. Retrieved April 29, 2018, from http://www.istruzione.it/esame_di_stato/Primo_Ciclo/normativa/allegati/prot5669_11.pdf
- MIUR. (2011). Linee guida per il diritto allo studio degli alunni e degli studenti con disturbi specifici di apprendimento. Retrieved April 29, 2018, from <http://www.miur.gov.it/documents/20182/198444/Linee+guida+per+il+diritto+allo+studio+degli+alunni+e+degli+studenti+con+disturbi+specifici+di+apprendimento/663faecd-cd6a-4fe0-84f8-6e716b45b37e>
- Mortimore, T., Hansen, L., Hutchings, M., Northcote, A., Fernando, J., Horobin, L., et al. (2012). Dyslexia and Multilingualism: Identifying and supporting bilingual learners who might be at risk of developing SpLD/dyslexia. Retrieved April 29, 2018, from https://www.bdadyslexia.org.uk/common/ckeditor/filemanager/userfiles/About_Us/Projects/Big_Lottery_Research_Report_Final_Version.pdf
- Schneider, E., & Crombie, M. (2003). *Dyslexia and foreign language learning*. London: David Fulton Publishers.
- Thompson, S. J., Johnstone, C. J., & Thurlow, M. L. (2002). Universal design applied to large scale assessments (Synthesis Report 44). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes. Retrieved April 29, 2018, from <http://www.cehd.umn.edu/nceo/onlinepubs/synthesis44.html>
- Turner, E., & Pughe, J. (2003). *Dyslexia and English*. London: David Fulton Publishers.

Sharing system of learning resources for adaptive strategies of scholastic remedial intervention

Barana, Alice^a; Di Caro, Luigi^b; Fioravera, Michele^a ; Floris, Francesco^a ; Marchisio, Marina^a and Rabellino, Sergio^b

^aDepartment of Mathematics, University of Turin, Italy ^bDepartment of Computer Science, University of Turin, Italy.

Abstract

This paper presents a model for school remedial, focusing on improving the digital materials sharing process for the diversification of tutoring strategies. The model involves the characterization of materials for automatic assessment shared within a community of tutors. The characterization expects materials to be linked with natural language descriptors explicating their intended instructional objectives. The possibility of implementing a recommendation system on the basis of natural language processing techniques is discussed taking in consideration an analysis of the application of the model within a local-scale project. Clustering techniques searching for materials that have the same educational purposes but involve the activation of different cognitive processes are proposed, in order to continuously extend the database of shared materials in favour of the effectiveness of ongoing tutoring actions. The results collected from questionnaires submitted to students, tutors, and teachers involved in the project are shown, and clustering data are discussed highlighting the feasibility of the application of the model.

Keywords: Adaptive tutoring; automatic assessment; clustering; sharing; virtual learning environment.

1. Introduction

The success of adaptive tutoring requires an accurate diagnosis of learners' needs. Technology Enhanced Learning Environments (TELEs) enable the creation of communities of practice dedicated to tutoring interventions based on digital technology, where sharing can enhance a diversification of contents in favour of different learners. In this process, the collection of explicit descriptions of learning intentions can be used as the basis for the recognition of optimal content. In this paper, automated recommendation of learning materials is proposed considering prerequisites and learning objective specified as metadata of resources for automatic assessment.

The present research discusses the design of materials created within a project for school remedial in mathematics. Clustering analysis is proposed to search for resources produced in previous editions and recommended for ongoing interventions, considering the specific necessities. Results from different editions of the project are presented. They show the effectiveness of experimental actions of school remedial, conducted using advanced tools integrated with a Virtual Learning Environment (VLE), on the basis of problem posing and solving methodology. A system for sharing digital resources among tutors is proposed to enhance the efficiency of the remedial interventions explicated through specific descriptors.

2. State of the art

The idea of technology-based adaptive teaching (Snow 1977) was born from the interest in individual differences among learners, who might show different attitudes toward learning and respond to different forms of instructions in different ways (Jonassen & Grabowski 1993), possibly changing over time. Instructional strategies should be adjusted accordingly with the student's progresses (Jonassen et al. 1990), which need to be continuously controlled. To enable an automated monitoring of learning outcomes, several online systems have been developed. According to the collection of assessment data, analysis of activities and feedback, the design of personalized paths can be constructed with materials and activities which best meet the students' needs (Shute & Zapata-Rivera 2007).

The use of ICTs boost the positive effects that the use of adaptive teaching methodologies has on the learners (Phobun & Vicheanpanya 2010): lessons are engaging, relevant, and interesting; the learning environment is comfortable and learners feel at ease; learners do not worry about saying something wrong, in fact mistakes are necessary to inform the teacher about how to adjust the strategy; learners take increasing responsibility for their own growth (Tomlison 2001). These factors are particularly relevant in contexts of tutoring as key points for the promotion of school success (Mascarenhas et al. 2011).

The project presented in this paper has been subject of study in few research on the positive effects of peer tutoring in fostering the student motivation (Ricchiardi & Torre 2014). The methodologies of the experimental Mathematics part of the project follow the same trend indicated by the Italian Ministry of Education and applied in the national project Problem Posing and Solving (Brancaccio et al. 2014). They have also been adopted within the Erasmus+ Project SMART (Science and Mathematics Advanced Research for good Teaching) (Brancaccio et al. 2016). In this paper, the tutoring process of the project is analyzed in the perspective of Instructional Design (ID). ID is a technology for the development of learning experiences and environments which promote the acquisition of specific knowledge and skill by students, incorporating learning strategies which make the acquisition of knowledge and skill more efficient, effective, and appealing.

3. The project

The project “Scuola dei compiti” (“School of Homework”) aims at reducing scholastic failures. It offers remedial actions through tutoring activities supported by new technologies and innovative educational methodologies developed by the University of Turin (Cavagnero et al. 2015). The project started in the school year 2012/2013, as a collaboration between the University, the Polytechnic, the City of Turin and the association of retired teachers. Twenty schools, divided between secondary schools of first and second grade, have taken part in the project, now in its seventh edition currently underway. The targeted action for the recovery of unsuccessful situations is directed to the students in the transition phase between the two school levels, through afternoon courses and online activities on courses hosted on a Moodle VLE. Tutoring is held by undergraduates of the University of Turin or the Polytechnic of Turin. The VLE is integrated with an Advanced Computing Environment (ACE), an Automatic Assessment System (AAS) and a web conference tool.

The tutoring activity is organized on a weekly basis as follows:

- two hours of meeting in presence
- one hour of distance learning using the web-conference tool

Tutors are asked to prepare new materials according to the specific needs diagnosticated to the learners. To help them create and diversify the materials, resources produced in previous editions of the project have been made available to inspire the creation of new materials.

4 Automatic Assessment

The project strongly relies on the adoption of the suite of software integrated to the VLE. The Automatic Assessment System (Maple TA) allows students to practice wherever and whenever they want and to receive immediate feedback on their level of preparation with indications on the educational material to be reviewed on the basis of the results obtained. The Moodle gradebook is integrated with Maple TA, so that it is possible to monitor student progresses and to find out their difficulties. One of the many potentialities of the software are the adaptive questions: they allow students to submit real-life problems, leaving more space to the reasoning process and giving them more attempts to find a solution. In case of failure, a guided path towards the solution is proposed, dividing the proposed problem into successive steps that guide the student's reasoning (Barana et al. 2015).

5 Methodology

The tutoring action can be analysed with the 5 phases that characterize the ADDIE model (Analyse, Design, Develop, Implement and Evaluate) of Instructional Design. The 5 phases, which alternate cyclically during the various weeks in which the support and recovery actions develop, can be described as follows:

- **Analyse.** Needs analysis takes place in the first phase of the project and in itinere: needs are firstly agreed with the teachers in service of the students who take part in the afternoon courses. Tutors investigate students' achievements on a weekly basis and develop the interventions accordingly.
- **Design.** The explication of specific learning objectives must be consistent with the needs analysis phase. Simultaneously the tutor is required to identify the prerequisites that the student must meet in order to reach the learning objectives.
- **Develop.** The strong versatility of the ACE and the AAS enables the creation of a wide range of different interactive materials to be offered to the students, in line with the criteria defined in the Design phase.
- **Implement.** Activities are submitted both in presence to the students and made available via the VLE.
- **Evaluate.** Tutors assess whether the proposed activities have allowed the students to reach the pre-established learning objectives. The specification of the couple (objectives, prerequisites) is crucial for determining where to intervene next.

5.1 Authoring and sharing materials for automatic assessment

It is proposed to associate digital materials to natural language descriptions which explicate the learning intentions and success criteria they were designed for. The model provides for a pair of descriptors (objectives, prerequisites), defined as follows, to be included as metadata:

- *Objectives* (or “goals”) specifies what learners are required to be able to do as a result of the learning activity related to the MLO. This statement should not simply describe a list of topics, that being too abstract, too narrow, nor being restricted to lower-level cognitive skills.
- *Requisites* (or “prerequisites”) states the tutor’s belief of the necessary and sufficient condition to attempt performing the learning material. It is the explicit declaration of previous knowledge and skills necessary and sufficient to achieve the Objectives.

The two descriptors must be expressed in a student-centred manner.

Figure 1 shows an example learning material.

A square of side $x > 7$ cm is transformed into a rectangle by increasing a side by 7 cm and decreasing the other side by 7 cm .

What is the relationship between the perimeters of the two figures?

$$\frac{P_{\text{square}}}{P_{\text{rectangle}}} = \text{Number}$$

What is the absolute value of the difference between the measures of the two figures' areas?

d = cm²

Which of the two figures has the largest area?

The square.

The rectangle.

The two figures have the same area.

Figure 1. Example of learning material for automatic assessment.

One example of Requisites of the learning material of Figure 1 would be “Knowing the concept of perimeter and how to calculate it for squares and rectangles”. An example of Objectives would be: “Comparing polygons by the calculus of areas”.

Materials sharing interacts with the three central phases of the ADDIE model (Design, Develop and Implement): in the design phase, tutors are fostered to think more deeply about the objectives and prerequisites. In the development and implementation phases, they could find new ideas drawn from diversified material.

5.2 Clustering learning materials

Descriptors express which student’s performance is required in terms of activated cognitive processes and types of knowledge on which these processes operate. To this aim, the adoption of a taxonomic reference is proposed: Anderson & Krathwohl’s taxonomy (Anderson et al. 2001). Anderson & Krathwohl proposed a classification of cognitive processes and knowledge types: 11 types of knowledge organized into 4 categories (Facts, Concepts, Procedures, Metacognition), and 19 basic processes organized into 6 categories (Remember, Understand, Apply, Analyse, Evaluate, Create) ordered by ascending cognitive complexity.

Considering Anderson & Krathwohl’s taxonomy, learning materials can be linked to a set of concepts’ couples referring to a 4×6 matrix: the first dimension of the matrix represents the types of knowledge while the second dimension represents the cognitive processes involved. The connection between a material and a matrix’s element is established by identifying cognitive processes and knowledge type from clues in content or metadata, such as

- one or more ‘action verbs’, each being a synonym of a single cognitive process;
- one or more disciplinary terms, each related to a single knowledge concept;

As an example, the Objective of Figure 1 “Comparing polygons by the calculus of areas” would be linked to the cognitive process from the category Understand because of the presence of the verb “Comparing”. As illustrated in Figure 2, the presence of an action verb (leaf element) is considered as an indicator of a cognitive process.

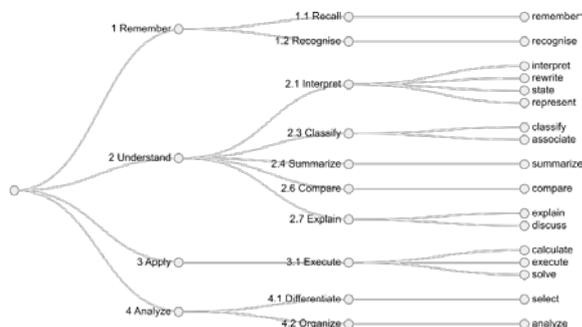


Figure 2. Example action verbs and related cognitive processes as defined by Anderson & Krathwohl’s taxonomy.

Similarly, the presence of disciplinary contents (leaves) indicate knowledge types. To actually detect the cues in descriptors, an ontological version of Anderson & Krathwohl taxonomy integrated with the domain-specific OntoMath^{PRO} ontology is proposed (Nevzorova et al. 2014). OntoMath^{PRO} is a bilingual (Russian/English) ontology of mathematical knowledge, geared to be the hub for Math knowledge on the Web of Data.

Sources shared by the developers with the Semantic Web community are translated in Italian.

6. Results and discussion

The following results are obtained by analysing the questionnaires proposed at the end of the previous editions of the project and submitted to the three subjects involved in the project for mathematics: tutors, students and teachers in service. A questionnaire asks tutors to evaluate their consideration on the importance of using the VLE, the ACE, the AAS, and all those tools integrated for adaptive tutoring (Barana et al. 2017), in a Likert scale from 1 to 5. Table 1 shows questionnaire results, which highlight the importance of the use of the AAS and all the technological tools integrated.

Table 1. Tutors' responses to the importance of the tool for adaptive tutoring.

	VLE	ACE	AAS	integration
Average	3.6	3.7	4.9	4.6
Standard deviation	1.0	1.1	0.9	0.6

To evaluate the effectiveness and attractiveness of the project, students' answers were analyzed and the improvement between the initial and final phase of the project in terms of school media was recorded. There is an increase in average of about 0.73 points, which increases to 0.78 considering only students who regularly attend the afternoon courses and actively participate in the activities proposed by the tutors. On the basis of the teachers' opinion, the course has been useful for 80% of students who attended mathematics course and these values increase with the students' attendance to the courses.

Table 2 shows the mean and standard deviation of the answers of the students' questionnaire regarding their appreciation of the various activities proposed on the platform. As it can be seen, also in this case the AAS has an average of 3.62 (standard deviation 1.015) and a good part of students, in addition to recognizing the effectiveness of the proposed tools, would like the methodologies based on digital tools to be introduced in the regular school lessons.

Table 2. Students' responses to the questionnaire.

Question	Mean	Std dev
How much did you appreciate being able to perform exercises and checks on the computer with automatic correction?	3.62	1.015
Were the materials interesting?	3.628	0.87
Do you think these platform resources have helped you improve?	3.00	1.23
Would you like to have a platform and be able to use the computer even in regular school lessons?	3.84	1.15
How much did you appreciate the availability of material on the platform?	3.50	0.99

7. Conclusion

The evaluation made by the subjects involved suggests the effectiveness and attractiveness of the project. A more efficient sharing system allows an ongoing monitoring of the quality of the project. A comparison between the descriptors inserted by different tutors allows analysing different strategies adopted on the basis of a common methodology, that will be helpful for assessing the project's outcomes.

References

- Anderson, L. W., Krathwohl, D. R. et al. (2001). A taxonomy for learning, teaching, and assessing. A revision of Bloom's taxonomy of educational objectives. New York, Addison Wesley Longman.
- Barana, A., Marchisio, M., Rabellino, S. (2015). Automated assessment in mathematics. *Proceedings - International Computer Software and Applications Conference*. pp. 670-671.
- Barana, A., Fioravera, M., Marchisio, M., Rabellino, S. (2107). Adaptive Teaching Supported by ICTs to Reduce the School Failure in the Project 'Scuola Dei Compiti'. *Proceedings - International Computer Software and Applications Conference*, pp. 432-437.
- Brancaccio, A., Demartini, C.G., Marchisio, M., Pardini, C., Patrucco, A. (2014). Il progetto PP&S informatica a scuola. *Mondo Digitale* 13(51), pp. 565-574.
- Brancaccio, A., Esposito, M., Marchisio, M., Pardini, C. (2016). L'efficacia dell'apprendimento in rete degli immigrati digitali. L'esperienza SMART per le discipline scientifiche. *Mondo Digitale* 15(64), pp. 803-821.

- Cavagnero, S.M., Gallina, M.A., Marchisio, M. (2015). Scuola dei compiti. Didattica digitale per il recupero dell'insuccesso scolastico. *Mondo Digitale 14(58)*, pp. 834-843.
- Jonassen, D. H., Grabowski, B. L. (1993). *Hanbook of Individual Differences, Learning and Instruction*. Hillsdale, New Jersey: Laurence Erlbaum Associates, Publishers.
- Jonassen, D. H., Grabinger, R. S., Harris, N. D. C. (1990). Analyzing and Selecting Instructional Strategies and Tactics. *Performance Improvement Quarterly*, vol. 3, n. 2.
- Mascarenhas, A., Parson, S., Cohen Burrowbridge S. (2011). Preparing Teachers for High-Need Schools: A Focus on Thoughtfully Adaptive Teaching. *Occasional Paper Series*, vol. 2011, n. 25.
- Nevzorova, O., Zhiltsov, N., Nikita, Kirillovich, A., Lipachev, E. (2014). OntoMathPRO ontology: A linked data hub for mathematics. *Communications in Computer and Information Science*, vol. 468, pages 105-119.
- Phobun P., Vicheanpanya, J. (2010). Adaptive intelligent tutoring systems for e-learning systems. *Procedia - Social and Behavioral Sciences*, vol. 2, n. 2.
- Ricchiardi, P., Torre, E. M. T. (2014). Progetti di tutoring per contrastare l'insuccesso scolastico e favorire la motivazione ad apprendere nella scuola secondaria. *L'integrazione scolastica e sociale*, vol. 13, n. 3, pp. 285-306.
- Shute, V. J., Zapata-Rivera, D. (2007). Adaptive Technologies. *Educational Testing Service*, Princeton.
- Snow, R. E. (1977). Individual Differences and Instructional Theory. *Educational Researcher*, vol. 6, pp. 11-16.
- Tomlison, C. A. (2001). *How to Differentiate Instruction in Mixed-Ability Classrooms*. Alexandria, VA: ASCD.
- Wang F., Hannafin, M. J. (2005). Design-Based Research and Technology-Enhanced Learning Environments. *Educational Technology Research and Development*, Vol. 53, No. 4 (2005), pp. 5-23.

Diverse Women Faculty Experiences Using Identity and Relational Concepts to teach Cultural Competence

Williams, LaShawn

Behavioral Science Department, Utah Valley University, United States of America

Abstract

This article partially engages the qualitative sections of Williams' 2017 research study that aimed to explore faculty experiences using relational concepts to teach cultural competence. Multiple experiences were common to respondents from the results obtained at completion of the survey. Implications for social work education, faculty mentorship and support are discussed. It was concluded that there is an express need for early intervention on behalf of doctoral students being mentored for teaching appointments, the use of identity is a healthy and connecting touchstone in social work education classrooms and ongoing work is needed to challenge the work of deconstructing privilege in service of using professional and personal identity to connect content to effective knowledge transfer.

Keywords: *Social Work; Diversity; Relational-Cultural Theory; Cultural Competence; Relational Teaching.*

1. Introduction

This article discusses some of the qualitative results from Williams' 2017 mixed-methods research project seeking to explore the experiences of social work faculty teaching cultural competence from a lens of relational cultural theory (RCT). Relational Cultural Theory "emphasizes health growth and courage, and points to a new understanding of human and individual strengths: strength in relationship, not strength in isolation" (Jordan & Hartling, 2002, p. 51). Jordan and Hartling explain that "isolation is seen as the source of the most suffering, while the process of creating mutual empathy and mutual empowerment is seen as the route out of isolation" (Jordan & Hartling, 2002, p. 51). Relational Cultural theory is an approach that emphasizes relationships, change, and growth. These things happen because of the ability to create and manage relational movement. (Williams, 2017)

Faculty were invited to share their teaching experiences related to specific RCT-based relational teaching concepts. Introduced by Edwards and Richards (2002), relational teaching is a pedagogy based in relational cultural theory. It describes the participation in growth-fostering relationships as a critical element in teaching students by focusing on three components that foster growth: mutual engagement, mutual empathy, and mutual empowerment. (Williams, 2017)

Faculty participation was sought in the Western region of the United States and extended to additional states along the country's borders. Respondents in the quantitative section were invited to participate in the qualitative section upon completion of the survey. There were initially 74 quantitative respondents. Of those respondents, 38 opted-in for future contact to complete the qualitative section. From the 38 interested in future contact, just 4 completed the qualitative portion of the study. All four respondents identified as women. (Williams, 2017)

2. Qualitative Results and Interpretations

This study sought experiences of social work faculty teaching diversity and cultural competence at schools accredited by the Council on Social Work Education (CSWE). The results of each question provided insight for additional research looking at the use of relationship in the classroom according to relational teaching principles. (Williams, 2017)

Social work faculty members' teaching experiences connected with relational cultural theory concepts outlined in relational teaching (Edwards & Richards, 2002; Williams, 2017). Each relational teaching concept connected to current literature associated with social work faculty experiences in teaching social justice and intersectionality (Robinson, Cross-Denny, Lee, Werkmeister Rozas, & Yamada, 2016), cultural competence (Saunders, Haskins, & Vasquez, 2015), white privilege and identity development for faculty and

students (Davis, Mirick, & McQueen, 2015), as well as faculty reflection on their teaching experiences. The most common component in each relational teaching concept's cluster of themes was that of identity. Identity became a conduit of faculty connection in the classroom (Williams, 2017).

Identity was a conduit of connection between students and faculty because faculty highlighted their use of their own racial, ethnic, gender, and other identities to help students connect with their own identities. Faculty worked to create positive classroom cultures that allowed expression and risk, promoting a continuation of exploring racial and ethnic identity processes. (Williams, 2017) Faculty noted using various pedagogical approaches to teach cultural differences (Saunders, Haskins & Vasquez, 2015) when they noted being impacted by student experiences which were shared in the classroom. This sharing created examples of the relational teaching concept of mutual empathy. Finally, identity was discussed as a conduit of connection when it exposed the support faculty provided students in their learning process through curricular adjustments that encouraged growth and contributed to the development of professional identity (Williams, 2017).

3. Implications/Recommendations for Social Work Education

Faculty who used their identities and named similarities were able to share examples with students. These examples legitimized and gave permission for faculty to teach about difference. While this provided some intellectual interaction, results showed that it did so with the presence of some emotional distance evidenced in responses (Williams, 2017). Some faculty who experienced having to use themselves as examples to connect in a negative way expressed frustrations. They stated that doing so without the support of colleagues or members in leadership was difficult. Others felt that they lacked experiential connections that mattered to their students (sometimes even with the support of colleagues and leadership) (Williams, 2017). Additionally, examples of the commitment to effective teaching of cultural competence sometimes contributed to "othering" processes (Diggles, 2014) used to teach cultural competence. A lack of awareness was demonstrated at times. A lack of motivation to self-reflect on the impact of their practices was evidenced in responses. Thus, a major implication for this study and the future of social work educators is the explicit use of self as a practitioner-in-progress. (Williams, 2017) Williams suggests a heavier usage of critical race theory (Diggles, 2014), intersectionality (Robinson et al. 2016), and de-centering privilege as techniques that will invite a deeper instructional authenticity of learning with and from one's students. Implications from this study recommend a refocus on the power of relationship and constructing student identities as allies (Gibson, 2014) in similar and different ways from instructors. Students can learn to

take risks in safe environments by seeing faculty do the same, knowing that learning from mistakes is encouraged and part of the growth process.

The above information, however, is impossible without the support, guidance, and mentorship to help faculty go further than using their identity as a starting place to actively creating an ongoing and dynamic relationship with students-as-allies where all are encouraged to “go first” and supported in the leadership process of cultural learning. Although faculty successfully demonstrated an ability to support students in their explorations of cultural identity and cultural competence, literature speaks to the need for faculty to have similar support in their professional ranks as that provided to students in the classroom experience.

Mentoring of women faculty members in the academy is noted by Williams a natural extension of relational cultural theory concepts (2017). Five are specifically outlined by Hammer, Trepal, and Speedlin (2014), namely attending to power, focusing on mutuality, fostering authenticity, listening into voice, and building a sense of community and connection. Gammel and Rustein-Riley (2016) propose that mentoring begin at the doctoral level for women faculty. In this study, some respondents stated having, and appreciating, support from colleagues on campus as they engaged the work of diversity and difference in their classrooms. Other respondents in this study did not report such support. This is a significant need for faculty from historically marginalized populations. (Williams, 2017) The burden of teaching diversity concepts and introducing social justice components into curriculum is documented as being especially challenging for faculty of color (Edwards, Bryant & Clark, 2008; Moule, 2005). Williams’ implications from this study point towards further research of the faculty experience in specifically engaging resistance and disconnection in the classroom from the perspective of relational cultural theory’s “creative work toward mutual empathy” 5-step approach (Comstock, Duffey, & St. George, 2002). Williams states that this can be accomplished with the active support and ongoing development of mentoring networks (2017).

4. Limitations of this Study

The major limitation documented in this study was the sample size. It was too small to make any generalizations that could apply to the profession of social work education. In addition to the sample size, it was noted that both the the gender of participants who returned information for the qualitative portion of the study were women. As previously stated (Williams, 2017), there was no intent in this study to exclude people of any gender identity or expression from participation.

5. Summary

In summary, this partial discussion of Williams' 2017 study demonstrates an ongoing need of support for and guidance in the experiences of women in academia who actively use the many intersections of their identity to help further the work of cultural competence. Further study of faculty experiences focusing on shame and entitlement when teaching diversity would be of benefit to learning how to support faculty who struggle and to mitigate the effects of faculty who may do harm due to the blind spots that can be created from equating training attendance with effective cultural competence. More research is needed about the inner journeys of faculty members to do the deconstructing work of their own privileges in order to give students active role models in the life-long process of anti-oppression knowledge transfer in social work education classes (Williams, 2017).

References

- Avant, D. W., & Bracy, W. (2015). Teaching Note—Using Problem-Based Learning to Illustrate the Concepts of Privilege and Oppression. *Journal of Social Work Education*, 51(3), 604-614.
- Comstock, D., Duffey, T., & St. George, H. (2002). The relational cultural model: A framework for group process. *The Journal for Specialists in Group Work*, 27(3), 254-272. doi:10.1177/019339220207003002
- Davis, A., Mirick, R., & McQueen, B. (2015). Teaching from privilege: Reflections from white female instructors. *Affilia: Journal Of Women & Social Work*, 30(3), 302-313. doi:10.1177/0886109914560742
- Diggles, K. (2014). Addressing Racial Awareness and Color-Blindness in Higher Education. *New Directions For Teaching & Learning*, 2014(140), 31-44. doi:10.1002/tl.2011
- Edwards, J., Bryant, S., & Clark, T. (2008). African American Female Social Work Educators in Predominantly White Schools of Social Work: Strategies for Thriving. *Journal of African American Studies*, 12(1), 37-49. doi:10.1007/s12111-007-9029-y
- Edwards, J., & Richards, A. (2002). Relational teaching: A view of relational teaching in social work education. *Journal of Teaching in Social Work*, 22(1/2), 33-48. doi:10.1300/J067v22n01_04
- Gammel, J. A., & Rutstein-Riley, A. (2016). A Relational Approach to Mentoring Women Doctoral Students. *New Directions For Teaching & Learning*, 2016(147), 27. doi:10.1002/tl.20196
- Gibson, P. A. (2014). Extending the Ally Model of Social Justice to Social Work Pedagogy. *Journal of Teaching In Social Work*, 34(2), 199-214.

- Hammer, T., Trepal, H., & Speedlin, S. (2014). Five Relational Strategies for Mentoring Female Faculty. *Adultspan Journal*, 13(1), 4-14. doi:10.1002/j.2161-0029.2014.00022.x
- Jordan, J. V., & Hartling, L. M. (2002). New developments in relational-cultural theory. In M. Ballou & L. S. Brown (Eds.), *Rethinking mental health and disorder: Feminist perspectives* (pp. 48-70). New York, NY: Guilford.
- Moule, J. (2005). Implementing a Social Justice Perspective in Teacher Education: Invisible Burden for Faculty of Color. *Teacher Education Quarterly*, 32(4), 23-42
- Robinson, M. A., Cross-Denny, B., Lee, K. K., Werkmeister Rozas, L. M., & Yamada, A. (2016). Teaching Note—Teaching Intersectionality: Transforming Cultural Competence Content in Social Work Education. *Journal of Social Work Education*, 52(4), 509-517. doi:10.1080/10437797.2016.1198297
- Saunders, J. A., Haskins, M., & Vasquez, M. (2015). Cultural Competence: A Journey to an Elusive Goal. *Journal Of Social Work Education*, 51(1), 19-34.
- Williams, L. C. (2017). *Mind the disconnect: Social work faculty experiences with relational teaching and diversity content* (Order No. 10284362). Available from ProQuest Dissertations & Theses A&I. (1954047998). Retrieved from <https://search.proquest.com/docview/1954047998?accountid=14779>

Drawing as dialogue

Brunetti, Federico Alberto

Politecnico di Milano - Scuola del Design., Liceo Artistico di Brera, Milano, Italy

Abstract

The training paths, in the different levels and differentiation by age and specific orientations, are essentially based on the acquisition of knowledge in which the transmission of competencies is organized starting and through the acquisition, and capacity for further modulation, of textual or alphanumeric languages. An area of particular intellectual value is however normally recognized and delegated to the activities defined as creative or artistic: that is, visual arts, or the choreutical and musical ones. The very concept of "vision", typical of the current methodologies of strategic thinking, refers to the ability to make visible the invisible, or to know how to conceive and communicate the experience of reality through interpretive hypotheses.

In Italy a new regulation called "School-Work Alternation" has been introduced in the training course of High Schools, for the development of those attitudes of so-called soft-skills in operational and relational responsibility, for a positive outlook in working contexts.

The case study of this manuscript concerns the students of the Liceo Artistico who forge their attitudes to know how to deal the conceptual mediations between visible and invisible, visual thinking and concept vision images. Drawing attitudes in fact accompanies the way they look at the world and elaborate a shareable image. These formative features have made their contributions in these experiences particularly interesting and original, not so much for non-profit creative collaborations that they have been able to develop with the Institutions that have welcomed them, but above all for the current image and innovative that they have been able to interpret and return.

Keywords: *soft-skills; visual thinking; Drawing; strategic thinking, visual interpretive hypotheses*

1. Introduction. Languages of learning: text and drawing

The training paths, in the different levels and differentiation by age and specific orientations, are essentially based on the acquisition of knowledge in which the transmission of competencies is organized starting and through the acquisition, and capacity for further modulation, of textual or alphanumeric languages. It is anthropologically evident how the organization of language and writing have been - and are - the interpretative algorithms that have made the human race able to develop memory as a shared and permanent factor through the generations; it is thanks to the learning of this shared code that education is founded through the communication of knowledge, models and archetypes.

The recent highlighting of *soft skills* through which behavioral attitudes, character and collaborative profiles can be oriented towards the interaction dynamics typical of complex organizations, remain based on the use of behavioral or linguistic or verbal languages in the communication of experiences and sharing of decisions and problems. An area of particular intellectual value is however normally recognized and delegated to the activities defined as creative or artistic: that is, visual arts, or the choreutical and musical ones. In this way what could be a synthetic and symbolic modality of strategic factor for the whole formation of personality and communication skills, both for personal as well as group attitude, is delegated / relegated to the skills of creativity. It has in fact been proven by various sources that the imaginative strategies characteristic of visual thought have a relevant importance in the identification of processes of high complexity that, in their proper conception and heuristic expression, can find positive solution and catalyze the dynamics necessary for their facing.

The very concept of "vision", typical of the current methodologies of strategic thinking, refers to a category - not necessarily only visual, but certainly related to the imagination - the ability to make visible the invisible, or to know how to conceive and communicate the experience of reality through interpretive hypotheses. These ideational abilities can find in drawing - based both of observation from the reality, or on mnemonic or imaginary implementation, and conceptual or design prefiguration - can find different modalities of visual and graphic expression of particular importance for the personal growth. *Through drawing*, overcoming the stereotypes and self-inhibitions often fueled by the same scholastic imposition of coded alphanumeric languages, the person of any age can find not only an emotional pleasure, but also trace the paths of inner and cognitive processing that otherwise could remain latent and unexpressed. Moreover, it is known that in the practice of the so-called drawing from reality, or even mnemonic, some autobiographical activities characteristic of a holograph tract at the limit between graphics and writing are put into action: for example, the aptitude test of the drawing by hearth of a tree, has become a classic interpretation elaborate of the character of a person, even at very different ages.

2. Arts between Humanistics and Science. Artistic High School

For these reasons a school where drawing is the fundamental cognitive and expressive language, even if renamed according to the specific disciplines taught (i.e.: geometric / figurative, architecture / painting, design / scenography, etc.) is at the center of an important evolution not only from the point of view of the "Arts" of which it is medium, but of the formation of creative thought, elaborated through education to image and to design. The educational program of the Artistic High School, upon which this manuscript is concerned, is located at this interesting crossroad: indeed while solidly humanistic and scientific subjects (defined cultural) remain, the orientation profile is directed towards the development of creative attitudes of the paths of the subsequent academic and university training, such as the Academies of Fine Arts or the Polytechnic Universities, or other postgraduate schools with a university profile. However it is well known how the scenario of the professions, and the relative training paths, are transforming themselves with diversification and application scenarios that are probably unprecedented, if not unknown, in the present time and into of the relationship between teachers and students.

3. A new soft skills learning experience and method

In recent years, in order to introduce without any hesitation the so-called soft-skills in the training courses, ie the "learning by doing" development of those attitudes of operational and relational responsibility necessary for a positive outlook in working contexts, in Italy a new regulation called "School-Work Alternation" has been introduced (among other European countries these educational protocols are named as: *work-related learning*, or *young apprenticeship programme*, or *national vocational qualifications*). Although with different difficulties -both organizational than bureaucratic and also various hesitations from different teachers who saw in this sudden innovation a problem rather than an opportunity- we can highlight in which way this experience has generated, if conducted with resilient collaboration, interesting experiences. Technical schools have traditionally interwoven collaborative relationships with their own territories, toward which their students had to be effectively formed for a fruitful insertion into the productive network. Differently the Liceums, usually oriented towards the prospect of pursuing towards university studies, have so far attended these frequentations or interactions with the territory as occasional or merely voluntary.

The reason for this distance lays both in the self-reference or institutional prudence of these kinds of high schools, as in the presumed awareness of the value of a theoretical knowledge up on the practical one, and upon in the organizational and bureaucratic difficulty of managing training times and roles that can be developed outside the institutions.

This new legislation has made it compulsory for the last three years of high school in to perform a total of 200 hours of activities coordinated with external institutions, delegating the design of these training courses to the schools themselves and to their internal delegates. It should be emphasized that a social security profile for former student-workers was been dedicated provided by I.N.P.S., the state institution responsible for social insurance for occupational accidents, in order to protect any activity performed - after specific courses on safety - in this context.

The Arts high schools, and Liceuns, and in particular the one here presented as a case study, have found in this legislation simply an equipped path, or in any case to be configured, in order to carry out those interactions with external competences in the territory to which it would otherwise have been difficult to interact with.

Thanks to the requirements inherent in this training path, it was thus possible - although certainly with a considerable organizational and bureaucratic effort - to demonstrate how the attitudes to be cultivated through visual arts education implies and educates also to an ability to communicate with the drawing, making useful the presence of students in the interactions with the working structures of the Milan area.

4. Dialogue through drawing

It is possible to notice how the specific skills, acquired during the course of their studies by the students of the Liceo Artistico, have predisposed them to face with particular agility these experiences that have been offered to them in the extracurricular field. But even more interesting and significant were the interest, expectations and in general the positive appreciation that the institutions that hosted these alternative training experiences. In fact, just as the coordinators of the training projects of these conventions have been careful not to configure activities that could have introduce any conflict or overlap with the work activities within the company in order not to conflict with the activities in progress, as well as the interest of the host structures was often motivated by being able to check how the younger generations perceive and know how to represent the contents of their business, of their corporate or company identity, of their brand. The students of the Liceo Artistico are found for their course of study- and for their personal attitudes - to know how to deal with particular interest the conceptual mediations between visible and invisible, between visual thinking and concept vision images. Although sometimes without explicit theoretical awareness, but with great creative intuition, they do not find themselves in difficulty in the semantic modulations and representation between reality and its symbols.

The act of Drawing, conceived and practiced in the many expressive technical characteristics and imaginative prefigurations that pre-empt it, accompanies the way they look at the world and elaborate a shareable image.

These formative characteristics have made their contributions in these “*Alternanza Scuola - Lavoro*” experiences particularly interesting and original, not so much for non-profit creative collaborations that they have been able to develop with the metropolitan, cultural, artistic, scientific and design Institutions that have welcomed them, but above all for the current image and innovative that they have been able to interpret and return.



Figure 1. (left): sculptor and graphic workshops elaboration developed in the Laboratories of Artistic Liceum of Brera. Painting, and Scenography Courses: Source: picture of the author.

<https://www.liceoartisticodibrera.gov.it/> <https://www.liceoartisticodibrera.gov.it/didattica/galleria-lavori/>
<http://www.liceoartisticodibrera.com/careers-in-art-artigianato-presso-le-gallerie-ditalia/>

Figure 2. (right) Liceo Artistico di Brera Team work – collaborative activities in different disciplines workshops and Laboratories : geometric / figurative, architecture / painting, design / scenography . Source: picture of the author.



Figure 3 (left) . Drawing digital process: 3D printer at work; analogic models smartphone macrophoto; virtual prototype overlapping in augmented reality; Design exercise modelling Lab in 3D sketchup sw.,
 Figure 4. (right): "Arts & Science Across Italy" national challenge: seminars at Liceo Brera and Università Bicocca with I.N.F.N. survey Laboratories. Source: picture of the author.

<https://web.infn.it/artandscience/index.php/en/>

<http://www.liceoartisticodibrera.com/concorso-arte-scienza-esposizione-in-spazio-hajech-gli-anelli-del-sapere/>

<http://arts.cern/>

<http://www.artescienzaeconoscenza.it/>



Figure 5. (left): Urban survey drawing from real sessions at Citylife Tre Torri skyscrapers development park, in the context of Accademia Fondazione Fiera Milano studies sessions. Source: picture of the author (2017).
 Figure 6. (right): Frames of some study sessions in Institutional sites (Museo del Design, Cittadella degli Archivi Comune di Milano; veneranda Fabbrica del Duomo di Milano, Gallerie d'Italia) Source: picture of the author:

http://www.comune.milano.it/wps/portal/ist/it/news/principiano/tutte_notizie/trasformazione_digitale_servizi/digitalizzazione_cittadella_degli_archivi



Figure 7. (left and right): some views of the final exhibits of students' works presented both in the Liceum hall, than into the gallery of some Istitution partners of the Alternanza Scuola – Lavoro: Acquario Civico, ISEC, ISAD, MuBa, Gallerie d'Italia Source: picture of the author (2017).

<https://www.liceoartisticodibreragov.it/comunicazioni/alternanza-scuola-lavoro/>

<http://www.liceoartisticodibreragov.it/esperienze-di-alternanza-scuola-lavoro/>

<http://www.liceoartisticodibreragov.it/didattica/alternanza-scuola-lavoro/>

http://www.liceoartisticodibreragov.it/circ235_1617-mostra-disseminare-alternanza-alternanza-spreading/

<http://www.liceoartisticodibreragov.it/didattica/alternanza-scuola-lavoro/alternanza-scuola-lavoro-progetto-careers-in-art/>

<http://www.liceoartisticodibreragov.it/acquario-civico-mostra-alternanza-liceo-brera-opening-2017-06-08-h-15/>

<http://www.liceoartisticodibreragov.it/inaugurazione-mostra-cercare-raccontare-progettare/>

5. An extraordinary case of study. "Arts & Science across Italy"

This specific national competition takes part to the concomitance "Alternating School Work" rules and it is part of a broad research path and now with valid methodological and institutional references that legitimize its experimentation: "Art & Science across Italy" is part of the European CREATIONS project of Horizon 2020 and is organized by the National Institute of Nuclear Physics and the CERN Experiment of CERN in Geneva. The project is aimed at high school students of the third and fourth year of Milan, Florence, Padua / Venice and Naples, and lasts for two years (2017-2018). In fact at CERN, since some years has triggered a broad discussion of mutual awareness and interest in quality view of knowledge, so not limited to the visual arts, but just the chance to try to understand and represent through every expression of the features arts invisible to reality that is the subject of scientific research. At a high level academic research, the Geneva-based research group ARTS@CERN has developed a series of collaborations inviting professional artists, on proposals of their projects through an international call, thus inviting a period of research and residence in contact with scientists and their work. The characteristics of these residential research art projects are among the most varied and have the intent of: *"..promoting the dialogue between artists and particle physics. It fosters the creation of new expert knowledge in the arts by extending artists' practice in connection with fundamental research.."*. At high school training level, the specific competition "Arts & Science Across Italy", is a specific initiative promoted by the CMS experiment, supported by a staff of experienced referents in

scientific communication through some Italian cities in which INFN is present with researchers and some experimental research centers and were organized presentation seminars, traveling exhibitions, visits to experiments, talks with scientists in schools. (About these initiative we can even quote a former first pioneristic project of this kind in Italy named "*Adotta scienza e Arte*": see in web references). A group of students of Artistic Liceum take so part also to this Institutional collaboration concerning the complex debate about visualization processes of Science. On one hand the binomial Art-Science can refer however to the objective datum of Nature and to the attempts of human intelligence engaged in the observation - direct or through the instrumental data - of the phenomena in the real world. On the other hand, the contiguity between Mathematics-Art deals with two conceptual universes, both originally abstract or intuitive, initially deriving (and only sometimes) the starting point from the real world, but moving forward and sublimating its elaborations towards a conceptual vision or a perceptive dimension. On other side the contiguity between Mathematics-Art deals with two conceptual universes, both originally abstract or intuitive, initially deriving (only sometimes) from the starting point of the real world, but moving and sublimating its elaborations towards a conceptual vision or a perceptive dimension. In both cases two different "characters" are matching: the disciplinary structure of the logical-formal reasoning remain essential at the basis of the theoretical or interpretative speculation, as for the artistic side it is fundamental the open the research to intuitive, symbolic and creative solutions. It is well known how the two logical and creative universes of human thought belong to two hemispheres - disciplinary and anatomical - specific and different, contiguous and synergic. Both constitute the founds of knowledge of the world and of oneself at work: in the act of observing, recognizing, naming and inventing.

6. Learning and teaching in the millenials digital era. Conclusions

An emphasis must be made on the fundamental support of teachers and tutors concerned at every level of all of these training experiences. In our transition era, after having gradually accompanied digital techniques between languages and intercommunication methods, they are also involved in the commitment to support the scenarios of innovations and discoveries that, thanks to these technologies, are making themselves available for research. If our generation of adults - researchers, teachers, parents - has crossed the threshold between one century and another, between analog and digital, now the generation of "millennials" is already digital and looks at the forms of thought of the twentieth century as a classicism to which you can inspire, in the same way with which it considers a design object - perceived for us as an originally innovative time - but considered today as "vintage". The metamorphic innovation of digital technologies, unfolds them with aptitudes of a resilient open mental openness.

At the same time these youngs are surrounded to a hypertrophic quantity of information that risks to complicate every possible decision. But in such a complex scenario their ability to connect past and future, images and words - far beyond the humanistic / scientific schemas of scholastic disciplines - appears as though they were merging multiple data synaptically from information platform, leaving us sometimes amazed and admired. Their "hi-tech skills" are probably more up-to-date than the adults around them, and it is hoped that in a forthcoming hypothetical 4.0 society they will be able to reinvent the professions that their parents could lose in a regenerative and responsible way, in automation processes, in a relationship that is already called "bottom-up": that is, in which young people can be able to train adults to use new technologies. Probably the most honest knowledge that we can participate with them is to share the rich awareness of the legacy of the past, to meet the scenarios of the unpredictable or explore the many forms of the unknown that is always before us.

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References & web references

- Bateson G. (1997), *Verso un'ecologia della mente*, Milano,
- Brunetti Federico, (2012) *Attraverso il Disegno. Relazioni tematiche, tracce metodologiche e atti didattici per l'architettura ed il design. Reprint with translations..* Milano.
- Ciappei C., M. Cinque (2014), *Soft skills per il governo dell'agire*, Milano,
- Cimatti B. (2016), *Definition, development, assessment of soft skills and their role for the quality of organizations and enterprises*, in: *International Journal for Quality Research*, 1, pp. 97-130.
- de Kerckhove D. (2008) *Dall'alfabeto a internet. L'homme «littéré»: alfabetizzazione, cultura, tecnologia*
- Edwards, B. (1979). *Drawing on the right side of the brain. A course in enhancing creativity and artistic confidence*. Los Angeles - New York, J. P. Tarcher;
- Golemand D. (2000), *Lavorare con intelligenza emotiva*, Milano,
- Kerejean A. (2003), *Le caractère plus importante que le CV*, Paris, Editions d'Organisation.
- Junco R.; Mastrodicasa J., (2007) *Connecting To The Net. Generation: What Higher Education Professionals Need To Know About Today's Students*, Washington, DC, NASPA,;
- Mayer G.D., Solowey P. (1997), *What is emotional intelligence?* In: P. Solowey, J. D. Sluyter (eds.), *Emotional development and emotional intelligence: Implications for educators*, New York, Basic Books, pp. 3-31.
- Notarbartolo D., Graffigna D. (2010), *Scrivere è ...* ; Grammatica Nuova, Firenze,

OMS (1993), *Skills for Life*, Geneve.

Prensky M., (2001) *Digital Natives, Digital Immigrants Part 1*, in *On the Horizon*.,

Vittadini G. (2016), in: Heckman J.J., Kautz T., *Formazione e valutazione del capitale umano*, pp. 7-24

Zendler Egon. (2011), *Encounters. Visionaries and Architects*

<https://www.sciencedirect.com/science/article/pii/S0747563215004008>

https://it.wikipedia.org/wiki/Generazione_Z https://it.wikipedia.org/wiki/Generazione_Y

<https://singularityhub.com/2018/01/30/nothing-cuts-through-complexity-like-visual-thinking/>

Iterative Design of a Gamified Course in High Education: deployment and evaluation

Baldeón, Johan^{ab}; Rodríguez, Inmaculada^b; Puig, Anna^b and Lopez-Sanchez, Maite^b

^aAvatar Group, Engineering Department, Pontificia Universidad Católica del Perú, Perú,

^bWAI Research Group, Department of Mathematics and Computer Science, IMUB and UBICS Research Institutes, University of Barcelona, Spain.

Abstract

During the last years, gamification has been used to engage students in more attractive educational activities in different Computer Science subjects at the university level, thereby improving their motivation and learning outcomes. This work continues a research that initially proposed a gamified design for the course “Distributed Artificial Intelligence”, an optional undergraduate course of the Computer Engineering degree. Specifically, we focused on reinforcing subjects related to Multi-Agent Systems (MAS) by means of fun hands-on activities to experiment theoretical concepts in practice. A first iteration of the design was deployed during two consecutive academic years, with good results in terms of students’ perceived learning, engagement and commitment during the class. Nevertheless, a posterior analysis of the design showed that the proposed mechanics did not consider some types of players - such as disruptors -, and some of the learning profiles - such as theoretical and reflexive -. Then, we proposed a card-based game to redesign the learning experience, using a LEarner-centered GAMification Design Framework (LEGA) that aligns both educational and gamification approaches. This paper focuses on this second iteration of the design, which has been deployed and evaluated during the last semester. The obtained results show that students liked the card game, were engaged and motivated during the gamified class, as well as they perceived an increased learning in the subject.

Keywords: Gamification; Teaching Multi-Agent Systems; MAS.

1. Introduction

Gamified classes are built upon fun and dynamic activities that make the learning experience lively and stimulating. Nevertheless, the design of such classes - that intend to boost students' involvement and go deep on conceptual subjects at the same time - is indeed a challenge for teachers.

Gamification should be a process carefully designed because of the inherent complexity of intervening elements (goals, users, context and resources, game elements, etc.). Much research work has studied the design of gamification, as a result several gamification design frameworks have been proposed such as the Gamification Model Canvas (GMC) (Escribano, Moretón, & Jiménez, 2016), the MDA (Mechanics, Dynamics, Aesthetics) (Hunicke, LeBlanc, & Zubek, 2004), DMC (Dynamics, Mechanics, Components) or others (Werbach, 2012; Marczewski, 2015). However, these frameworks are general guidelines for scaling up experiences in a wide range of fields such as business, events, or education. More concretely, in the education field, there are particular characteristics that should be taken into account: learning objectives, student profiles and the educational context (Kapp, 2013; Simões et al., 2013). Some more specific gamification frameworks have been proposed for the gamification of learning (Mora, Zaharias, González, & Arnedo-Moreno, 2015) (Sheldon, 2011) (Baldeón, Rodríguez, & Puig, 2016). Most of these frameworks conceive gamification as a spiral process consisting of several iterations that serve the purpose of design, validate and refine consecutive gamified solutions.

This work continues a previous research focused on the gamified design of a Multi-Agent System course in Computer Science degree from the University of Barcelona. Until now, we have performed two iterations of the gamification process. In the first iteration, we proposed several activities that revolved around the learning task of defining a market model (Baldeón, Lopez-Sanchez, Rodríguez, & Puig, 2016). Afterwards, and based on obtained results, we provided a second design of the gamification which extended the previous one incorporating new mechanics based on strategy cards. This extension takes into account students' learning and playing styles (Baldeón, Rodríguez, Puig, & Lopez-Sanchez, 2017). This paper concretely focuses on the deployment and evaluation of the card-based redesign.

2. Previous work

There is limited literature in the gamification of teaching and learning MAS. Melo et al. (2006) used a first-person shooter in the course curriculum of Autonomous Agents and Multi-Agent Systems, achieving highly motivated students. Fasli and Michalakopoulos (2005) integrated a simulation game in their graduate course on Agent Technology for E-

commerce to teach students the principles of electronic markets and strategic interaction. They achieved to engage and challenge students. Another work included role-playing games when teaching the content of a MAS, where players understood the basis, were motivated and had fun (Barreateau, 2001). Sakellariou, Kefalas, & Stamatopoulou (2008) utilized a multi-agent programmable modelling environment to increase active learning, where students enjoyed and their level of satisfaction increased. Soh (2004) introduced a game-based technique to his Multi-Agent Systems class in four game days, where students' teams competed against themselves in games related to MAS issues, achieving motivated and wise students. Aligned with previous experiences, our work aims to improve students' performance and compromise by means of the gamification of several theoretical and hands-on sessions.

3. Gamification design

We have followed the design process as stated in LEGA gamification framework. Briefly, LEGA defines five stages that guide teachers in the task of gamification for learning. Figure 1 gives relevant details of every stage in the second iteration of the design. This figure is self-contained regarding Stages 01, 02, and 03. However, stages 04 and 05 are more detailed in the next section.

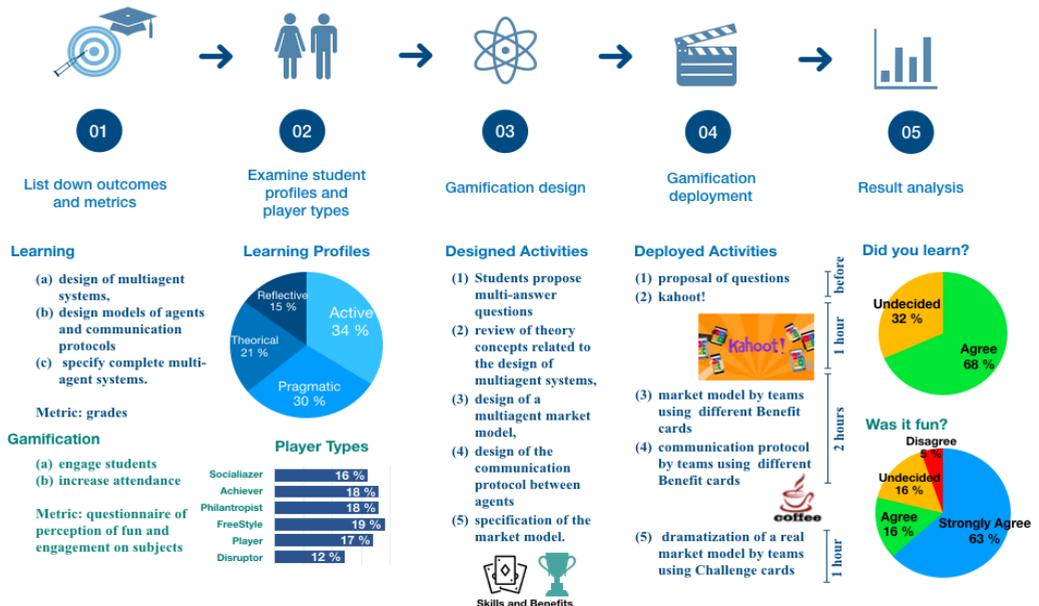


Figure 1. Gamification stages of MAS course using LEGA gamification framework. Source: authors (2018)

4. Gamification in practice

4.1 Deployment

The gamification was structured in two parts. In the first part, the teacher introduced the game to the students and explained the first task to be performed before starting the game: each student had to propose 2 multi-answer questions related to MAS concepts. The teacher selected 10 questions to be included in the Kahoot!¹(Activity 1). The card game started in the second part, planned as a 4-hour long class with a coffee break. Activities were focused on the design of a MAS market collaboratively. Concretely, the design of their market models (Activity 2), and design of interaction protocol between agents (Activity 3), and specify a complete market (Activity 4). Cards were being used by students i) to form groups to work on a type of market product (products deck), ii) to select market strategies (strategies deck), and iii) to develop some *Skills* and perform some *Challenges* in activities 2, 3 and 4. For instance, the *Spy* skill card allows the student to observe the work of other teams. The *Juglar* challenge card invites the student to recite in verse an oral exposition, and then win points. Note that we proposed Skills and Challenges cards in the re-design to contemplate different types of players - such as disruptors² - not considered in the previous design.

At the beginning, the teacher gave the students a personal scoreboard sheet to annotate rewards along the game. Students that proposed Kahoot! questions selected by the teacher received extra points. Then, students played the Kahoot!, updated their scoreboard with the obtained points, and the top 5 students in the Kahoot! ranking drew a card from the Skills deck. Additionally, a Challenge card was distributed to each participant.

After that, to favour the creation of (three) groups with students that usually don't work together, students should draw one card from the *Product* deck (Party, Dron and e-Book). The teaching staff formed pairs of students in each group. Once the couple was formed, they agreed who assumed the role of provider and who the role of buyer. Each role adopted a strategy, from among a set of three possible strategies using the *Strategy* deck (Imitation, Innovation, Reputation leadership for provider role, and Buy cheapest, Satisfy requests exactly, and Be loyal to the provider for buyer role).

The game continued through activities 2 and 3 by pairs. Before each activity, each player had to play all the cards that he/she wished to use during that activity. To make the design of the model and the protocol, players had a limited time to discuss and develop a proposal. When time ran out, each couple presented their design to their team. The rest of the team

¹ Kahoot! is a web-based system for developing interactive questionnaires, where students participate with their mobile phones

² Disruptors want to disrupt your system, to force positive or negative change.

voted each couple's argument using virtual coins, and the winning pair received extra points and drew a card from the deck of *Skills*.

The last activity was to specify a complete market (Activity 4) model by each team. Each team adopted the market model of the winning pair of their team on activities 2 and 3, and dramatized a possible execution of the complete market model. Before dramatization, all players played the Challenge cards in their hand that they wished to use. For each completed challenge during activity 4, students obtained some extra points. At the end of the session, each student had the opportunity to elaborate - at home - an individual improvement of the specification done in activity 4, by means of a video or blog, that was voted by the rest of the class. The game ended and the game-winner was the student with the highest number of points. At the end of the game, the results were added to the assessment of the student's progress in the subject. The top three ranked students obtained an additional point on the subject grade, an additional point in laboratory practice or a voucher for a correct question on the theory test. This mechanism was an extrinsic motivation to enhance student participation in the game.

4.2 Analysis of results

We conducted a survey to obtain data about students' perception of both learning and gamified dimensions. Related to learning, the gamified activities helped the students to become familiar and better understand the concepts of the subject (See Figure 2a, 68% and 32% of students thought that learned a lot and most, respectively). When the analysis is done by activities (Figure 2b), the three activities where the students perceived they learned the most were those related to market model design (where 28% of responses signalled Activities 2, 3 and 4), which are the activities where players used the cards of *Skills* and *Challenges*. The Activity 1, where they played Kahoot! shows moderate results in terms of perceived learning (14%). Nevertheless, students' opinions about how Activity 0, where they proposed Kahoot! questions, has impacted their learning is very low (2%).

Figure 3 shows results on the gamified dimension of the activities. In Q1, the majority of students (79%) would recommend attending gamified sessions to their classmates. Moreover, the students felt high commitment and motivation during the activities (Q2 and Q3, with 100% of responses between scales 3 and 5). When asked about attendance (Q4), 64% of respondent had a highly positive response.

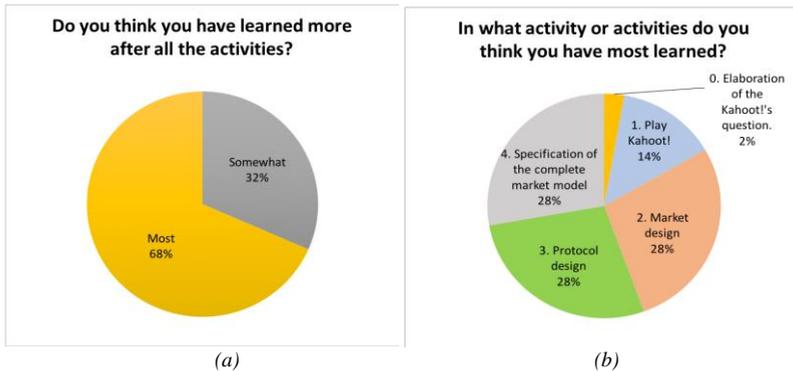


Figure 2. Students' perceived learning a) Overall perception b) By activity. Source: authors (2018).

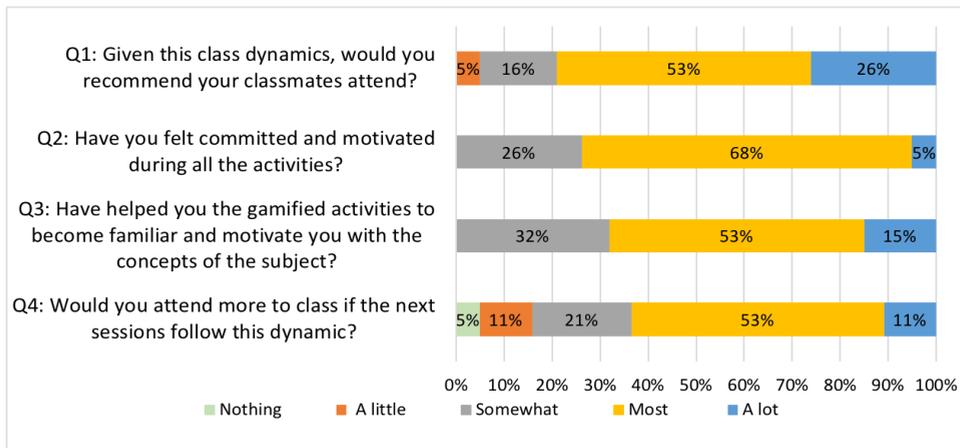


Figure 3. General results of the survey about the gamified sessions. Source: authors (2018).

The survey included several questions related to each activity. For the sake of limited space, we don't show results of Activities 0, 1, 2 and 3 in graphs, but briefly explain gathered opinions. In the Activity 0, the proposal of Kahoot! questions, students were little motivated. This may be because the activity was concretely designed for the learning styles reflector and theorist, and as there are other learning styles then the level of appreciation is scattered. However, almost all students liked the execution of Kahoot! In Activities 2 and 3, students worked on the market and the protocol design. They liked to work in groups and to share their proposals with other groups. However, a few students did not like to present their proposals to all the class, they did not feel good when presenting orally to the class.

Figure 4 shows survey detailed results related to Activity 4, the complete specification of the market model. Note that many students liked to compete in obtaining the best possible market model and presentation, but 21% of the class had a negative response because they probably do not meet with the profile of player that most like this kind of (competitive) mechanic. Moreover, 89% of students scored between 3 and 5 this question, then they

enjoyed the gamification dynamics performed as defining a theme and a narrative for their proposal presentation (Q6). However, for a few students, the dynamics of defining a subject and a narrative, as well as the act of competing and presenting their full market models were not of their interest (Q7). Some students did not pretend recognition or did not like the competition. We think these are students with a predominant philanthropic player style.

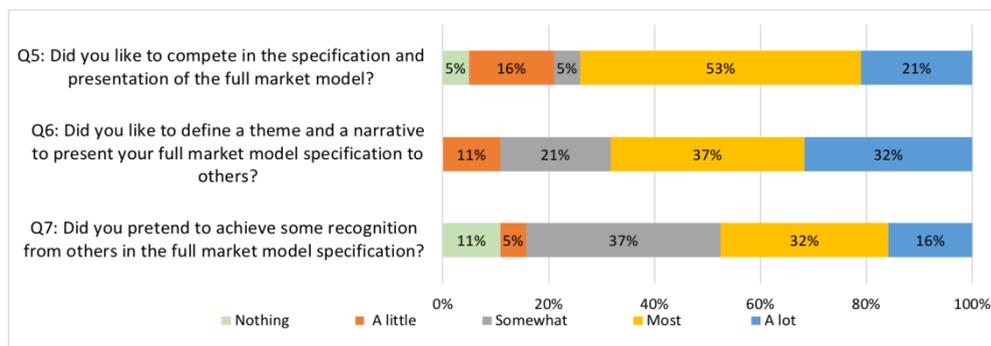


Figure 4. Survey about the full market model specification activity. Source: authors (2018).

When students were asked about the gamification elements such as the use of points, prizes and a leaderboard, only a few liked a little the use of these elements. This may be due to the fact that there were students that do not fit the “player” player style (motivated by rewards). Regarding the use of *Skill* cards, students enjoyed them, they highlighted their usefulness. However, some students indicated that the Skill card that they played did not give them an advantage because they considered that their cards only blocked the effect of another card without the opportunity to initiate some influence in the presentation of another group, or because there was no need to use it, or because the skill offered was not useful at all. Thus, we should balance and redefine Skill cards with negative appreciations. In the case of the Challenge cards, and due to the design of the session, only some of the cards were distributed, of which most were very well valued, nevertheless, for future editions of the gamification we think we should distribute more cards to students.

5. Conclusions

This paper focuses on the iterative design of a gamified class in Multi-Agent Systems subject of Computer Science degree. Concretely, we deploy and evaluate a second iteration of the design. In this second iteration, we propose a redesign - including activities and mechanics - for player and learner styles not considered in the first one. Students perceived that they had learned in almost all activities. They also enjoyed and feel committed during the class. Some cards have to be revised because they complained about their usefulness. Nevertheless, they ask for more quantity of others. In future academic years, we plan

review cards' design and test students' knowledge about MAS models before and after the gamified class.

References

- Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., de Freitas, S., Louchart, S., Suttie, N., Berta, R., & De Gloria, A. (2015). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, *46*(2), 391–411.
- Baldeón, J., López-Sánchez, M., Rodríguez, I., & Puig, A. (2016, May). Gamification of multi-agent systems theory classes. In *International Conference on Autonomous Agents and Multiagent Systems* (pp. 172-183). Springer, Cham.
- Baldeón, J., Rodríguez, I., & Puig, A. (2016, September). LEGA: a LEarner-centered GAMification design framework. In *Proceedings of the XVII International Conference on Human Computer Interaction* (p. 45). ACM.
- Baldeón, J., Rodríguez, I., Puig, A., & López-Sánchez, M. (2017). Evaluación y rediseño de una experiencia de gamificación en el aula basada en estilos de aprendizaje y tipos de jugador. In *Experiencias de gamificación en aulas* (pp. 95-111). InCom-UAB Publicacions, Institut de la Comunicació, Universitat Autònoma de Barcelona.
- Barreteau, O., Bousquet, F., & Attonaty, J. M. (2001). Role-playing games for opening the black box of multi-agent systems: method and lessons of its application to Senegal River Valley irrigated systems. *Journal of artificial societies and social simulation*, *4*(2), 5.
- Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD research*, *1*(1), 19.
- Escribano, F., Moretón J., & Jiménez, S. (2016, April 7) Gamification Model Canvas Framework Evolution. Retrieved February 1, 2018, from <http://gecon.es/gamification-model-canvas-framework-evolution-1>
- Fasli, M., & Michalakopoulos, M. (2005). Teaching e-markets through simulation games. In *AAMAS 2005 Teaching MAS Workshop*.
- Hunicke, R., LeBlanc, M., & Zubek, R. (2004, July). MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI* (Vol. 4, No. 1, pp. 1-5). AAAI Press San Jose, CA.
- Kapp, K. M. (2013) *The Gamification of Learning and Instruction Fieldbook: Ideas into practice*. San Francisco: John Wiley & Sons.
- Marczewski, A. C. (2015) *Even Ninja Monkeys Like to Play: Gamification, Game Thinking and Motivational Design*. CreateSpace Independent Publishing Platform.
- Melo, C. D., Prada, R., Raimundo, G., Pardal, J. P., Pinto, H. S., & Paiva, A. (2006). Mainstream games in the multi-agent classroom. *IEEE/WIC/ACM international conference on Intelligent Agent Technology* (pp. 757-761). IEEE Computer Society.
- Mora, A., Zaharias, P., González, C., & Arnedo-Moreno, J. (2015, December). FRAGGLE: A FRamework for AGile Gamification of Learning Experiences. In *International Conference on Games and Learning Alliance* (pp. 530-539). Springer, Cham.

- Sheldon, L. (2012). *The multiplayer classroom: designing coursework as a game*. Course Technology/Cengage Learning.
- Soh, L.-K. (2004). Using game days to teach a multiagent system class. In *Proceedings of the 35th SIGCSE technical symposium on Computer science education - SIGCSE '04* (Vol. 36, p. 219). New York, New York, USA: ACM Press.
- Simões, J., Redondo, R. D., & Vilas, A. F. (2013). A social gamification framework for a K-6 learning platform. *Computers in Human Behavior*, 29(2), 345-353.
- Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business*. Wharton Digital Press.

A New perspective to the Process of Education/Communication in the Era of Digital Technologies

Cury, Lucilene^a and Cesar Sousa, Paulo^b

^aUniversity of São Paulo, Brazil, ^bPostgraduate Program in Integration of Latin America, University of São Paulo, Brazil.

Abstract

This paper aims to discuss the challenges of higher education regarding the relationship between the university and the individual in the era of Information and Communication Technologies (ICTs). It proposes a new teaching-learning model that allows establishing an educational and transformative communication between university-student. Therefore, it is imperative to consider that technology by itself adds little to the construction of new knowledge and, in this sense, the university can wave towards the establishment of a new paradigm in the education-student relation. In order to justify this proposal, this paper will analyze how the course “Theory and Method of Research in Communication, taught in face-to-face format for the undergraduate students of the School of Communications and Arts of the University of São Paulo, will be converted into a distance-learning course. This conversion will contribute with the formation of new researchers in the scientific field and consequently with the democratization of knowledge. As it can be observed, the mass use of the e-learning modality in Brazil presents itself as a potential tool for consolidating this new teaching-learning model, when associated with the communication process.

Keywords: Education/ Communication; ICTs; teaching-learning model; participative-student; dialogue.

1. Introduction

The consolidation of digital technologies in recent decades has completely altered our relationship with the environment and the way we perceive our presence in the world. Because of the technological impact, the communication resources used in education are under constant modifications by this technological revolution, which has affected the teaching-learning process in the most varied areas of knowledge. The technology also allowed the university to expand its space beyond its physical limits. Up to this moment, considered as a modality of education distinct from the face-to-face format, distance education has proven its effectiveness in the educational system. In Brazil, the Distance Education 2016 Census showed that it is already possible to find a wide range of programs of different levels at most of the three hundred and forty educational institutions that participated in the research. This is fact turns evident the search for education to supply the new needs imposed by information and communication technologies (ICTs).

The impact of digital technologies on educational transformation is happening all over the world, as in the case of Complutense University of Madrid, which since 2014 has expanded beyond its physical walls by joining the production of MOOC (massive, open, online course) in the most varied areas of knowledge, in collaboration with other universities in Europe and the United States. The use of ICTs in Education can also be observed in Portugal, which has expanded access to higher education, especially through e-learning by the so-called Open Universities, as Tibiriçá (2015) observes. Although these repercussions are very positive, Peruvian sociologist Maria Teresa Quiroz draws attention to the fact that, even with all these changes brought about by the internet, classrooms still expresses the same educational practices focused on the transmission of knowledge. For her, the quality of education is not only about the use of technology, "but about thinking and attitude that allows a more flexible, personalized and ubiquitous school" (Quiroz, Maria Teresa, 2015). According to Aparici (2014), "methodological changes, which seeks for new pedagogical models, and interactive practices based on dialogue are issues that are beyond a certain technology or another." In this sense, despite all the technological apparatus available in our daily lives, education still makes use of the old pedagogy of transmission that treats the student as passive issuer in the communication process. Recognizing this, Prieto Castillo (2000) states that "communication in education goes far beyond the use of the means in teaching. We are interested in communication in the work of the educator, in the work of the student and in the means and materials used".

In view of these observations, it is evident that, even with the possibilities of using the current available technological apparatus, higher education continues to treat the student as a passive receiver within the communication process. It is, therefore, up to the higher education institutions to broaden the debate about the teaching-learning process in order to rethink the relations that are being established between student-university regarding the

possibilities of the use of technology. For this reason, it is necessary to intensify the search for new methods that allow the establishment of a new communication process based on the dialogue as proposed by Freire (1973), so that the model based solely on the transmission, be surpassed and reaches a new pedagogical conception, able to lead to understanding through new ways and languages of communication.

2. Reflections about the Process of Education/Communication

The present paper proposes to make a brief critical analysis of the communication process established between the individual and the university in the face of this new need imposed by digital technologies.

In the historiography of education both the concept of space and time are dichotomous. This is due the fact that space is an essential component for the existence of any activity, while its occupation is converted in the place where such action is or will be developed. Viñao Frago and Escolano (2001) stated that “where one learns and one teaches, is always a place, one creates a place. However, such a place may vary in time for the students and for the professor”, which corroborates for the place where the educational institution is operating also becomes part of the process of formation of the student. This happens because the teaching-learning process is changeable and follows the evolution of each era. In this sense, the space always communicates, shows how the humans being use it according to each culture and in this way, the dialogue between space and the individual can be perceived through the signs that are arranged in each place. In view of this, it is the duty of the educator to query the effectiveness of the current means used by the educational institution in the communication and teaching-learning processes.

Kaplún (2014) argues that education, in order to meet contemporary demands, must be able to activate the potentialities of self-learning and co-learning and stimulate the autonomous management of students in their learning to learn process. Thus, for such processes to advance, it is necessary for Education to develop tools capable of stimulating and motivating the students, transforming them into communicators, allowing them to develop self-expression and discover their abilities during the teaching-learning process. Hence, it is necessary that the digital literacy of our students, those included and excluded in cyberspace, as well as of our professors be considered in the discussion about access to ICTs as defended by Gutiérrez Martín Afonso (2014). Consequently, the development of this new method of literacy is one of the paths that can and must be pursued so that educational communication between higher education and the individual be established and that the collective intelligence be mobilized.

3. The Dialogical Relation as Advancement in the Teaching-learning Process

It is necessary to question the noises of communication between education and the student, since the traditional structure of education slowly follows the language used by the student is his/her daily life. In this sense, the school has the mission of adapting its space to the communicational necessity imposed by the digital culture. In the words of Nóvoa (2015), "it is necessary to rebuild a culture of debate and criticism marked by interaction, dialogue, joint reading our work, and for the capacity to engage in an intellectual conversation with others." Although this task is quite challenging, one cannot ignore the fact that education has adapted to the realities of each era, and has established itself throughout times as an institution that forms individuals. It is possible to observe that the university already moves towards the use of these new elements. However, in order to such actions allow educational institutions a fluent dialogue with the language of the student of our days, it is necessary to understand the differences between information, knowledge and wisdom as proposed by Cury (2012), when revisiting Morin's work. In distance education, for example, we can find elements that support or not the necessities of dialogue in this new scenario. In this sense, Covi Druetta (2014) draws attention to the fact that "despite theoretical, methodological and technological advances, modern networked-distance education systems do not always have a transformative and dialogic perspective of a learning network". Considering this demand, it is possible to observe that the programs offered through distance education in Brazil and the number of students they have attracted are quite expressive as the graphs obtained by the Distance Education

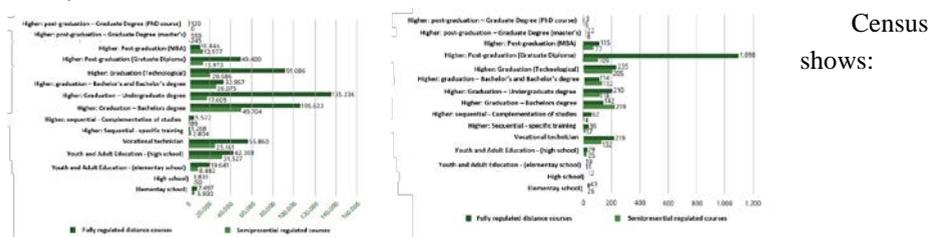


Figure 1. The graphics show, respectively, the numbers of enrolments and the programs offering in absolute numbers categorized by academic level. Source: Brazilian Association for Distance Education. (Org.). (2016). *Censo EAD.BR: analytic report of distance learning in Brazil 2016 [Digital version Adobe Reader]* (M. T. M. Abreu, Trad.). Recovered from http://abed.org.br/censoead2016/Censo_EAD_2016_portugues.pdf. [Translated by Maria Thereza Moss de Abreu].

Although such an educational modality makes use of instruments compatible with the digital era, these resources must be in harmony with pedagogical practices that make the student the protagonist of his own learning. Faced with this necessity, a proposal was made to adapt the course "Theory and Method of Research in Communication". Taught in a face-

to-face format for the undergraduate students of the School of Communications and Arts of the University of São Paulo, this course will be converted into a distance-learning course, which can broaden the training of researchers in the scientific field and, consequently, lead to knowledge democratization. In the face-to-face format, the course is offered annually in the first semester. It has a workload of 60 hours developed in the period of one semester (6 months), for an approximate number of 60 students. The course will be based on expository classes, readings and text reports, teamwork, advising inside and outside the classroom, preparation and execution of a collective research project. The teaching work will be done alongside master's degree and PhD students, who, in addition to in-depth seminars on topics developed in class and other didactic activities, will provide fundamental support by accompanying the educational process. To meet the proposed learning objectives, the contents are divided as follows: Class 1: Presentation of the course and indication of the changings to begin the process of teaching / learning of scientific research. Class 2: Discussion of the main points of the movement, with notes towards the deep phases of the process. Class 3: The classic science –René Descartes. Class 4: The epistemology of complex thinking – Edgar Morin. Class 5: The question of the research problem – Karl Popper. Class 6: Present examples of research problems to orient students on choosing their topics as well as its respective problems. Class 7: The definition of the research topics and problems chosen, as well as their demarcation, in order to verify their research viability. Class 8: The phases and stages of a research project - Lucilene Cury. Class 9: Starting to design the project. Class 10: Finalization and presentation of projects. In order to meet the proposed pedagogical purposes, the course, which is offered as a sixty-hour in-person course will be divided into two modules in the e-learning format, being one module theoretical and the other practical, with 10 lessons each in a period up to 12 months. The structure planned for the course is displayed in the figure below:

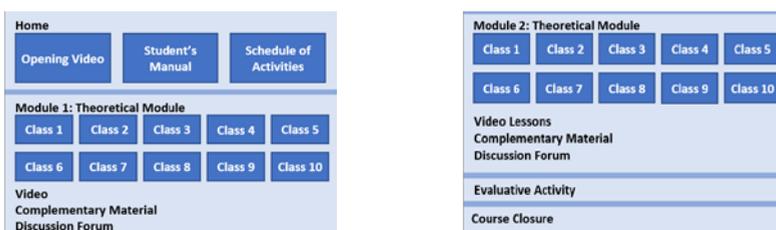


Figure 2. Structure of the course *Theory and Method of Research in Communication* for the e-learning format. Source: Cury, L., Sousa, P. C., & Kudeken, V. S. S. (2017). *Proposta de Curso na Modalidade Ead - Introdução à Pesquisa Científica a partir da Disciplina Teoria e Método de Pesquisa em Comunicação da ECA/USP*. doi: 10.17143/ciaed/XXIIICIAED.2017.00420

As can be seen in figure 2 above, the student can make use of different learning resources to obtain appropriate knowledge. For this to be possible, there will be used the Active Methodology so that the educational instruments adapt to the needs of the student and not the opposite as happens in the transmitting education model. Thus, the role of the teacher in this model will be to mediate knowledge, while the student will be in the center of the process. Such method should allow a greater engagement and stimulation of the students' criticism and reflection turning them into the protagonists and managers of their own learning process. As argued in this article, dialogic communication, decentralized and participatory, is an essential element to make the student an active member in the construction of knowledge. In order to make this process viable, the modules will be organized in a way that instigates the students to be motivated and participative, as well as the appropriation of knowledge through the module. In this sense, the innovation that is proposed is focused on the best performance of the tools used, which, along with the absolutely updated and consistent content, will guarantee the quality of the course in the distance modality, as it is practiced in the face-to-face modality. Through the instructional design, the theoretical module will adapt the content in images, short videos, podcasts, infographics, symbols, among other materials, in order to facilitate the understanding of the information by the students' different ways of learning. In order to go deep into the relevant themes of the program, videotapes will be recorded in different modalities such as video-animation and video-interviews with expert professors. Additionally complementary material will be provided such as scientific articles that will allow students to make new discoveries regarding the subjects studied. The discussion forum will be the place where the student will be encouraged to engage in the debates that will be promoted on previously studied topics; to share their experiences and doubts; to get closer to the other participants; and the space in which the advising will be carried out. Finally, the evaluation of the student will be formative. Attention will be given to the navigability of the digital platform, to the student participation in debates promoted in the discussion forums and to their performance in the assessment activity. This activity will consist of a research project on a theme to be defined, which will be handed out by the student at the end of the practical module in order to evaluate how was the student's appropriation of the knowledge during the program. As for the performance assessment and effectiveness of the course, from the first edition of the course it will already be possible to compare the results with the face-to-face course performance. For the distance learning course the following indicators are proposed: navigation in the Moodle Platform, in order not to compromise the student's activity time of correctly work in the Virtual Learning Environment otherwise it could negatively affect the content comprehension; the student-professor relationship, through the discussion forum, should be able to stimulate dialogue, similar to the face-to-face contact and education. Finally, the analysis of the results of these two components of the teaching-learning process in the distance education must necessarily be compared with the good

performance of students in face-to-face education, in which there are dialogue and active participation of the students.

We agree with the reflections of Prieto Castilho (2000) and Nóvoa (2015) on communication in education and the need to rebuild the culture of debate and criticism. As observed, the diversity of ways of learning, made possible by ICTs, and its alignment with the proposed methodology will enable students from different learning styles to process information into knowledge in a participatory, dialogic and transformative way. Given this perspective, it is considered that teaching methods that allow the establishment of educational, dialogical and plural communication between educational institution and student, plus the learning objects that will compose the program, and that such objects are very close to the ordinary media consumed by the student in the digital world, it will allow the student to participate in the teaching-learning process in the same he/she uses ICT in his/her daily life. This fact will give new meanings to the concept of higher education and will expand the opportunities for knowledge generation in the general society.

4. The Challenges of Education in the Digital Era

Based on the reflections and the experience that we presented here, it is up to higher education and education as a whole to develop new practices that are not only aligned with the digital means. More important is to think on methodologies that stimulate mechanisms of self-learning and teamwork and finally abandoning the pedagogy of transmission, a challenge that should be achieved through the establishment of effective dialogue between teachers and students. Such need arises because the current virtual connects people with each other all the time, in a way that school activities in close spaces and oriented towards educational action, are themselves already part of the internet, therefore in the context of cyberspace. As a result, it is necessary that the content of higher education courses receive new meanings so students will be able to integrate in his/her learning process the elements that he/she uses in the digital environment in his/her daily life. This will stimulate the increase of the bond student-university, and it will be tool to prevent dropouts in higher education.

5. Final Considerations

The reflections presented in this paper seek to articulate a new method of teaching and learning in order to understand the contemporary demand imposed by ICTs' emersion. In order for this perspective to become possible, higher education needs to discover new forms of dialogues and to establish an educational communication with its students since through this practice it will be possible to abandon the pedagogy of transmission and adopt a plural

model, consistent with the changes experienced by society. In this sense, the university can and must emphasize the establishment of a new paradigm in the education-student relationship, that of participation, emphasizing collaborative work among all parts, in a horizontal format. Thus in this format, the role of the teacher is to be the driver of the process not the instructor who defines an outdated model of education, provoking lack of motivation and copy of repetitive data, which is valueless to the true purpose that Education should have. It is about working with communication in your favor, in a true Communication / Education binomial. Furthermore, the possibility of using this model in the e-learning modality, presents itself as an important tool for the consolidation of this new proposed model, increasing the number of students who will use it and hence leading to a real democratization of education. Therefore, is for the university to perceive these possibilities for the application of new practices that will allow an effective relationship with the individual, so that the education/ communication process become a reality in a short-term.

References

- Aparici, R. (Org.). (2014). *Educomunicação: para além do 2.0*. São Paulo, SP: Paulinas.
- Associação Brasileira de Educação a Distância. (Org.). (2016). *Censo EAD.BR: relatório analítico da aprendizagem a distância no Brasil 2016 = Censo EAD.BR: analytic report of distance learning in Brazil 2016* [Versão digital Adobe Reader] (M. T. M. Abreu, Trad.). Recuperado de http://abed.org.br/censoead2016/Censo_EAD_2016_portugues.pdf. [M. T. M. Abreu, Trad.].
- Crovi Druetta, D. (2014). A trama reticular da educação. In R. Aparici (Org.). *Educomunicação: para além do 2.0*. (L. M. Reis, Trad.). São Paulo, SP: Paulinas.
- Cury, L. Revistando Morin, *Comunicação & Educação Revista do Departamento de Comunicações e Artes da Eca/USP* 17(1), 39-37. doi: <http://dx.doi.org/10.11606/issn.2316-9125.v17i1p39-47>
- Cury, L., Sousa, P. C., & Kudeken, V. S. S, (2017). *Proposta de Curso na Modalidade Ead - Introdução à Pesquisa Científica a partir da Disciplina Teoria e Método de Pesquisa em Comunicação da ECA/USP*. doi: 10.17143/ciaed/XXIII CIAED.2017.00420
- Frago, A. V., & Escolano, A. (2001). *Currículo, espaço e subjetividade: a arquitetura como programa*. Rio de Janeiro, RJ: DP&A.
- Freire, P. (1973). *¿Extension o comunicación?. La conscientización en el medio rural*. Buenos Aires, Siglo XXI, 1973.
- Gutiérrez A. M. (2014). Criação multimídia e alfabetização na era digital. In R. Aparici (Org.) *Educomunicação: para além do 2.0*. (L. M. Reis, Trad.). São Paulo, SP: Paulinas.
- KAPLÚN M. (2014). Uma pedagogia da comunicação. In R. Aparici (Org.). *Educomunicação: para além do 2.0*. (L. M. Reis, Trad.). São Paulo, SP: Paulinas.

- Nóvoa, A. (2015). Em busca de liberdade nas universidades: para que serve a pesquisa em Educação?. *Educação e Pesquisa*, 41(1), 263-277, doi: <http://dx.doi.org/10.1590/S1517-97022015400100301>.
- Prieto, D. C. (2000). *Comunicación, universidad, y desarrollo*. Buenos Aires, Argentina: Plangeco.
- Quiroz-Velasco, María-Teresa (2015). Aprendizagens na era digital [recurso electrónico] : dentro e fora da escola. *Comunicação & educação*, 20(1), 63-70, doi: <http://dx.doi.org/10.11606/issn.2316-9125.v20i1p63-70>.
- Tibiriçá, Cleonildi. (2015). *Por uma reinvenção do diálogo na educação*. Tese de doutorado, Universidade de São Paulo, São Paulo, SP, Brasil. Recuperado de <http://www.teses.usp.br/teses/disponiveis/27/27154/tde-26062015-155843/pt-br.php>.

Preparing Effective Literacy Educators Through Professional Development

Massey, Ingrid Ahrens and Thompson, Tobi Fillman

College of Education, Northeastern State University, United States of America.

Abstract

Since changes to the reading/language arts Oklahoma Subject Area Test (OSAT) in late 2010, elementary education teacher candidates at a teacher training college in the Southern United States have experienced declining scores resulting in test failure and delaying student teaching and graduation. The purpose of this case study was to identify factors that students and faculty perceived as most beneficial in preparing students to pass the OSAT. Constructivism served as the conceptual framework for this study addressing the effects of collaboration, hands-on learning, and application of knowledge. Purposeful sampling was used to recruit 6 elementary education students who had taken the OSAT and 4 full-time reading and language arts faculty members who participated in semistructured interviews. Analysis of coded data indicated themes of preference for experiential learning, intensive strategy instruction, and a review of tested content. Based on study findings, a 3-day professional development training was created to provide students a review of tested subject matter through embedded strategy instruction and opportunities for hands-on application of learning.

Keywords: *Teacher preparation, professional development, teacher training, elementary education, Oklahoma Subject Area Test, United States.*

1. Introduction

Graduating competent, qualified teachers is a goal worldwide (Bransford, Darling-Hammond, & LePage, 2005). Northeastern State University (NSU), situated in the northeastern corner of Oklahoma, is no different. Rich in local history and tradition, NSU strives to produce top performing teachers and is known for graduating more teacher candidates than any other institution in the state (Agnew, 2009). However, since 2011, NSU's college of education has experienced a declining pass rate on one of the three required exams necessary for teacher candidates to graduate and be certified to teach in the state. Declining pass rates on the reading/language arts Oklahoma Subject Area Test (OSAT) for elementary education majors posed a problem at NSU. In November of 2010, 69% of NSU students passed compared to 68% of students statewide. The 2011-2012 academic year data revealed a cumulative pass rate of 34% locally, compared with a 37% pass rate statewide (certification officer, NSU College of Education, personal communication, September 27, 2012).

The goal of NSU's elementary education program is to increase student scores and, ultimately, the rate of passing to save its teacher candidates both time and money, while maintaining a program that prepares teachers of the highest quality. The OSAT must be passed before NSU students can continue to their final internship and to graduation. Delays in passing this required exam delay graduation for NSU's teacher candidates that further delays them from entering the workforce and impacting the lives of the students they will teach. This delay in graduating highly qualified teachers ultimately affects preschool through 12th grade (P-12) schools across the state as fewer new teachers are entering the profession.

The Oklahoma State Regents for Higher Education recently announced a critical teacher shortage in 10 areas including elementary education (OSRHE, 2013). Discouraged students left in a holding pattern, waiting to intern until they pass this single test, left NSU's teacher education program out of necessity to find a source of income, which results in further teacher shortages. Other programs across the state allow their candidates to complete their full internship and graduate, but leave their graduates unemployable because they have not achieved the certification requirement from the state.

The purpose of this study was to identify factors that may have contributed to the decline in the rate of passing as well as those factors that contributed to success from the perspectives of NSU's elementary education teacher candidates and reading and language arts faculty members. If these factors went unidentified, and NSU's elementary education teacher candidates continued to perform unsatisfactorily on the OSAT for reading and language arts, NSU was at risk of losing its accreditation from the National Council for Accreditation of Teacher Education (NCATE) and, eventually, its elementary education

program. However, the effect it would have on NSU's teacher candidates and their future students was the greatest threat. In an effort to identify contributing factors, data were collected from reading and language arts faculty members as well as teacher candidates who had already achieved this benchmark. Surveying teacher candidates who had taken the OSAT to identify factors that helped better prepare them, and interviewing faculty members about how they prepared students for the test in their courses, revealed practices that proved beneficial in better preparing future students for successful completion of the test.

2. The Literature

Professional development (PD) has a longstanding presence in education and the ongoing learning among teaching professionals. Research indicated that effective PD attended by preservice teachers lead to higher quality teaching and a greater commitment to the profession (Han, Hu, & Li, 2013). In recent years, traditional modes of PD, including workshops and conferences, have been reported as being ineffective and lacking the qualities needed to not only increase teacher knowledge but to sustain that learning toward professional growth (Bayar, 2014). Years of research have shown a direct link between student achievement and teacher quality while other research has revealed many teacher preparation programs fail to adequately prepare teacher candidates for their future classrooms (Bayar, 2014). Resulting from federal initiatives including No Child Left Behind (NCLB), professional educators have felt the push from standards-based reform emphasizing "improved teaching as the best path to increased learning and improved student performance" and have subsequently been required to participate in additional professional development activities (Wallace, 2014, p. 11).

Although vast differences exist in teaching across subjects and grades, whether urban or rural, some similarities remain when identifying components of effective professional development. Effective PD in the arts, vocational education, and elementary and high schools includes components of collaboration and active learning (Abilock, Harada, & Fontichiaro, 2013; Shoulders & Myers, 2014; Stanley, Snell, & Edgar, 2014; Wallace, 2014). Mishkind (2014) found duration as the key factor in evidence-based professional learning, while Darling-Hammond and Richardson (2009) identified content, context, and design as the characteristics of effective professional development. The use of peer reviews and observations to inform PD decisions has also proved to be beneficial in improving teaching practices (Drew & Klopper, 2014). Furthermore, researchers at the Florida Center for Reading Research found that one component of effective PD included the use of student outcome data to "establish priorities for adult learning, to monitor progress or growth in teacher skills, and to sustain continuous improvement" (Torgesen, Meadows, & Howard, 2006, para. 1).

The National Center for Education Statistics (NCES, 2009) reported having a class with an effective teacher increased student achievement drastically and was more beneficial than limiting class size. Rivkin, Hanushek, and Kain (2005) suggested the single greatest impact on student achievement is not class size, funding, or the grade a school receives on local or state report cards, but the effectiveness of the teacher in the classroom. However, according to the National Council on Teacher Quality (NCTQ, 2011), 72% of states in the union fall well below the norm in the amount of content knowledge required to achieve state certification, with Arkansas, Oklahoma, and Iowa ranked at the second percentile. Furthermore, NCTQ (2011) reported that only nine states adequately test their teacher candidates' knowledge of reading content and methods and the essential elements of reading instruction. This evidence fails to support expert opinions that greater content knowledge and advanced subject matter degrees positively impact student learning (Beare, Marshall, Torgerson, Tracz, & Chiero, 2012).

The need for effective teachers has never been greater than it is today. Nationally, reading and math scores among fourth and eighth graders have stagnated over the past decade and have shown only slight gains in scores in less than one fourth of the United States since 2009 (NCES, 2011). Data indicated that the lowest performing subgroups continue to be minority groups including Native American Indians, Hispanics, and African Americans as well as those from lower earning families who qualify for free or reduced price school lunches (NCES, 2011). There continues to be an achievement gap, especially in reading and mathematics, between White and non-White students as well as those considered limited English proficient and the need for highly qualified teachers is a priority (Rojas-LeBouef & Slate, 2012).

Statistics show a direct correlation between teaching quality and student achievement. Researchers suggest that higher qualified teachers, those with National Board Certification and value added or advanced degrees, were less likely to teach in schools with a high minority population or an increased number of economically disadvantaged students (Berry, Daughtrey, & Wieder, 2010). Conversely, the greatest portion of alternatively certified teachers or those teaching on an emergency license were found in urban and poor rural districts with high percentages of minority and disadvantaged students (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005). In California, one in seven teachers was considered under qualified or undercertified, and those classrooms were staffed by teachers who held emergency credentials or were in the process of receiving some type of teacher training, whether traditional or alternative training (Howard, 2003). Although many states suffer from teacher shortages, it is predominantly districts in urban areas or schools whose students are considered to be at-risk or underserved that are most difficult to staff. These schools suffer more from teacher attrition and retention problems than schools with a higher socioeconomic status enrollment (Howard, 2003).

3. Methodology

In an effort to identify the information proposed, a case study approach was taken. Traditionally, case study research is employed in an attempt to define “what is known based on careful analysis of multiple sources of information” (Hancock & Algozzine, 2006, p. 10). An in-depth study, including interviews from multiple participants, aimed to reveal the perceptions of both students and reading and language arts faculty regarding practices and procedures in and out of the classroom that best prepare students to successfully complete the OSAT.

Addressing the problem using a case study design resulted in the fleshing out of specific aspects that are present in NSU’s teacher preparation program that best prepared students to pass the OSAT. Participants also identified aspects they felt might be missing that are keeping candidates from passing on their first attempt. This information could only be extracted from qualitative data gathered through individual interviews with both faculty and students. The use of open-ended questions ensured the participants could elaborate on any of the questions and were not led in any particular direction that may have skewed the results of the study. Interview questions were directly aligned with the guiding research questions to help focus specifically on the problem and identify potential solutions.

4. Summary of the Findings

As anticipated, a match existed between teacher preparation methods, subject area knowledge, and pedagogical knowledge and a candidate’s later effectiveness in the classroom. Research findings also revealed that reading and language arts instructors who provided opportunities for enhanced or additional field experiences and application based projects in the classroom yielded students who performed higher on the OSAT. Student findings, from those who successfully completed the reading/language arts OSAT, indicated that students who conducted a thorough review of the subject matter prior to taking the test, along with those application based projects in the classroom, felt more prepared for success on the OSAT. Reading and language arts course work could span a candidate’s professional education over a period of two to four semesters, at minimum, resulting in some regression of foundational subject matter. Additional findings indicated that the most successful students were those who conducted some manner of subject area review upon completion of all course work and prior to taking the OSAT.

The findings revealed several specific activities and assignments teacher candidates believed were most beneficial in preparing them for successful completion of the OSAT subtest 1 (reading/language arts). One common recommendation among student participants was to take the OSAT subtest 1 as soon after completion of all required reading

and language arts courses as possible so the content and strategies would still be fresh. This recommendation was the initial driving force behind the decision to design a PD plan that offers a review of the tested content in a way that involves the participants with hands-on activities and includes opportunities to apply the information while thinking critically about subject matter, proposed problems, and logical solutions (Dixon, Yssel, McConnell, & Hardin, 2014).

A 3-day PD project was designed to focus on content knowledge and involve active learning. This design not only provides participants with the subject matter review they need but also equips them with tools and strategies that will better prepare them for their future classrooms. Many designs for PD exist, but recently the focus has moved away from the passive, workshop approach to one with more opportunities for active engagement, critical thinking, and practical application (Yamauchi, Im, & Mark, 2013).

5. Conclusion

This case study set out to identify the perceived aspects inherent in NSU's elementary education teacher preparation program that best equips candidates with the skills and dispositions necessary to pass the OSAT subtest 1. Interviews with faculty and students confirmed beliefs that a constructivist approach to teaching and learning was preferred and that offering students multiple opportunities to apply their learning through hands-on engagement, both in the classroom and in the field, helped in constructing meaningful connections between theory and practice. The development of a PD plan that incorporates many of the elements that participants identified as beneficial will serve as a rigorous review of reading and language arts content. Furthermore, embedding many effective instructional strategies into the review provides opportunities for participants to experience how beneficial the strategies can be in better understanding content. These known strategies can become part of the future teachers' repertoires and, subsequently, can be applied in their classrooms with their students when they enter the teaching profession. Preparing highly qualified teachers who possess in-depth subject matter knowledge, understand effective pedagogy, and utilize best practices in teaching reading and language arts has the potential to positively impact students' academic achievement across the state for generations to come.

References

- Abilock, D., Harada, V., & Fontichiaro, K. (2013). Growing schools: Effective professional development. *Teacher Librarian*, 41(1), 8-13. Retrieved from <http://kurdylapublishing.com/2011/11/teacher-librarian-the-journal-for-school-library-professionals/>
- Agnew, B. (2009). *Roots from the Cherokees: Promises for our future*. Tulsa, OK: Mullerhaus.
- Bayar, A. (2014). The components of effective professional development activities in terms of teachers' perspective. *International Online Journal of Educational Sciences*, 6(2), 319-327. doi:10.15345/iojes.2014.02.006
- Beare, P., Marshall, J., Torgerson, C., Tracz, S., & Chiero, R. (2012). Toward a culture of evidence: Factors affecting survey assessment of teacher preparation. *Teacher Education Quarterly*, 39(1), 159-173. Retrieved from <http://www.teqjournal.org/>
- Berry, B., Daughtrey, A., & Wieder, A. (2010, March). Teacher effectiveness: The conditions that matter most and a look to the future. *Center for Teaching Quality*, 1-20. Retrieved from <http://www.teachingquality.org>
- Bransford, J., Darling-Hammond, L., & LePage, P. (2005). Introduction. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world* (pp. 1-39). San Francisco, CA: Jossey-Bass.
- Darling-Hammond, L., Holtzman, D. J., Gatlin, S. J., & Heilig, J. V. (2005). Does teacher preparation matter? Evidence about teacher certification, Teach for America, and teacher effectiveness. *Education Policy Analysis Archives*, 13(42), 1-24. Retrieved from <http://epaa.asu.edu>
- Darling-Hammond, L., & Richardson, N. (2009). Teacher learning: What matters? *Educational Leadership*, 66(5), 46-53. Retrieved from <http://www.ascd.org/Default.aspx>
- Dixon, F. A., Yssel, N., McConnell, J. M., & Hardin, T. (2014). Differentiated instruction, professional development, and teacher efficacy. *Journal for the Education of the Gifted*, 37(2), 111-127. Retrieved from <http://jeg.sagepub.com>
- Drew, S., & Klopper, C. (2014). Evaluating faculty pedagogic practices to inform strategic academic professional development: A case of cases. *Higher Education*, 67, 349-367. doi:10.1007/s10734-013-9657-1
- Han, Y., Hu, M., & Li, L. (2013). Formative evaluation of the no-fee teacher education program from the students' standpoint. *Chinese Education Society*, 46(2-3), 100-118. doi:10.2753/CED1061-1932460207
- Hancock, D. R., & Algozzine, B. (2006). *Doing case study research: A practical guide for beginning researchers*. New York, NY: Teachers College Press.
- Howard, T. C. (2003). Who receives the short end of the shortage: Implications of the U.S. teacher shortage on urban schools. *Journal of Curriculum & Supervision*, 18(2), 142-161. Retrieved from <http://www.ascd.org/publications/jcs/archived-issues.aspx>
- Mishkind, A. (2014). *Evidence-based professional learning*. Research brief no. 11. California Department of Education. Retrieved from <http://calpro-online.org/>

- National Center for Education Statistics (2009). *Highlights from TIMSS 2007: Mathematics and science achievement of U.S. fourth- and eighth-grade students in an international context*. Institute of Education Sciences, U. S. Department of Education, Washington, DC.
- National Council on Teacher Quality (2011). *2011 state teacher policy yearbook: National summary*. Retrieved from <http://www.eric.ed.gov/PDFS/ED528825.pdf>
- Oklahoma State Regents for Higher Education (2013). *Future teachers' scholarships*. Retrieved from https://secure.okcollegestart.org/Financial_Aid_Planning/Scholarships/Career_Scholarships/Future_Teachers_Scholarship_Program.aspx
- Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, 73(2), 417-458. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0262.2005.00584.x/abstract>
- Rojas-LeBouef, A., & Slate, R. (2012). The achievement gap between White and non-White students. *International Journal of Educational Leadership Preparation*, 7(1). Retrieved from <http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=EJ971502>
- Shoulders, C. W., & Myers, B. E. (2014). Effective professional development in agriscience education: An examination of core features. *Journal of Agricultural Education*, 55(1), 167-185. Retrieved from <http://www.jae-online.org>
- Stanley, A. M., Snell, A., & Edgar, S. (2014). Collaboration as effective music professional development: Success stories from the field. *Journal of Music Teacher Education*, 24(1). doi:10.1177/1057083713502731
- Torgesen, J., Meadows, J. G., & Howard, P. (2006). *Using student outcome data to help guide professional development and teacher support: Issues for Reading First and K-12 reading plans*. Tallahassee, FL: Florida Center for Reading Research.
- Wallace, T. (2014). A comparison of professional development practices in rural and urban high schools. *Rural Educator*, 35(2), 11-16. Retrieved from <http://epubs.library.msstate.edu/index.php/ruraleducator/article/view/125>
- Yamauchi, L. A., Im, S., & Mark, L. (2013). The influence of professional development on educators' instructional conversations in preschool classrooms. *Journal of Early Childhood Teacher Education*, 34(2), 140-153. doi:10.1080/10901027.2013.787476

Making It: Institutionalizing Collaborative Innovation in Public Higher Education

McCarthy, Seán^a; Barnes, Audrey^b; Holland, S. Keith^c; Lewis, Erica^d; Ludwig, Patrice^e; Swayne, Nick^f

^aSchool of Writing, Rhetoric & Technical Communication, James Madison University, USA, ^bSchool of Art, Design, and Art History, James Madison University, USA, ^cDepartment of Engineering, James Madison University, USA, ^dSchool of Nursing, James Madison University, USA, ^eDepartment of Biology, James Madison University, USA, ^f4-VA, James Madison University, USA.

Abstract

This descriptive case study provides a broad overview of JMU X-Labs, an academic maker space (in other words, a teaching lab with fabrication and digital production technologies) that hosts team-taught, project-driven multidisciplinary courses. The JMU X-Labs serves the students and faculty of James Madison University, a mid-sized, public, and undergraduate-focused university in the United States. The narrative proceeds from two different but overlapping points of view: how courses at JMU X-Labs are designed and taught; and how administration of JMU X-Labs supports them. The authors refer to specific courses, pedagogical methods, and problem-solving strategies to illustrate the narrative, and they argue throughout that pedagogy and administration are indelibly intertwined in how the organization operates. Gesturing to the broad applicability and transferability of the JMU X-Labs model, the authors mark some of areas of further research that would benefit a more robust understanding of how the organization operates and grows. Finally, the authors speculate how the dynamics of this young and growing organization may answer some core and difficult questions pertaining to innovation in higher education.

Keywords: *Innovation; Learning for Employment; Maker Spaces; Pedagogy; Multidisciplinary; Educational Strategies*

1. Introduction

On the first day of class at JMU X-Labs, Jamie didn't quite know what to expect. She had heard from other students that the course she had signed up for, "The Virginia Drones Project," offered practical experience working with unmanned aerial vehicles. The subject matter seemed exciting, and this kind of course was difficult to come by elsewhere on campus. With little-to-no expertise in the area, however, and not recognizing many faces around the room, Jamie felt anxious. A biology major, she had previously worked with one of the faculty members (albeit, in a different context: an advanced ecology course) who recommended she take this experimental class. Seeing him there helped her feel more at ease.

Although he didn't show it, Jamie's professor, Paul, was also nervous. It was his first time teaching in this space, and his first time co-teaching with faculty from other disciplines. He was used to working in labs, but this place was different. A former TV station situated on the edge of campus, JMU X-Labs comprised a series of connected, open-plan spaces that converged around a double-height room with a large garage door. Short-throw projectors beamed onto three walls, and a telepresence robot sat charging in the corner. Scribbled-on whiteboards on wheels were scattered throughout this main space, and a large yellow cart stuffed with what looked like kids' arts and crafts supplies took up one corner. In the space to the left of the garage door, a handful of unrecognizable, yet expensive looking machines flanked the walls. The sound of 3D printers working hummed in the background.

The above scene synthesizes the experiences of a student and a faculty member who have worked at JMU X-Labs, a shared academic maker space, which is an educational laboratory equipped with fabrication and digital technologies (Ludwig, Nagel, & Lewis, 2017). Located in James Madison University (JMU), an undergraduate-focused, public university in Virginia, JMU X-Labs has become a recognized hub of innovation and multidisciplinary teaching and research on its home campus, and it has begun to attract state and even national recognition for its commitment to forward-thinking undergraduate-focused education. This short, descriptive case study will provide a broad overview of JMU X-Labs from two different but overlapping perspectives: how courses at JMU X-Labs are designed and taught, and how the JMU X-Labs administration supports those classes. Combined, these viewpoints will provide a sketch of an on-campus organization that is successfully fostering a culture of innovation in a mid-sized, public, and undergraduate-focused university in the United States (US).

2. Teaching and Pedagogy at JMU X-Labs

Established in 2013, JMU X-Labs developed out of a process of trial and error and has grown considerably during that period. The authors (faculty and administrators who have taught and steered the direction of JMU X-Labs over the past four years) have all contributed their expertise to a variety of programming at JMU X-Labs, most notably the multidisciplinary and problem-based learning courses that form the core enterprise of the organization. In this course model, a multidisciplinary group of faculty designs and delivers a course to students from across the disciplines who develop solutions to complex societal, technological, or environmental issues, often referred to by design theorists as “wicked problems” (Rittel and Webber, 1977). Projects are often sponsored by clients who are trying to solve or respond to these issues in one way or another. These collaborators can be on-campus organizations, companies in the private sector, or organizations within the government and public sectors. Further, the faculty or clients may connect students to mentors in industry or elsewhere who have technical or problem specific expertise. These experts help guide the students’ research trajectories, and also frequently advise the faculty. For certain courses, industry experts become adjunct faculty and co-teach the course, often using telepresence technologies to do so.

Table 1. List of JMU X-Labs Courses and Disciplines Involved

Year	Course Name	Disciplines Involved
2015,2016, 2017	Medical Innovations	Engineering; Nursing; Biology
2016, 2017, 2018	The Virginia Drones Project	Biology; Industrial Design; Engineering; Physics; Writing; Computer Science; UAV Entrepreneurs
2017	AR/VR (Augmented Reality & Virtual Reality)	Computer Science; Computer Information Systems; Industrial Design; Media Arts; Communications; Theater and Dance
2017, 2018	Fueled (food truck)	Integrated Science & Technology; Biology; Engineering
2017, 2018	Hacking for Defense	Computer Information Systems; Engineering; International Affairs; Nursing; Writing
2017	Hacking for Diplomacy	Engineering; International Affairs; Sociology; Intelligence Analysis; Communications; Writing
2018	Autonomous Vehicles	Computer Science; Engineering; Integrated Science & Technology
2018	Blockchain	Integrated Science & Technology; Manufacturing; Information & Knowledge Management
2018	Political Discourse and Political Process	Political Science, International Relations, History, Justice Studies

As the titles to the courses in the above table indicate, courses at JMU X-Labs differ from standard courses in that they are structured around specific problems or ideas rather than content areas (such as biology, or physics). The emphasis on project-based learning and emerging technology is a powerful driver that attracts students' attention and participation. However, interest alone is insufficient to attain a balanced mix of disciplines for each cohort, because it is unusual for students in the US university system to take courses outside their chosen major or minor, beyond core general education requirements. Thus, to ensure effective recruitment, each member of the teaching team uses a course listing within their department's major to enroll a small number of students (<12). As a result, a JMU X-Labs course is actually a network of courses that provides credit to students in their chosen major but that meets concurrently, is co-located in a single space, and shares a common

syllabus. These three-to-six credit courses (meaning students meet for three or six hours a week) are generally scheduled in the evenings to allow for greater faculty participation and to accommodate most students' schedules.

Given their networked character and problem-based focus, learning objectives vary from course to course. Some offerings, such as "The Virginia Drones Project," have a number of objectives that extend across all participating sections, but that also contain specific nested objectives that are tailored to particular disciplinary groups. Other courses, such as "Medical Innovations," have objectives that span across all participating sections (Nagel, Lewis, Ludwig, 2016). Similarly, deliverables are largely predicated on the needs of the client/community partner, and so change from course to course. Often, they are technological solutions to specific problems. Two of our unmanned aerial vehicle-specific offerings, to illustrate, have developed attachments to drones to safely find and eradicate landmines in rural areas that were formerly theaters of war. Sometimes, however, solutions are intangible and are better characterized as services. A team working with a cybersecurity company in the "Hacking for Diplomacy" course created an assessment tool that informs intelligence analysts about the technical characteristics of emerging cybersecurity threats. Although the final product was a website, this project was essentially a service designed to help analysts determine the nature and characteristics of a cybersecurity outbreak.

Many JMU X-Labs classes are invested in finding new applications for emerging technologies or to respond to wicked problems that are difficult to approach, let alone solve. Consequently, it is important to articulate clearly what exactly the students are expected to produce within the sixteen-week arc of the semester. In nearly all instances, the deliverables produced by our classes are prototypes of final products rather than projects that are ends in themselves. Essentially, prototyping is a rough sketch or articulation that should only cost enough time and effort to generate valuable feedback to further iterate an idea (Brown, 2008). The prototyping process in our courses is fast and iterative, and in the early stages of development prototypes are designed with simple materials, such as paper, cardboard, and wire. As the semester evolves so do the quality, sophistication, and specificity of the materials, but the final projects produced by teams are generally prototype solutions. Although not ready for market, these deliverables serve two very important functions: 1. They demonstrate student learning of the concepts taught in the class and the quality of the team's response to their partner/client's needs. 2. For the client, these prototypes provide potential responses to the problem under consideration that may be worth seeking funding for further development.

Prototyping is a key part of design thinking, which along with ethical reasoning and communication, forms three pillars of instruction common to many JMU X-Lab courses. These pillars serve to provide a solid "operating system" upon which to build a common experience for all the participating students, regardless of discipline. Design thinking is a

problem-finding and problem-solving method that occurs as an iterative process through the following actions: empathize, define, ideate, prototype, and test (d.School, 2010). These actions parallel the scientific process (observe, formulate hypotheses, develop predictions, test, refine) and the creative process (research, ideate, develop, revise). This method enables students and faculty across disciplines to rely on a recognizable framework and to develop a common language for communicating process and ideas. Some classes, particularly those with students from disciplines that traditionally do not define themselves as “creative,” have used the book *Creative Confidence* (Kelley & Kelley, 2013) to ground their understanding of design thinking.

Teaching ethical reasoning within the context of our project-driven, multidisciplinary courses provides a framework for students to weigh the risks and benefits of their prototype designs. Featured in the syllabi of many JMU X-Lab courses are texts such as the story of Henrietta Lacks (Skloot, 2010) and “The Eight Key Questions” (Madison Collaborative, 2013), a method of ethical reasoning designed for undergraduate instruction by faculty at our university. Some courses also include reflective assignments or questions on the final exam that further assess students’ ability to reason ethically as they develop creativity skills and build their projects. Students in the “Medical Innovations” course have completed the Survey of Ethical Reasoning pre/post course and have found increased confidence in their ability to ethically reason following a creative course with deliberate ethics instruction (Personal Communication Allison Ames, 2017).

Finally, written and oral communication practices are woven throughout all courses. Students develop oral presentation skills throughout the semester to better understand the problems they are trying to solve and to articulate the prototypes they develop to various audiences, including faculty, collaborating partners, and the general public. Writing, which we understand as a fundamentally multimedia practice, is an integral aspect of the communication instruction throughout the course. Students use a variety of technologies to write in these courses. Messaging systems such as Slack coordinate team efforts; collaboration-based technologies such as Google Docs enable students to complete collaborative writing assignments throughout the course. Furthermore, most JMU X-Labs classes publish a publicly-accessible course website and social media feeds where students document their research journeys for a general audience using a variety of media and genres. These public-facing representations of the course serve a number of functions: to document the research process; to teach students how to articulate their research for diverse audiences via the worldwide web; as an archive for students for professional development purposes; and as a publicity tool to market the outcomes of the course with campus, local, regional, and national media (McCarthy et al. 2016).

Currently, we are collecting data on many of the JMU X-Lab courses to better understand student learning outcomes. Based on course and instructor surveys and personal feedback,

we can informally report that outcomes of JMU X-Labs courses align well with recommendations from the Association for American Colleges and Universities to promote skills sought by employers, such as: critical thinking; complex problem solving; written and oral communication; application of knowledge and skills in real-world settings; and the location, organization, and evaluation of information from multiple sources (Hart Research Associates, 2013). Furthermore, the success of JMU X-Labs is reflected in increasing interest from industry and public-sector organizations that wish to partner with our classes, both to work on wicked problems these organizations face, as well as to forge a recruitment pipeline for students who have participated in JMU X-Labs courses.

3. Administration at JMU X-Labs

Administrative structures that support JMU X-Labs are important to acknowledge and explain. Without these structures, the courses described above would not function—the administrative scaffolding should therefore be viewed as integral to their pedagogical success. To illustrate, a JMU X-Labs course is actually a network of concurrently-running classes, as discussed above. This was made possible by adapting the regular scheduling of courses to the needs of this multidisciplinary style of teaching. Without this administrative “hack” (or adaptation), the classes that we describe above would not exist in the same way.

Equally important is the relationship between JMU X-Labs and the rest of the university. The JMU X-Labs reports directly to the university provost rather than to a specific department or academic unit. This reporting structure is significant because multidisciplinary courses are well regarded and even sought after in some disciplines but are often considered extra-curricular in terms of logistics, departmental culture, and curricular requirements. Reporting directly to the university provost has the effect of creating an “agnostic” space within the university where alternative forms of teaching, learning, research, and innovation can take place without disrupting disciplinary or departmental norms.

Routine issues, such as procurement of supplies, are complicated at JMU X-Labs. With up to eight active and unique courses underway in a typical semester, JMU X-Labs staff purchases might include virtual reality headsets, cell phones, sheep’s blood, brewing supplies, sensors, and even a golf cart (for use in the class in autonomous vehicle design in 2018). These purchases require research prior to purchase and then maintenance once they become part of the lab’s stock. JMU X-Labs is a team of six administrative and technical staffwork for the in a part-time capacity. Technical experts research and maintain the various technologies and work with students during open lab hours. The administrative team handles the considerable logistics of running the lab, as well as managing finances, calendars, promotion, website design and a wealth of other duties, including the design,

organization, and promotion of events such as conferences and end-of-semester presentations.

Several faculty who regularly teach at JMU X-Labs have become part of the core structure of the organization—another way that pedagogy and administration intertwine at JMU X-Labs. They weigh in on course development, as well as initiate and execute research projects based on the courses taught in the lab. Often, they will solicit industry and community partners to take part in courses to work with students as either clients or mentors. Finally, as JMU X-Labs projects continue to be successful and become better known, several of its faculty and administrators have started a small but promising consultancy arm of the organization to bring design- and multidisciplinary-based innovation practices to other organizations.

4. Conclusion

Although we are already at work on research that examines student learning outcomes, there is clearly a need for research into JMU X-Labs in other areas of inquiry. Pedagogically, how do we recruit students who will succeed in these innovation-driven classes (Mayhew and Selznick, 2016), and how do we train faculty to work in teams and teach students technologies the faculty often don't yet fully understand themselves? Institutionally, how do we broker relationships between departments and faculty to staff JMU X-Labs courses, and how is that labor accounted for and rewarded? An organization such as ours depends on a network of partners both on and off campus: how is that network developed and sustained, and what are the tangible benefits for everyone involved?

These and other questions animate the group of faculty and administrators who are affiliated with JMU X-Labs. Hugely positive anecdotal evidence propels us to design studies to answer them, as such research will enable us to validate what we do and improve upon it, and hopefully provide resources to others to help them adapt JMU X-Labs' model to other institutional settings. Moreover, we believe that the relatively young and emergent culture that has built around JMU X-Labs begins to answer some broader questions about the popular, yet vexed issue of innovation in higher education. As Berger and Milem (2000) argue, student learning is largely ignored in discourses surrounding change making in higher education. JMU X-Labs, in contrast, is successful *because* student learning is its primary focus. Denning and Dunham (2010) observe that many bids for innovation fail because organizations are focused on external exemplars rather than the needs and capacities of the organization itself. JMU X-Labs emerged out of the particular (and peculiar) specificity of its host institution. In the process, it has hacked into existence a vibrant culture of innovation that may look at home in elite institutions such as Stanford and MIT, but is largely nonexistent in public education (at the undergraduate level, at

least). “Making it,” we find, is about understanding, engaging, and transforming what is right in front of us, not peering longingly at greener, faraway hills.

References

- Berger, J. B., & Milem, J. F. (2000). Organizational behavior in higher education and student outcomes. In J. C. Smart & W. G. Tierney (Eds.), *Higher education: Handbook of theory and research*, Vol. XV (pp. 268-338). New York: Agathon Press.
- Brown, T. (2008). Design Thinking. *Harvard Business Review*, 1-9.
- d. Hasso Plattner Institute for Design at Stanford [d.School]. (2010). *An introduction to design thinking process guide*.
- Denning, P. J., & Dunham, R. (2010). *The innovator's way: Essential practices for successful innovation*. Cambridge: MIT Press.
- Hart Research Associates. (2013). It takes more than a major: Employer priorities for college learning and student success. *Liberal Education*, 99(2).
- Kelly, T., Kelly, D., (2013). *Creative confidence: Unleashing the creative potential within us all*. New York, NY. Crown Business.
- Ludwig, P.M., Nagel, J.K., & Lewis, E.J. (2017). Student learning outcomes from a pilot medical innovations course with nursing, engineering and biology undergraduate students. *International Journal of STEM Education*, 4 (33), 1-14.
- Mayhew, M. J., & Selznick, B. S. (2016). Straight A students may not be the best innovator. *The conversation*. Retrieved from <https://theconversation.com/straight-a-students-may-not-be-the-best-innovators-54440>
- Nagel, J.K., Ludwig, P.M., & Lewis, E.J. (2017, June). Community health innovation through and interprofessional course. Paper presented at *American Society of Engineering Education Annual Conference and Exposition*, Columbus, OH.
- Madison Collaborative. (2013). *The 8 key questions handbook*.
- McCarthy, S., Barnes, A., Briggs, F., & Ludwig, P., Robinson, K., Swayne, N. (2016). Undergraduate social entrepreneurship education and communication design. *Proceedings of the 34th ACM International Conference on the Design of Communication*.
- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4, 155-169.
- Skloot, R. (2010). *The Immortal life of Henrietta Lacks*. New York, NY. Random House.

Students' motivation, concentration and learning skills using Augmented Reality

Sampaio, Daniel and Almeida, Pedro

Digimedia - Universidade de Aveiro, Portugal

Abstract

The use of new technologies in the teaching and learning process, as the case of devices with the use of Augmented Reality, captures student and teacher's attention, creating the expectation that its use can provide the participants with new ways of interacting, new possibilities for collaboration and potentially an increase in motivation for learning. This research promoted the use of Augmented Reality using four prototypes created by the researcher/teacher during the teaching-learning process and had as main objectives: to evaluate the impact on motivation and learning competencies; identify, explore and evaluate different strategies for the integration of Augmented Reality devices and resources and define a set of guidelines for the integration of augmented reality systems. With the results of the questionnaires completed online by the students, it was concluded that they were greatly interested in the possibility of interacting this way with the programmatic contents, the use of the prototypes added a greater motivation to solve the tasks proposed by the teacher and, during the use of the prototypes, the students showed high levels of concentration for their achievement.

Keywords: *Augmented Reality; Student Motivation/ Concentration; Learning strategies; Information and Communication Technologies; Educational Technologies.*

1. Introduction

The success index of the courses is many times affected by the student's (lack of) motivation and by difficulties in learning with the content. According to Brophy (2004) the concept of student motivation is used to explain the degree to which students devote their attention and effort in various activities that may or may not be the level desired by their teachers. The introduction of new technologies, in this context, can be an important asset to overcome these difficulties and create the conditions of change that may involve the student into more intensive learning experiences. It is important for an educational system to be up-to-date with the technological advances and the changes it may bring to teaching innovation and as a complement to the learning process in the classroom. The technologies that are being gradually introduced in educational contexts enable teachers and students to diversify strategies that lead to knowledge building so it will be necessary to understand what advantages they can bring to the teaching-learning process. As Joseph (2012) points out, technology will continue to dominate many aspects of human existence and, if used to full potential, can guarantee an improvement in the teaching-learning process, leading to the need of understanding whether the impacts of the technological education are more positive in comparison with traditional forms of teaching. Thus, the exploitation of new technologies in the classroom is always a challenge for all participants in the teaching-learning process. If on the one hand the students possess a high digital literacy, due to being immersed in a society addicted to technology, on the other hand, the teachers are not always up to par in handling this technology; although there are, for both teachers and students, many advantages, as pointed out by Sobral and Menezes (2012), when they state that the use of technologies in the classroom increases the motivation of the students, their concentration is higher and, as a consequence, they learn more. Therefore, the student/teacher relationship becomes more in tune. Education is still unable to keep up with the constant changes that technology has had, as in many areas, in education, Information and Communication Technologies (ICT) has enormous potential of exploitation which can be an advantage for student learning and consequently in their educational success. For that, it will be necessary to explore the teaching-learning processes using these technologies. One of these technologies, Augmented Reality (AR), has captured the attention of students and teachers. As indicated by Nincorean et al (2013) AR is one of the emerging technologies that can have enormous potential and impact on learning. According to Shelton and Hedley (2002), the arrival of new technologies, such as AR systems, captures the attention also for pedagogical purposes. According to Kesim and Ozarslan (2012) the students when using AR technology interact with objects and information in three dimensions in a natural way. In the current context, where the use of AR devices has been intensifying in education, the learning process can be transformed. Although, the introduction of technologies in the classroom can create new ways of knowledge

acquisition, it is necessary to evaluate if they have the same skills of a traditional manual or book. Di Serio, Ibáñez and Kloos (2013) in a usability study have shown that, although AR is not yet sufficiently used in education, student enthusiasm has reduced most of the difficulties, and this may be a determining factor for the student's growing interest in pedagogical content and the effective success of the introduction of this type of technology in education.

2. Research Purpose

2.1. Objectives

The project has three main goals:

- Evaluate if the introduction of Augmented Reality technologies in the learning process carries significant improvements in the motivation and competences acquisitions of students;
- Identify, explore and evaluate different strategies for the integration of Augmented Reality systems and its features in the teaching and learning process of an Information Communication Technologies (ICT) subject;
- Define a set of guidelines (best practices) for the integration of Augmented Reality systems in teaching and learning processes.

2.2. Methodology

This research project has a sample of sixty-two students from three 8th grade classes of the Agrupamento de Escolas D. Pedro IV, Vila do Conde. These students do not have prior experience with Augmented Reality systems and most of them not even know about this type of technology. This project follows an Action Research methodology since it includes several research cycles focused on the development and evaluation of different Augmented Reality based prototypes and related teaching strategies for its integration in the ICT curriculum. Each student used the 4 prototypes (*Figure 1*) while solving a worksheet and was invited to answer a brief questionnaire after each session. Following the Action Research methodology, the planning of the four prototypes took in consideration the conclusions regarding the use of the previous cycle.

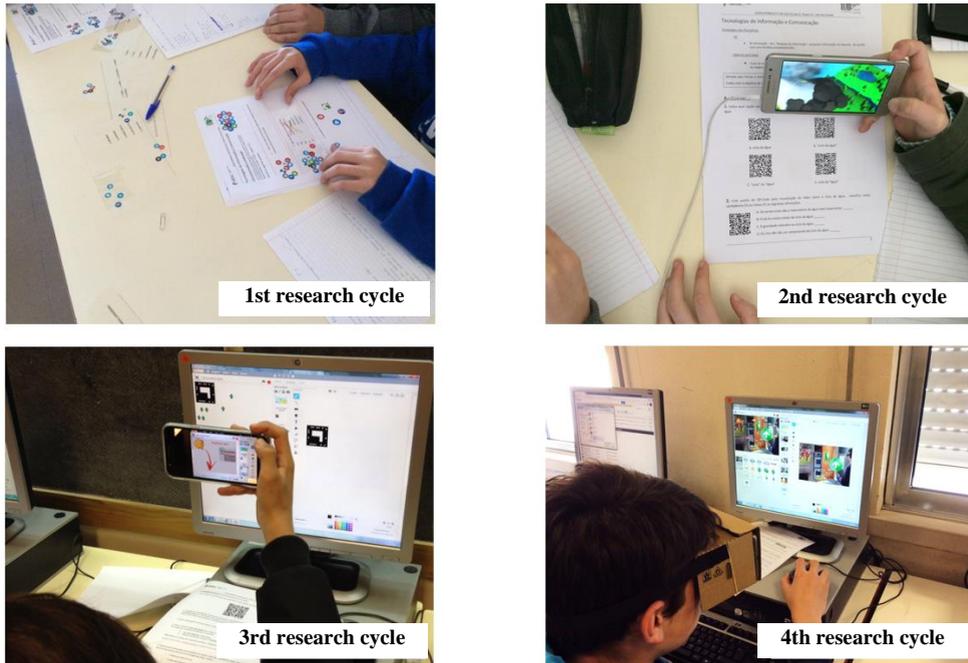


Figure 1. Research cycles

2.2.1. First research cycle

In the first research cycle the prototype was built with the objective of creating a parallelism between transparencies (acetate) over printed assignments with the foundations of a device with an AR system that integrates a real object with a virtual in a real environment. The transparencies contained printed solutions and when overlaid on an assignment paper revealed the solution for the assignment. Despite the fact that this prototype was prepared with paper and acetates, the main goal was to prepare students to work with systems that expand reality, complementing it with tips and solutions, in a simplistic way, but in essence close to what can be obtained with an AR system.

2.2.2. Second research cycle

The second prototype was targeted to an assignment that integrated contents from ICT and Natural Sciences. It was focused on (information) search techniques and materials flow in ecosystems. This prototype was the first to use mobile devices. Students had to install an application to scan for QR-Codes (QRC). When they did it, it showed multimedia content linked to each question of the paper assignment.

2.2.3. Third research cycle

The third cycle was based on the idea that the student will be pointing the mobile device to a real object and will be able to visualize the virtual elements related with the programmatic contents, i.e., use integrally the AR system in their devices. In this cycle it was possible to make a parallel between the way QRC and AR work, because in the second cycle students using QRC had access in the mobile device to a hyperlink with multimedia contents but in the third cycle the multimedia contents were displayed on the devices above the actual object that was scanned. When solving the tasks the contents remained related to ICT and Natural Sciences. The student, in order to solve the tasks, had to follow the provided steps to see on the screen of the mobile device the multimedia contents that helped with the task completion.

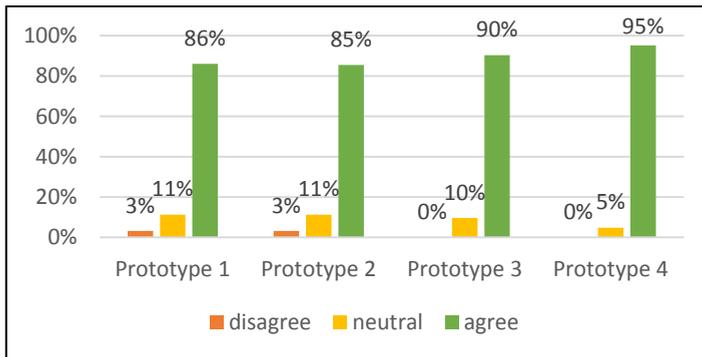
2.2.4. Fourth research cycle

It also took in consideration the idea that this prototype should make use of a complete and immersive AR system. It differed from the third prototype because it was developed so that the student could work "freely" with the keyboard and mouse without having to hold the mobile device to watch the contents in the AR system. Although with similar concepts of the third prototype, it introduced a Google Cardboard placed on the head using a tape. This way the student had an opened field of view, focused on the contents that appeared on the screen, and was able to have his hands free to work. It was intended with this prototype to make a simulation of the effective use of AR glasses, because it is an emergent technology and still has quite high acquisition values. However, using Google Cardboard if paired with a mobile device with an AR system installed, despite the lower quality, it integrates the principles of AR glasses.

2.3. Results

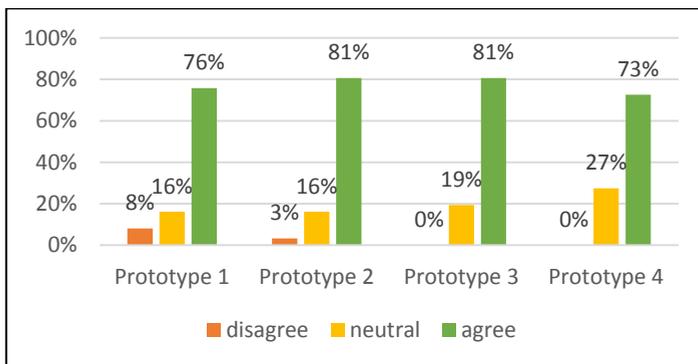
At the end of each research cycle the students completed an online questionnaire related with the use of the prototype. Of the several results obtained, the following are highlighted:

Graph 1 shows the high value of students' motivation using the prototypes. In particular, the values of the last two prototypes that use AR are very high, above 90%. Thus, students' motivation increased with the introduction of the prototypes using AR (prototype 3 and 4) in relation to the two previous prototypes (prototype 1 and 2) that didn't have this technology.



Graph 1. Were the students motivated using the prototype?

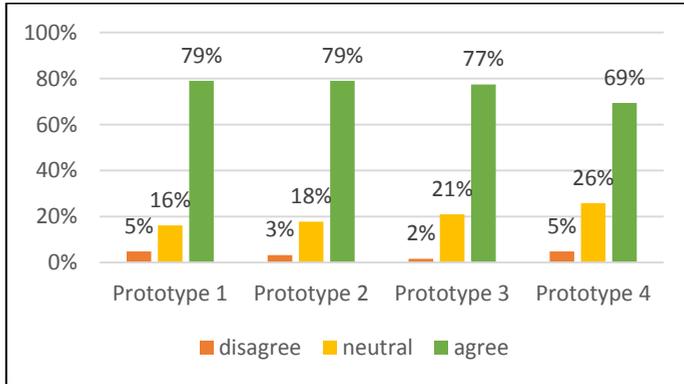
As can we see in Graph 2, concerning the comprehension of contents by students, they clearly agreed in their answers, with values between 73% (P4) and 81% (P2/P3), which shows that the introduction of AR in the teaching-learning process can increase the success index of student learning.



Graph 2. Did the students understand the content using the prototypes?

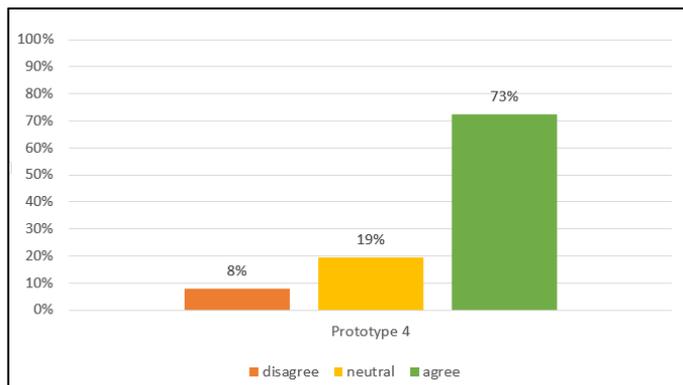
Graph 3 shows the student concentration perception while solving the exercises using the prototypes. We can verify a perception of high concentration levels. However, it is important to mention the decrease in student concentration from the first to the fourth prototype, but the concentration values are still high. This decrease can be related to the distraction that the use of a technological innovation can cause in the students and by the fact that Google Cardboard (prototype 4) occupied the field of vision of the students, creating a filter in the perception of the reality. However, it is important to note that this small decrease in student concentration is not correlated with student motivation. It is also important to highlight the slight decrease in student concentration in contrast to the increasing introduction of technology in the prototype. Based on this, we can conclude that

adding more technology reduces student concentration, but their motivation increases significantly.



Graph 3. Were the students concentrated using the prototype?

Graph 4 expresses the students' opinion about the advantages of visualizing the contents with Augmented Reality Glasses (ARG) while working/studying. It is possible to conclude, from the presented values (73%), that students clearly express their agreement with the use of ARG in an educational context.



Graph 4. Were there advantages in using ARG in educational context?

3. Conclusion and Future Work

From the results of the questionnaires completed by students at the end of each cycle, the analysis of the opinions shows that the students were highly interested with the possibility of interacting with the programmatic contents, perceived and valued the use of devices with AR in the acquisition of the subject contents, and demonstrated that the use of the

prototypes added an extra and relevant motivation to solve the tasks proposed by the teacher. During the use of the prototypes, the students still showed high levels of concentration when solving the tasks with the use of the prototypes. The high levels of concentration observed in students, when using prototypes, may be due to the introduction of new teaching methods, which they are not used to. Thus, diversifying the teaching methodologies can be an enriching experience and a relevant factor for the success of learning. Although this type of technology is not yet sufficiently used in education, the enthusiasm of the students can be a determining factor for the success of the use of AR in the teaching-learning process.

The work continues with deeper analysis on the gathered data. A preliminary analysis of the results shows a promising field of research. The following stage in this research is to analyse the teachers' opinions, after using the prototypes, to verify their perception on the added value that AR can have in the teaching and learning process. At the same time identify, by the opinions of teachers, new approaches for teaching methodologies.

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References

- Brophy, J. E. (2004). *Motivating students to learn - second edition*. Routledge.
- Di Serio, Á., Ibáñez, M. B., & Kloos, C. D. (2013). Impact of an augmented reality system on students' motivation for a visual art course. *Computers & Education*, 68, 586-596.
- Joseph, J. (2012). The barriers of using education technology for optimizing the educational experience of learners. *Procedia-Social and Behavioral Sciences*, 64, 427-436.
- Kesim, M., & Ozarslan, Y. (2012). Augmented reality in education: current technologies and the potential for education. *Procedia-Social and Behavioral Sciences*, 47, 297-302.
- Nincarean, D., Alia, M. B., Halim, N. D. A., & Rahman, M. H. A. (2013). Mobile augmented reality: The potential for education. *Procedia-Social and Behavioral Sciences*, 103, 657-664.
- Shelton, B. E., & Hedley, N. R. (2002). Using augmented reality for teaching earth-sun relationships to undergraduate geography students. *Augmented Reality Toolkit, The First IEEE International Workshop* (pp. 8-pp).
- Sobral, S. R., & Menezes, N. D. C. A. P. (2012). Motivação de alunos com e sem utilização das TIC em sala de aula.

From time to time. A constructivist approach to sociality in learning

Mancini, Francesco^a and Glusac, Tanja^b

^aDepartment of Architecture, Curtin University, Western Australia, ^bDepartment of Architecture, Curtin University, Western Australia.

Abstract

Under the current financial pressures, tertiary education increasingly looks towards corporate sector to import its model of management and efficiency. While benefits of this model can be seen in practice, in regard to staff and facilities management and financial viability, its impact on teaching and learning is causing a disruption to the very core of tertiary education, eroding sociality in learning and opportunities for sharing knowledge and values. Capacity to work in teams and ability to critically solve problems by collaborating and sharing insights and information, are skills students are expected to gain during their studies. The development of these skills to their fullest using Design Thinking approach, however, is currently not widely supported, albeit desirable,¹ in the present education context which is addressing the efficiency of time management by reducing contact time, increasing student/staff ratio and shifting towards integrated and mass education modes of delivery. While this paper is not disputing the existing model, it responds to its current challenges proposing a stronger integration of different factors contributing to learning. The aim is to present a collaborative working model as a way of bridging 'the missing link between theoretical findings [on holistic and interdisciplinary learning] and demands by pedagogy science'². Such a model is envisioned to encourage sociality in learning and strategize space/time/experience management, ultimately enhancing knowledge and value sharing.

Keywords: *Design Thinking; Constructivism; experiential Learning; Sociality; Studio Culture.*

¹ Ability to solve 'wicked problems' as supported by Design Thinks is becoming more attractive to the tertiary sector as it promotes 'holistic modes of constructivist learning in projects' (Scheer et al. 2012, p. 8).

² Scheer et al. (2012, p. 8)

1. Introduction

Approach to learning and teaching from a Humanistic perspective is often seen to be holistic. This approach is based on constructivism, an epistemological model which ‘describes the individual human subject engaging with objects in the world and making sense of them’ (Crotty, 1998, p. 79). This making sense, or creating meanings, is aided by ‘the mélange of cultures and sub-cultures into which we are born’ (Crotty, 1998, p. 79). Cultures, by definition constructs themselves, are dynamic and ever changing. Learning and knowledge in this context is equally ever evolving and expanding ‘through new insights’ and ‘individual experiences’ (Scheer et al. 2012, p. 9 drawing from Reich (2008) and Kolb (1984)) In this regard, the culture of learning and sociality traditionally fostered within educational institutions, such as universities, is seen as essential. Nevertheless, this holistic approach to education, including the culture of building sociality of learning, is being challenged by constant time and resources cuts brought about by financial pressures and adoption of a corporate model of management and efficiency within tertiary education sector.

As a response to these pressures and cuts, this paper looks at the problem of time loss and consequential loss in sociality, and proposes to tackle it from the Design Thinking perspective. Design Thinking has been selected as a methodology to counteract and solve the above indicated complex problems due to its primary focus being on value as an end product or service. This paper argues that Design Thinking can be introduced to wider areas where it equally can be used as a methodology for tackling various pedagogical problems and achieving constructivist type of learning, due to particular skill set that it helps develop as suggested by Razzouk and Shute (2012, p. 331). It is for this reason that Design Thinking is slowly making its way into a variety of disciplines, including Business which uses Design Thinking to look at innovative strategies for problem solving. According to Kees Dorst (2011, p. 522 drawing from Stacey, Griffin and Shaw 2000) ‘the business and management communities’ are introducing Design Thinking in their practices to ‘broaden their repertoire of strategies for addressing the complex and open-ended challenges faced by contemporary organisations’. Gaining meta competences required of the 21st century learners that extend ‘beyond cognitive knowledge’ is the complex and open-ended challenge facing education sector, specifically universities, which, according to Scheer et al. (2012, p. 8), is possible to achieve ‘with the help of constructivist learning’.

2. Problem

Under the current financial pressures, tertiary education increasingly looks towards corporate sector to import its model of management and efficiency. While many benefits of this model can be seen in practice, in regard to staff and facilities management and financial

viability, its impact on teaching and learning is causing a disruption to the very core of tertiary education, eroding sociality in learning and opportunity for sharing knowledge and values.

The current corporate model, fast entering academia, has been identified by Richard Sennett (2005) as a new stage in capitalism striving for 'flexibility'. Sennett (2005, p. 113) suggests that this post-Fordist model has been brought about by 'the globalization of labor and capital flows' as well as 'a transformation in production' which consequently altered existing organizational structures and their bureaucratic systems with the goal of increasing flexibility in the work environment. A deviation from a Weberian model of 'the bureaucratic triangle'³ to the post-Fordist model currently in place caused the 'de-layer[ing]' of organizations with the aim of substituting excessive 'levels of bureaucracy' with the fast evolving information technologies (Sennett 2005, pp. 113, 114). Sennett (2005, p. 114) suggests that through this 'de-layer[ing]', businesses 'sought to destroy the practice of fixed-function work', which was seen to be too rigid and unresponsive to the prevailing fast changing market conditions. Within this model, companies are opting to reorganize themselves as internal markets generating internal competition with the aim of achieving greater effectiveness and efficacy. Though businesses are slowly sobering up to the reality of this model and its many short-comings⁴, universities, which are not suited to this model, seem to be dragging their feet.

The post-Fordist award-based system driven by Key Performance Indexes and consumerist and service oriented mentality, that has gradually permeated tertiary sector, does not apply well to educational settings since it leads to the loss of the 'real' motivators that are research and investment in teaching. This loss, in what is effectively the backbone and essence of tertiary educational institutions, is indirectly leading to the loss of efficiency and productivity on academics' part who are becoming increasingly burdened by bureaucratic and administrative tasks which the post-Fordist model tried to minimize.

This disruptive model that we have been facing for some time has been extensively discussed and critiqued by Maggie Berg and Barbara K. Seeber in their book titled *The Slow Professor: Challenging the Culture of Speed in the Academy*. Both professors in the

³ Sennett (2005, p. 114) suggests that Max Weber's (1922) notion of 'rational bureaucracy was founded on an analogy between military and business organization' with both having clearly identified and strictly hierarchical chain of command. Though initially associated with military and industry, since 1960s Weber's model penetrated the white-collar sector, including universities.

⁴ According to Sennett (2005, p. 115), 'just as the space of power in the flexible organization is not democratic, so the time dimension of these institutions promotes neither loyalty nor fraternity. Business leaders who were once enthusiasts for constant corporation reinvention are beginning, as it were, to sober up. It is hard to feel committed to a corporation that has not defined character, hard to act loyally to an unstable institution that shows no loyalties to you. Lack of commitment translates into poor productivity, and to an unwillingness to keep a corporation's secrets.'

Department of English at Queen's and Brock Universities respectively, they argue that 'If there is one sector of society that should be cultivating deep thought in itself and others, it is academia. Yet the corporatization of the contemporary university has sped up the clock, demanding increased speed and efficiency from faculty regardless of the consequences for education and scholarship' (Berg and Seeber 2016, cover sheet). More specifically, some of the 'on the ground' problems related to time cuts affecting both academics and students across Australian universities are:

- Inflexibility of and compliance with the curriculum has led to a disproportionately high imbalance in terms of time required to complete menial administrative tasks and time dedicated to teaching, research and preparation. This imbalance is contributing to the lack of innovation, and academics embracing the risk adverse culture by opting for 'the safe way' due to limited for experimentation in teaching.
- The reduction in contact hours has resulted in compressed delivery and focus on content packaging with limited opportunities to explore the depth and breadth of content and contextualization. This reduction in contact hours and increased offering of lectures online has also led to an unhealthy perception that attending classes is not important or worth students' time consequently contributing to fewer interaction opportunities with staff and with other students.
- Students are often too focused on delivery and production of assessment tasks. This is done mostly at the expense of deep research and learning. This attitude, when coupled with the ever decreasing time available to academics to assess students' work, is increasingly impacting on the extent and quality of feedback, which is then elevating risk of jeopardizing fairness.
- Fragmentation of time due to constant flow of emails and social media distractions. From the students' perspective there are also other commitments outside university such as employment, often full-time, necessary to cover tuition fees and livelihood expanses, and the need for a balanced social life.
- Extended response time to requests for information/administrative responsibilities, and administrative imbalance between responsibility and authority.

The above listed issues stemming from the reduction of time inadvertently lead to fragmentation of 'Knowledge acquisition', focus on 'isolated subjects' and inability to 'execute a holistic and interdisciplinary learning' that are starting to negatively affect the overall experience of both teachers and students (Scheer et al. 2012, p. 8). In this process, many valuable opportunities to reflect and identify connections and form a 'big picture' are lost. While these conditions are necessary to acknowledge and contemplate upon, since they are here to stay at least for a foreseeable future, they are also raising a sense of urgency

for educators and academics to re-evaluate their current approach to teaching and research as a way of responding to the pressures imposed by the post-Fordist corporate model. As a way forward, this paper proposes an alternative approach addressing the problems academia is facing in the teaching arena by using constructivist framework and Design Thinking methodology.

3. Pivot point

Capacity to work in teams and ability to solve problems by collaborating and sharing insights and information, including critical thinking, are skills students are expected to gain during their studies. Dunne and Martin (2006, p. 519) suggest that ‘An important aspect of collaboration, however, is the idea of expanding perspectives by collaborating with individuals unlike oneself.’ One of the ways of achieving this is through utilizing Design Thinking methodology.

So what is Design Thinking? Tim Brown (2008, p. 1) defines Design Thinking as ‘a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos.’ He further suggests ‘that innovation is powered by a thorough understanding, through direct observation, of what people want and need’ (Brown 2008, p. 1). Central to Design Thinking is a reasoning process referred to as Abduction, which, according to Dorst (2011, p. 523-524) can be approached from two angles – Abduction-1 which considers ‘conventional problem solving’ where the value and the working principle are given but the ‘what’ is unknown, and Abduction 2 – where only the end value is known, but the ‘what’ and the ‘how’ are missing. These are summed up by Dorst (2011, p. 524) in the following formula redrawn by authors:

Abduction	WHAT (thing)	+	HOW (working principle)	leads to	VALUE (aspired)
Abduction-1	???	+	HOW	leads to	VALUE
Abduction-2	??? (thing)	+	HOW (working principle)	leads to	VALUE (aspired)

Dorst (2011, p. 525) suggests that to effectively investigate such a problem it is essential to apply a reverse engineering process by taking into account the known outcome, which is the desired value, and work iteratively on possible frameworks to identify what needs to be designed. The aim is to further reduce the level of complexity of the problem by figuring

out how the designed object will fulfil the set of given values so to successfully complete the equation. According to Dunne and Martin (2006), this is where the ethos becomes important, in the moment when the designer and the customer/client set a shared reference value against which complete equations can be tested out of a range of possible solutions (Dorst 2011, p. 525). According to Charles Owen (2007) Design disciplines belong to a synthetic/real realm (fig.1 adapted from Owen 2007).

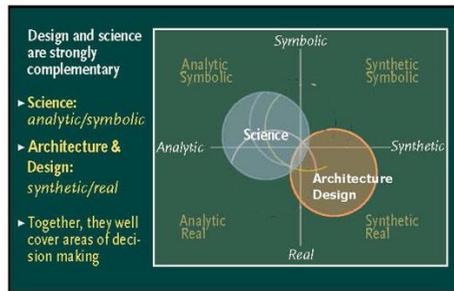


Figure 1. (adapted from Owen, 2007) Design and Science are Complementary

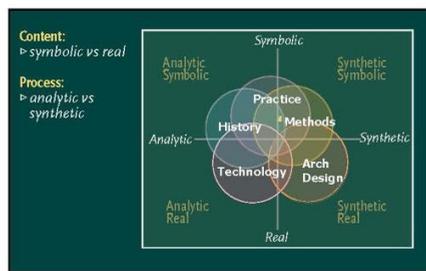


Figure 2. (adapted from Owen, 2007) Differences within Architecture Design, Technology, Practice, History and Theory. Methods of Communications can be compared to owen's positioning of Design, Medicine, Science, Art and Law

After identifying in detail the components of a creative character (Table: 1 from Owen 2007),

Table 1. Creative skills according to Charles Owen (adapted from Owen, 2007, p22-23)

Fabun's List - The talented writer	Silvano Arieti - psycho aattudes	Csikszentmihaly's - emotional Polarities
<i>Sesitivity. Ability to see and to respond</i> <i>Questioning attitude. Inquisitiveness,</i> <i>encourages seeking new and original answers.</i> <i>Board education</i> <i>Asymmetrical thinking</i> <i>Personal courage</i> <i>Sustained curiosity</i> <i>Time control</i> <i>Dedication</i> <i>Willingness to work</i>	<i>Fluency of thinking</i> <i>Flexibility</i> <i>Originality</i> <i>Redefinition</i> <i>Elaboration</i> <i>Tolerance for ambiguity</i>	<i>Generalized libidinal energy and restraint</i> <i>Convergent and divergent thinking</i> <i>Playfulness and discipline - or irresponsibility</i> <i>and responsibility</i> <i>Fantasy and reality</i> <i>Extroversion and introversion</i> <i>Humility and pride</i>

Owen asserts that albeit creativity is common to both Science Thinking and Design Thinking, the former is fundamentally initiated by analysis of facts, while the latter includes facts and possibilities since the beginning as part of an open-ended problem which needs a real response, a form. In addition to that, Owen demonstrates that Design Thinking is a particular creative approach to problem solving, as it is based on peculiar metacognitive skills (Table 2, adapted from Owen, 2007) which make a fundamental difference with any creative process in scientific realm.

Table 2. Design thinking metacognitive skills adapted from Owen 2007, p22-23)

Non-io Centered concern	Communication with self and others as a way of designing	Open ended solution trajectory or context relevance in relation to goal (form)
Conditioned inventiveness Human-centered focus Environment-centered concern	Ability to visualize Tempered optimism Bias for adaptivity	Predisposition toward multifunctionality Systemic Vision View of the Generalist
Self-governing practicality	Ability to use language as tool Affinity for teamwork	Ability to work systematically with qualitative information

While Science values the correctness of conclusions using a false/true matrix, in Design the assessment of a solution to an open ended problem is made considering the effectiveness of that solution among multiple credible solutions on the base of a set of cultural values (Owen, 2007, pp. 22-25). This conclusion is inherent to a number of criteria which shape the common ground of any design discipline. Their ultimate goal is giving form to products, artifacts and environments which constitute the language of human individuals for their coexistence in social communities. As a consequence of this intricate relation, Design problems, as well as designers, are informed by the same anthropological, social, artistic, legal-economic and technological implications which generate the complex open ended problems that they are called to solve. In the learning environment, this means that Design Thinking is sympathetic with constructivism and ‘gets teachers empowered to facilitate constructivist learning’ (Scheer et al. 2012, p. 8)

Presented next is a collaborative working model based on Design Thinking that not only contests the assumption that Design Thinking is less time efficient due to being an iterative process, but also encourages sociality in learning and strategize space/time/experience management, thus ultimately enhancing knowledge and value sharing.

4. A Design Thinking based teaching model: Studio 144

The proposed teaching model for Design disciplines based on Design Thinking and Constructivism rests on the assumption that both share common principles of critical inquiry, as outlined by Crotty (1998, p. 157) in that they both assume that facts cannot be seen outside their value and ideological context. Concepts, likewise, are always to be filtered through power and social relations rooted in history. From this it follows, that the relationship between the two is always mediated within the realm of social relations, such as production and consumption, and therefore language.

With this in mind, the proposed constructivist model tries to realize a teaching environment which facilitates the gaining of the Design Thinking metacognitive competences presented by Owen (2007) and illustrated in table 2. In this model, problems, facts and a set of cultural values are presented to students for them to elaborate further while developing the competences skillset described in table 2 that are grouped in three sets of values 1) non-ego centric design concern, 2) communication with self and others as a design tool, 3) open ended solution trajectory. Such a teaching model advocates for a careful simulation of external conditions and stakeholders contribution. This model can then take advantage of a continuum of space/time flow and hands on strategy which is no longer broken down into hierarchically assigned micro tasks as happens under the Fordist/Taylorist approach.

More specifically concerning Architecture, Studio culture, which has been a prevalent model since Bauhaus, has been progressively dismissed by universities due to increasing cost associated with running studio based teaching. In the traditional studio model a space is set aside for students to spend time there throughout a week within and outside teaching hours. Willing to consider a student centered learning approach the aim is to set a 'new' multi- purpose studio space where students can work and attend lectures, seminars and workshops for all the subjects taught during the semester and not just Architectural Design. Correspondingly, and drawing from Owens (2007), the Design Thinking strategies can be applied to the five core subject areas of Architecture course, including Design, Methods of communication and inquiry, History and Theory, Technology and Professional Practice. The point of deviation from a typical model concerned with teaching facts and delivering content is the emphasis on teaching subject values first and foremost. The consequential interpretation of facts based on a set of values according to a creative thinking investigation helps to shape the measures necessary to solve a design problem in Architecture and to apply it in practice (fig 3 adapted from figure 9 Owen 2007, p. 21).

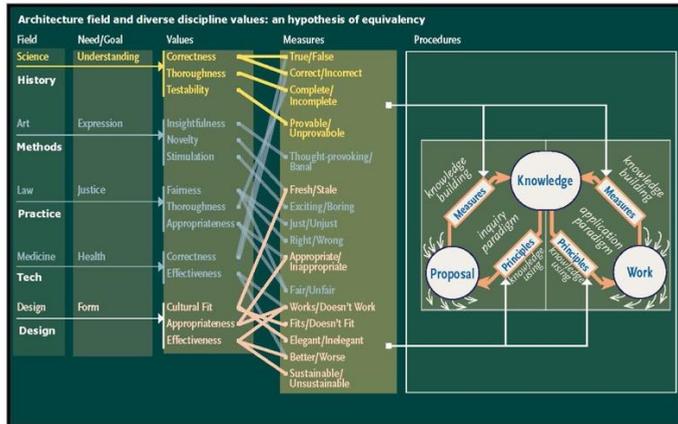


Figure 3. (adapted from Owen, 2007) hypothesis of equivalence of values between disciplines and architecture subjects

In order to generate this condition, not only the program, but also space and time need to be carefully considered and planned in tune with the teaching model, as the time spent together helps you take ownership of the place and the experience, and inadvertently learning. If the responsibility is taken for the space, it can be associated with responsibilities inherent to the learning activities of students in such spaces. (Hertzberger, 2009, p. 28).

In conclusion, this model based on problem solving can be proven to be effective and exportable to other disciplines. Notwithstanding our faith in its usefulness, we believe that such model should not substitute, but integrate the present task based model, as we believe that it is worth to expose students to various learning experiences to widen their adaptability and their skillset.

According to Crotty (1998, 79) 'we are taught and we learn in a complex and subtle process of acculturation. ... Our cultural heritage can therefore be seen as a pre-empting task of meaning making so that [today] for the most part we simply do not do what constructivism describes as doing.' While this indeed may be the case, the constructivist approach allows for continuous criticism of former meaning making space for further insights and deepening of the existing, and at the same time providing opportunities for new meanings to be created (innovation). To this end, understanding in which moment of students' education it is worth to apply this model and how often in the curriculum remains an open ended problem for discussion.

References

- Beckman, S. L., & Barry, M. (2007). Innovation as a Learning Process: Embedding Design Thinking. *California Management Review*, 50(1), 25- 56.
- Brown, T. (2008). Design Thinking. *Harvard Business Review*, June. 1-9. Reprint R0806E.
- Buchanan, R. (1992). Wicked Problems in Design Thinking. *Design Issues*, 8(2), 5-21. <http://www.jstor.org/stable/1511637>
- Crowther, P. (2013). Understanding the signature pedagogy of the design studio and the opportunities for its technological enhancement. *Journal of Learning Design. Special Issues: Design Education*, 6(3), 8-28.
- Dorst, K. (2011). The core of 'design thinking' and its application. *Design Studies*, 32, 521.532. DOI:10.1016/j.destud.2011.07.006
- Dunne, D., & Martin, R. (2006). Design Thinking and How It Will Change Management Education: An Interview and Discussion. *Academy of Management Learning & Education*, 5(4), 512-523. <http://www.jstor.org/stable/40214410>
- Hertzberger, H. (2009). *Lessons for Students in Architecture*. Rotterdam, Netherlands: 010 Publishers.
- Owen, C. (2007). Design Thinking: Note on its Nature and Use. *Design Research Quarterly*, 2(1), 16-27.
- Razzouk, R., & Shute, V. (2012). What Is Design Thinking and Why Is It Important? *Review of Educational Research*, 82(3), 330-348. DOI:10.3102/0034654312457429
- Scheer, A., Noweski, C., & Meinel, C. (2012). Transforming Constructivist Learning into Action: Design Thinking in education. *Design and Technology Education: An International Journal*, 17(3), 8-19.
- Sennett, R. (2005). Capitalism and the City: Globalization, Flexibility and indifference. In Y. Kazepov (Ed.), *Cities of Europe. Changing contexts, local arrangements, and the challenge to urban cohesion* (109-122). Oxford, England: Blackwell Publishing.

Learning outcomes in the field of human resource management in business administration studies in the context of implementation of European Qualifications Framework (EQF) - examples from University of Valencia, Spain, and University of Dubrovnik, Croatia

Vrdoljak Raguž, Ivona^a and Hernandez-Carrion, Jose-Rodolfo^b

^aDepartment of Economics and Business Economics, University of Dubrovnik, Croatia

^bDepartment of Applied Economics, Faculty of Economics, University of Valencia, Spain

Abstract

The study carried out in this paper involves the analysis of the content of the competencies in the field of human resource management in order to acquire the key competencies of the students that will be aligned with the needs of the labour market according to the European Qualifications Framework (EQF). The method of comparative analysis and case study methodology is used in the paper. This research compares teaching courses that include the acquisition of competencies in the field of Human Resource Management in business administration studies, one of the key areas of contemporary management, with examples from the Department of Economics and Business Economics of the University of Dubrovnik (Croatia) and the Faculty of Economics of the University of Valencia (Spain). The study may be a contribution to better alignment and compatibility between study programs of economics and management in the countries and beyond. In order to get answers to the research questions, the paper analyses the learning outcomes of the two observed universities.

Keywords: *European Qualifications Framework; EQF; Learning Outcomes; Human Resource Management; University of Valencia; University of Dubrovnik.*

1. Introduction

This paper explores the study content of Economics and Business Economics studies at the University of Valencia in Spain and University of Dubrovnik in Croatia in the context of achieving the principles set out in the Bologna Declaration, based on the European Qualification Framework (EQF).

In the paper authors deal with the consistency of the learning outcomes between individual courses in the area of Human Resource Management at the University of Valencia and the University of Dubrovnik, using the method of comparative analysis and case study methods. Examples of case studies are presented from the Faculty of Economics of the University of Valencia and the Department of Economics and Business Economics of the University of Dubrovnik.

The key starting points for this research are as follows: multidisciplinary approach, understanding usage of human resource management as a critical factor for the company's competitiveness, but also the success of each organization and the necessity of linking key competencies of students with needs in the labour market, as well as the mutual alignment of competencies acquired in individual courses in Economics and Business Administration, and Business Economics studies, both horizontally and vertically.

2. European Qualification Framework and Higher Education

The recommendation of the European Parliament and later the Council of 23rd April 2008, on the establishment of the European Qualifications Framework for lifelong learning, created a common reference framework of eight levels of qualifications, expressed as learning outcomes with increasing levels of proficiency. The purpose of the European Qualifications Framework for lifelong learning (EQF) is to improve the transparency, comparability and portability of people's qualifications. The EQF is a common European reference framework which links countries' qualifications systems together, acting as a translation device across different countries and systems in Europe.

Council Recommendation of 22nd May 2017 on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23rd April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2017/C 189/03), is the reference, published in the *Official Journal of the European Union*. The goals (outcomes) of the process of adopting the study program - learning outcomes and acquired competencies are implemented in EQF and they serve as a translation device between different qualifications systems and their levels.

Learning outcomes and study contents need to be constantly adapted to socio-economic changes. Some of the most important goals of the Bologna Declaration, whose implementation process in the Croatian and Spanish higher education system is as follows: introduction of national qualifications frameworks comparable to the EHEA (European Higher Education Area and Bologna Process), define learning outcomes for all three cycles according to Dublin descriptors and quality assurance in accordance with European quality standards (Standards and Guidelines for Quality Assurance in European Higher Education).

Higher Education has looked towards the acquisition of knowledge and competences (the "learning outcome") instead of focusing on study programs and teaching hours. This implies a "paradigm shift", from teaching to learning, from the program to the "learner", from post-secondary education to lifelong learning (Lifelong Learning or LLL), from the formative itinerary to their achievements and from "diplomas" to "qualifications" (that is, the type and level of the set of competencies and knowledge that a person can demonstrate).

Learning outcomes became part of the Bologna Process after the Berlin Conference held in 2003, and its conclusions included the requirement for member states of the Bologna Process to produce a framework of comparable and compatible qualifications in their higher education systems, which will describe qualifications in terms of teaching load, level, learning outcomes, competency and profile. Ministers demanded that the European Qualifications Framework be created for the European Qualifications Framework (Čikeš, 2005). The application of learning outcomes to higher education institutions is a major challenge.

3. Methodology and Research Results

In order to get answers to the research questions, the paper analyses the learning outcomes of the two observed universities. As a result of this research, the paper outlines the learning outcomes of Human Resource Management courses and courses that are related to Human Resource Management (HRM) on examples of the Faculty of Economics of the University of Valencia and Department of Economics and Business Economics of the University of Dubrovnik.

The *Croatian qualifications framework (CROQF) Act* (Ministry of Science, Education and Sports, 2013) establishes the CROQF based on learning outcomes, defined in terms of knowledge, skills and responsibility and autonomy. It is a single, comprehensive eight-level framework, which incorporates credit systems. It includes qualifications from all levels and subsystems of formal education and training (general education, VET and higher education); it will also be the basis for validating non-formal and informal learning. Apart from offering transparency, the CROQF is seen as an important tool for reforming national

education and training; this includes setting up a system for validating and recognising non-formal and informal learning, and creating a well-founded quality assurance system (CEDEFOD, European Center for the Development of Vocational Training (2015). *National Qualifications Framework Developments in Europe*. Retrieved April 19, 2018, from http://www.submeet.eu/european_library/EQF_in_Europe.pdf).

The research carried out for Croatian University of Dubrovnik set in the context of the CROQF (Croatian qualifications framework) and is compared to the results of the ECONQUAL project aimed at “contributing to the process of redefining and reviewing learning outcomes relevant to changes in the social, political, economic and technological environment”. The ECONQUAL project was a necessary step towards creating a sustainable higher education system in the field of economics to the satisfaction of employers, students and higher education teachers (ECONQUAL, 2016). The aim of the project was to “improve the quality of higher education of economists through the development of qualification standards in the field of economics”, while the specific objectives of the project were “to develop a qualification standard for the economy and business economy in a higher education system; criteria for innovation and improvement of study programs at economic faculties” (ECONQUAL, 2016).

In Croatia at the majority of public state universities at the Faculties/Department the study programmes are 3+2, only one is 4+1 and one study programme is integrated 5+0.

Learning outcomes of the *Human Resource Management Course* at the Department of Economics and Business Economics of the University of Dubrovnik. After attending the course and passing the exam, the students will be able to:

- independently design and conduct basic human resource management tasks in all enterprise categories
- analyse internal and external human resource management environment
- understand the concept of strategic human resource management
- understand job analysis issues, systematize the student's postgraduate course and exam
- differentiate the concept of training from the concept of employee development
- apply models, methods, techniques and HR management programs in business practice (planning, attracting, selecting and orienting human resources)
- addressing practical human resource management skills in organizations (work performance management, professional career through work and compensation).

Courses at the undergraduate and graduate level at the Department of Economics and Business Economics of the University of Dubrovnik that are related to the course Human

Resource Management are: courses at the undergraduate study (Basics of Management, Sales Management, Change Management, Operations Management) and courses at graduate study (Corporate Governance, Marketing Management, Strategic Marketing Management, Strategic Management, International Business Negotiation, Brand Management, Business Leadership, Quality Management, Controlling). Also at the study Economics programme is a very important course that one related with Human Resource Management in Labour Economics.

In the Spanish case, the *National Agency for the Evaluation of Quality and Accreditation (ANECA)* is a state foundation created in 2002, in compliance with the provisions of the Organic Law of Universities, which aims to contribute to the improvement of the quality of the higher education system through the evaluation, certification and accreditation of teaching, teaching staff and institutions. ANECA develops different programs to carry out its evaluation, certification and accreditation activity), in order to integrate the Spanish system into the *European Higher Education Area (EHEA)*, although most regions or Autonomous Communities have created their own “regional” quality assurance organizations (*Agència Valenciana d'Avaluació i Prospectiva or AVAP* in Valencia region).

The main programs developed by ANECA are: 1.-VERIFICA: evaluates the proposals of the study plans designed in accordance with the objectives established for the construction of the European Higher Education Area. 2.-MONITOR: monitors a verified program until it must be presented again to renew its accreditation. 3.-ACREDITA: performs an assessment for the renewal of the initial accreditation of official degrees.

Unlike other countries of the EHEA where the structure of degrees and masters is no longer a topic of university policy, in Spain the RD of 2015 reopens the issue of 3 + 2 and 4 + 1 and carries the risk that universities spend their energy in structural aspects instead of investing in more strategic reforms, such as curricular and methodological renewal, lifelong learning, improved governance and university funding, the promotion of innovative capacities of universities and its competitiveness in the European and global sphere.

Degree in Business Administration and Management is analysed according to its subjects for *Human Resource Management Curriculum* (Human resource management tools, Work psychology, Labour economy, Pay incentives and systems, Negotiation techniques and economic applications, Supplementary pension systems, Labour and trade union law, Sociology of organizations, Strategic management of human resources).

Two famous new concepts arrive: “learning outcomes” and “competences”, both used with different shades of meaning and in somewhat different frames of reference. In all cases they are related to what the learner supposedly will know, understand and be able to do at the end of a learning experience (Hernandez-Carrion, 2011, p. 147). At University of Valencia three competences types are established for every degree: Basics, General and Specific

ones. We focus only on *Basic Competences* (*Competencias Basicas = CB*, Faculty of Economics, University of Valencia, Spain (Retrieved February 8, 2018, from <https://www.uv.es/uvweb/economy/en/faculty-economics-1285848977403.html>).

- CB1 - Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

- CB2 - Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

- CB3 - Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

- CB4 - Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

- CB5 - Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

There are also three different *competences for Master degree*, three different competences always for every degree: Basics, General and Specific ones. Basic Competences are:

- CB1: That the students know how to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.

- CB2: That students are able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

- CB3: That the students know how to communicate their conclusions and the knowledge and reasons that support them, to specialized and non-specialized publics in a clear and unambiguous way.

- CB4: That the students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous

- CB5: Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

A different one is *the degree in Labour Relations and Human Resources*. Also we find three competences for every degree: Basics (CB), General and Specific ones; the CB are:

- CB1 - Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

- CB2 - Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

- CB3 - Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

- CB4 - Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

- CB5 - Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

4. Discussion

The significance of Human Resources Management (HRM) is that it reflects the capacity to attract and retain a stable, qualified workforce, making it the greatest asset for achieving positive results for its economy and future. The Bologna Declaration of 1999 has put in motion a series of reforms needed to make European Higher Education more compatible and comparable. Our paper analyses the learning outcomes of the two observed universities, University of Valencia, Spain, and University of Dubrovnik, Croatia; “learning outcomes” and “competences” are related to what the learner supposedly will know, understand and be able to do at the end of a learning experience.

Learning outcomes describe significant learning that learners have achieved, and can be demonstrated at the end of a course or program. There are no rules on how many outcomes are appropriate per lecture course or credit point and standardisation would be artificial. Some courses may have many outcomes that are easily achieved. Other, may have more complex outcomes which are more demanding to acquire.

In this paper it is also shown that even though the same course is analysed, there are a lot of differences between the learning outcomes and connections with other courses that are part of the curriculum of the study programme of the analysed universities which is the proof of heterogeneity of the study programmes between different countries and universities in EU.

5. Concluding Remarks and Recommendations for Future Research

This paper presents a contribution to the analysis study programs of Economics and Business Economics in the contemporary socio-economic context. The research area refers to study programs in Economics and Business Economics in Spain and Croatia. The broader role of this field of study is also to examine the role and significance of the study of management in contemporary socio-economic conditions. The paper emphasizes the necessity of deeper insight and holistic approach to human resource management issues in organizations, especially in the context of relevant contemporary socio-economic developments.

The paper contributes to better compatibility among the study programs of Economics and Business Economics in the country and abroad. As a possible limitation of research it should be emphasized that in the research are not included those courses whose content is indirectly related to the course Human Resource Management. Moreover it can be a guide for further research that could focus on the real needs from basic competences: impact, role of professionals, market value of competences, and implications for globalization; and may also be aimed at further research on the logical and substantive connectivity of the study programs studied at the two universities examined. It will be interesting to include in future research more universities from different countries of the European Union and make the comparison.

References

- Čikeš, N. (2005). *Kvalifikacije i kompetencije u europskom prostoru visokog obrazovanja*, Tempus projekt: Prvi koraci u Bolonjskom procesu, Zagreb, Sveučilište u Zagrebu.
- CEDEFOD, European Center for the Development of Vocational Training (2015). *National Qualifications Framework Developments in Europe*. Retrieved April 19, 2018, from http://www.submeet.eu/european_library/EQF_in_Europe.pdf
- ECONQUAL - Katalog zanimanja (2016). *Istraživački rezultati Projekta ECONQUAL*, Ekonomski fakultet Sveučilišta u Rijeci, Rijeka. Retrieved October 29, 2017, from https://www.efri.uniri.hr/hr/econqual/187_187
- Elken, M. (2015). Developing policy instruments for education in the EU: the European Qualifications Framework for lifelong learning, *International Journal of Lifelong Education*, Vol. 34(6), 710-726. <https://doi.org/10.1080/02601370.2015.1103795>
- Hernandez-Carrion, J. R. (2011). English language for successful integration: Learning from the Bologna Process. *Annals of the University of Oradea: Economic Sciences*, Vol. 20(2), 140-147. <https://doi.org/10.5281/zenodo.1222075>

The Centre for Excellence in Teaching (CET) at Portucalense University: goals, strategies and expected outcomes.

Fernandes, Sandra^a; Morais, Paula^b; Mesquita, Diana^c; Abelha, Marta^{a,d}; Fernandes, Sara^a and Albuquerque, Ana Sílvia^a

^aPortucalense Institute for Human Development (INPP), Portucalense University, Portugal,

^bResearch on Economics, Management and Information Technologies (REMIT),

Portucalense University, Portugal, ^cUniversity of Minho, Portugal, ^dCentro de Estudos

Interdisciplinares do Século XX – CEIS20, University of Coimbra, Portugal.

Abstract

This paper presents part of the change process carried out at the Portucalense University (UPT), Portugal, aimed at promoting student centred teaching and learning. To attain this goal, the Centre for Excellence in Teaching (CET) was created to support academic staff development, provide pedagogic training for teachers, create pedagogical resources and enhance the dissemination of best practices and teaching quality at UPT. The preliminary results of the implementation of the activities developed by the CET reveal a positive participation and involvement of academic staff, according to data collected through an online questionnaire to participants. Teachers showed interest in developing active learning strategies and openness to change their teaching practices. Some examples of the activities implemented by teachers, in the first semester of 2017/2018, are briefly presented in this paper.

Keywords: *teaching and learning; quality; pedagogic training; active learning; PBL.*

Introduction

The shift of paradigm towards student centred learning and teaching is a key issue of the *European Standards and Guidelines for Quality Assurance in Higher Education* (ESG) (Belgium, 2015), a key reference document for internal and external quality assurance in Higher Education. According to this framework, it is possible to identify two important standards for internal quality assurance, namely:

- Institutions should ensure that the programmes are delivered in a way that encourages students to take an active role in creating the learning process, and that the assessment of students reflects this approach.
- Institutions should assure themselves of the competence of their teachers.

Therefore, the constructive alignment between student centred learning, teaching and assessment (Biggs, 1996; Biggs & Tang, 2011) and the professional development and training of teaching staff must be at the heart of the implementation of any change process that aims to promote quality in teaching and learning in higher education.

Some of the guidelines pointed out in the document, concerning the teaching and learning environments, include the following characteristics (ESG, 2015, p. 12):

- “- respects and attends to the diversity of students and their needs, enabling flexible learning paths;
- considers and uses different modes of delivery, where appropriate;
- flexibly uses a variety of pedagogical methods;
- regularly evaluates and adjusts the modes of delivery and pedagogical methods;
- encourages a sense of autonomy in the learner, while ensuring adequate guidance and support from the teacher;
- promotes mutual respect within the learner-teacher relationship;
- has appropriate procedures for dealing with students’ complaints”.

In regard to the teaching staff, the ESG refers to the need to build an environment that offers opportunities for and promotes the professional development of teaching staff, encourages scholarly activity to strengthen the link between education and research and, finally, encourages innovation in teaching methods and the use of new technologies.

This paper presents part of the change process carried out at the Portucalense University, Portugal, aimed at promoting student centred teaching and learning. To attain this goal, the Centre for Excellence in Teaching (CET) was created to support academic staff in the achievement of this outcome.

Context of the study – Portucalense University

Portucalense University (UPT) is a private higher education institution, located in Oporto, in the north of Portugal. It is organized in four Departments: Law, Economics, Management and Informatics, Heritage and Tourism and Psychology and Education that teach 1st and 2nd cycle programmes and post graduations, structured according to the Bologna Process. More than acquiring theoretical knowledge, the students have the chance to develop practical work and research projects, developing different kinds of skills that prepare them for jobs in future career and for living in a competitive global society. Programmes are structured so as to respond flexibly to changing labor market needs, through various teaching methods empirically based on significant case studies whenever applicable. UPT has its own exclusive staff and also counts on the input from external professionals from different industrial and commercial sectors, through seminars with guests on various themes, promoting its relationships with the corporate world with the goal of preparing students for the future professional demands.

As part of the continuous improvement goal within the teaching and learning process, it is part of the institution's objectives that teachers use methodologies aimed at the active participation of students, methodologies aimed at preparing students for research, activities developed within the curricular units which promote students skills in different areas and deepen students' approach to the labour market (mini-internships, projects in partnership with enterprises, action-research projects, among others). The diversity of scientific areas in which teachers teach associated with the different realities as to the type and number of students per class present greater challenges for the accomplishment of this objective.

It is, therefore, a concern of the Rector's Office to promote teacher training and professional development in multiple areas: pedagogical and curricular, languages, training management, personal and social skills that allow them to update in the most diverse areas of teaching and learning, as well as acquire significant tools to develop research, mentoring and teaching tasks.

The Center for Excellence in Teaching (CET), created in 2017, is one of the institutional strategies carried out by the Rector in order to attain the pedagogical challenges faced by higher education European institutions.

The Centre for Excellence in Teaching (CET) at Portucalense University

The CET was created within the scope of promoting excellence and improvement of teaching and learning at UPT. The aims and core activities of this centre are aligned with other institutional bodies of the university, such as the Pedagogic Council and the Evaluation and Quality Assurance Office at UPT.

Amongst the several activities that CET intends to promote to enhance the quality of teaching and learning at UPT, one of the main activities is the development of pedagogic training sessions for academic staff. These sessions are designed, organized and developed according to teachers' individual motivations, interests and needs, previously collected through an online survey.

Aim and goals

The objectives of the CET include the following:

- To promote pedagogic training for academic staff;
- To develop pedagogical resources and publications;
- To create a website for the dissemination of best practices and for the recognition of teaching quality at UPT.

The CET aims to:

- Recognize the importance of pedagogical training for the quality of teaching and learning;
- Respond to the individual needs of academic staff, in terms of training areas;
- Develop strategies that promote the reflection on teaching practices;
- Create a network for the discussion of teaching practices and experiences;
- Disseminate examples of good teaching practices at UPT.

Preliminary Results

Pedagogic Training for Academic Staff

An online survey of Classroom Teaching Methods (Bonwell, 1991) was used to collect data from teachers in regard their teaching methods and also to identify teachers' motivation to participate in pedagogic training. The results of the survey (n=65) indicated that teachers were interested in learning more about active learning (92,3%). Therefore, during the months of June and July, corresponding to the end of the academic year, three training sessions with the duration of 3 hours each were developed about the theme of active learning (Prince, 1994). An external expert, both on education sciences and on coaching for

higher education teachers, was responsible for preparing the training sessions, with the support and guidance of the coordination team of the CET.

Most of the teachers who participated in the pedagogic training sessions (n=27) reported that they introduced changes in the classroom, regarding the strategies used - some examples: Kahoot (flipped classroom), Think-Pair-Share, PBL (Problem and Project) and Simulation. The motivation to change and the attempt shown by the participating teachers, as well as the level of critical reflection shown during the discussion about their teaching practices, are important issues to highlight as results from this first implementation.

The experiences carried out vary in terms of application, according to the level of systematization of the pedagogical approach. That is, in some cases the changes introduced were still of exploratory nature, without great impact, for example, changes in the assessment method; in other cases, deeper changes with impact on pedagogical and curricular practice were verified. However, it is important to stress the diversity of experiences shared by teachers, in their own voices. This represents a significant milestone in the CET's activity, crucial for the professional development of teachers.

A case of PBL implemented in 2017/2018

An example of a pedagogical approach implemented by a group of teachers from the Department of Psychology and Education was based on Project-based Learning – PBL. The pilot experience of PBL methodology was applied in the 2nd year of the Social Education programme at UPT (Fernandes, Abelha, Fernandes & Albuquerque, 2018).

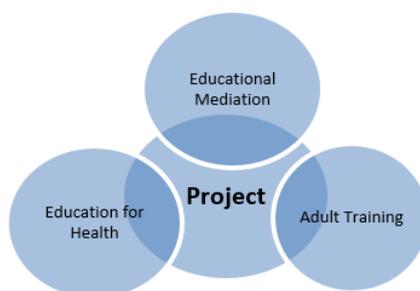


Figure 1. Curricular Units participating in the PBL Project of 2017/2018

In the first semester of the academic year of 2017/2018, an interdisciplinary project was developed within three curricular units namely, "Adult Education", "Education for Health" and "Educational Mediation", under the theme of addictive behaviors and dependencies. The selected theme for the project integrated the learning outcomes specific to each of the

three courses, as well as their assessment methods, in a common project that allowed the curricular articulation and the development of a set of transversal competences considered as fundamental for student success.

Students and teachers perceptions were collected, both at the beginning and at the end of the PBL approach, revealing a positive view of the role of the project to enhance student centred teaching and learning.

Creativity, oral and written communication, problem solving, project management, interpersonal and teamwork skills were key competencies highlighted by students as a result of the PBL project. This also resulted in a greater capacity of autonomy and the development of a more active role of students in their own learning, characteristics which are in accordance with the main guidelines of European Standards and Guidelines for Quality in Higher Education (2015).

Constrains related to time management and adaptation to the PBL methodology were pointed out by the students as the main problems felt in an early stage of the project. These difficulties were overcome with the increase of confidence and experience in the development of PBL methodology.

In addition to improving the teaching and learning process, the PBL methodology has positive aspects, according to the three teachers who participated in the approach. Findings from teachers highlight the following advantages of the PBL approach:

- a) promoting collaborative work amongst teachers, that attenuate any fears regarding methodologies of an innovative nature for the generality of the participant teachers;
- b) greater curricular articulation, culminating in an integrated project of three courses;
- c) increased confidence by teachers on their work;
- d) shared responsibilities by teachers in a complementary way;
- e) improving the quality of student learning, as it encourages risk taking and diversification of teaching methodologies.

Regarding the less positive aspects or difficulties found, teachers identify difficulties in the coordination of the time schedules and lack of time, motivated by the number of additional tasks assumed by each teacher.

Final Remarks

In general, the activities developed by CET at the Portucalense University have shown a positive participation and involvement of academic staff. Teachers are interested in improving teaching and learning and have shown openness to change their teaching practices. The examples reported briefly on this paper contribute to confirm this outcome.

During one of the follow-up sessions carried out by CET, after the implementation of the active learning strategies in the first semester of the academic year of 2017/2018, the teachers also referred to the constraints and difficulties faced when introducing changes to their teaching and learning practices in the classroom. For this reason, it was considered important that teachers collect data from students to better understand their motivations, difficulties and mindset, when introducing changes to the traditional teaching and learning environment. Some of the issues and constraints referred by teachers, based on the notes collected from the external teacher trainer, can be summarized in the three major topics:

- Student mindset: the way students face the challenges proposed, time management by students, class attendance, etc. - Preparing students since the first day at the university is a fundamental issue to change student mindset. Perhaps the starting point is to clarify: What is the student profile that UPT wants to develop? And based on this, UPT should prepare, together with all the stakeholders (teachers, partners, etc.), curricular opportunities and other academic experiences that allow all students to develop the skills associated with this profile.
- Class attendance: this appears to be one of the major difficulties for some teachers, to the point that it even limited the implementation or conclusion of the innovative strategies developed in some contexts. However, the position that UPT should assume based on this attitude demonstrated by students is not consensual amongst teachers. This topic deserves greater reflection and a specific time and space for the joint discussion, was one of the conclusions drawn by teachers.
- "It did not work": for some teachers, the new strategies implemented simply did not work (eg. Kahoot in the Psychology programme, student involvement in the definition of questions for a test, the inclusion of a new curricular unit within an interdisciplinary project, etc.). These situations should be further analyzed case-by-case in order to better understand the constraints and create alternatives and other solutions with the aim of improving teaching and learning. This is a fundamental issue for teacher motivation.

Future work of CET should focus on continuing improving teaching and learning through academic staff development and training, which can be complemented by other activities that can involve greater student participation in the reflection process. It is important to understand students' point of view, what do they think about these changes, what do they

consider that is important to change. In sum, student involvement is a crucial step to take CET to a higher level.

References

- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university: what the student does* (4th ed.). Buckingham: Open University Press/McGraw Hill.
- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), 347-364.
- Bonwell, C., & Eison, J. (1991). *Active Learning: Creating Excitement in the Classroom*. ASHE-ERIC Higher Education Reports. Washington DC: ERIC Clearinghouse on Higher Education.
- ENQA, ESU, EUA & EURASHE (2015). Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). Brussels, Belgium.
- Fernandes, S., Abelha, M., Fernandes, S. & Albuquerque, A. S. (2018). Implementation of PBL in a Social Education Programme at the Portucalense University. In *PAEE/ALE2018 Conference Proceedings*. 28fev-2mar, Brasília, Brasil. (accepted for publication).
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93 (3), 223-231.

The ISA Lab workshop: a Project based learning initiative

Orozco-Messana, Javier^a; De la Poza, Elena^b

^aDepartment of Mechanical Engineering and Materials, Universitat Politècnica de València, Spain, ^bCenter of Economic Engineering, Universitat Politècnica de València, Spain

Abstract

In the context of higher education in the XXI century, the different stakeholders (markets, firms, households, States) assume prospective University graduates will be responsible for providing solutions to the most challenging societal problems, delivering sustainable projects and contributing to improve the quality of life of citizenship controlling for the local but also global impact. Academic staff adapt their role continuously to foster students into the acquisition of competences and skills to better fulfill the societal demands.

This paper deals with the process of conceptualization, design and implementation of a PBL workshop in an international and multidisciplinary environment. The ISA lab workshop was envisioned by an academic who ideated, planned, designed and empowered others into action. The result was the first edition of the ISA lab workshop, an international multidisciplinary workshop on sustainability.

Keywords: *project based learning; higher education; sustainability; stakeholder.*

1. Introduction

Project-Based Learning (PBL) is an innovative approach to learning that teaches a multitude of strategies critical for success in the twenty-first century (Bell, 2010). This method uses problems as a starting point for the acquisition and integration of new knowledge (Barrows, 1986). Following García (2016), the PBS methodology embeds four main elements: (1) authenticity since the problems to solve are real; (2) research: students need to build their knowledge by discussing and gathering information; (3) use of techniques to plan, design, coordinate, control and deliver the project; (4) autonomy: students risk by making choices, assuming responsibility.

Students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge, (Bell, 2010). As a result, students develop general but also subject competencies by applying complicated processes and procedures such as planning, communication, research and self-directed learning, (Lasauskiene and Rauduvaite, 2015).

The implementation of the PBS as an education paradigm rather than a mere teaching learning method employed by one lecturer in a single course might require to introduce solutions at institutional level, to design a PBS model from its conception to its implementation, (Lasauskiene and Rauduvaite, 2015). Moreover, PBL can become the perfect tool for integrating multiculturalism and cross-disciplinary context by higher learning partner institutions cooperate in the design and implementation of educational programs based on PBL, (Arroyo-Cañada *et al.*, 2016).

Thus, PBL is an overall approach to the design of learning environments; in their work Krajcik and Blumenfeld (2005) identify the principles of PBL and their lessons learnt about this methodology over ten years of experience providing a model for applying project-based methods to classrooms across the curriculum.

This paper deals with the process of conceptualization, design and implementation of a PBL workshop in an international and multidisciplinary environment. The ISA lab workshop was envisioned by an academic who ideated, planned, designed and empowered others into action. The result was the first edition of the ISA lab workshop, an international multidisciplinary workshop on sustainability.

In the context of higher education in the XXI century, the different stakeholders (markets, firms, households, States) assume prospective University graduates will be responsible for providing solutions to the most challenging societal problems, delivering sustainable projects and contributing to improve the quality of life of citizenship controlling for the local but also global impact (Lehmann *et al.*, 2008). Academic staff adapt their role continuously to foster students into the acquisition of competences and skills to better fulfill

the societal demands. Harden and Crosby (2000), synthesized the academic staff roles, as a planner, facilitator, information provider, resource developer and a role model.

2. ISA lab workshop: the Interdisciplinary Sustainability Assessment Laboratory

The ISA lab workshop in its first edition was performed by academic staff from six institutions belonging to the Polimundus network - a collection of Universities seeking to promote Engineering Excellence in Research. The academic staff from the North American and European Universities of British Columbia (UBC), Cork (UCC), Cambridge (U.Cambridge), Delft (TU Delft) and Politècnica de Valencia (UPV) gathered for a week in the UPV campus located at Valencia, Spain, to conduct an experimental and interdisciplinary project-based learning workshop on sustainability.

The main goal of this workshop consisted of bringing academic staff from a myriad of areas of expertise (Engineering for Sustainable Development, Chemical Engineering, Energy, Built Environment, Architecture, Green Infrastructure, Law) and institutions but also students with diverse backgrounds, interests and cultures. They work on real sustainability-oriented challenges and to explore the benefits of working in such an environment and to begin to shape a vision for the future needs in this area.

The novelty of this workshop relies on the heterogeneity of the drivers combined: the diversity of the academic body (the facilitators of the student's learning process), the independent background and origins of students, the PBL as the teaching approach employed, all rolled up by the enhance of promoting the sustainability in the region of Valencia.

Since courses at higher education Degrees are mostly organized in strict disciplinary environments, without providing the opportunity to cross with other disciplines, initiatives such as the ISA lab in Valencia can provide a safe space for staff and students to experiment with these methods, to learn from each other and reflect on the skills and approaches which might help them be more effective in the future.

2.1. Design of the ISA lab workshop

The dreamer and creator of the ISA lab was a UPV lecturer who recruited the crew of academics into the ISA lab workshop at its inception. Note, not all the lecturers knew each other in advance and the ISA lab design and implementation was their way of meeting.

Then, lecturers chose at least 2 students from their Universities of origin (at Master and undergraduate level). The only criterion established for the selection of students was their engagement in sustainability. Thus, a lecturer and at least two students represented each

University involved in the workshop. During the ISA lab planning stage the communication between partners was through e-mail but also through visits from the UPV leader to the rest of institutions.

Once the main stakeholders involved in the workshop were confirmed, the stage of design started. The primary goal of learning by projects, required the identification of cases of study that covered the glocal condition: (i) to provide a real scenario in which a local problem in the region of the Valencian Community that requires action but (ii) in which the solutions could come from a global multidisciplinary perspective. It is relevant to comment that with the exception of the UPV academic staff, the rest of academic participants were not engaged with the projects previous to the ISA lab.

During the workshop the students would be provided with a portfolio of information for each of the cases of study selected. Then, they would tackle the six dimensions of each project (environmental, social, economic and technical) by analyzing the impact of the solutions presented. (Table 1 describes each project and the solutions presented to students for their analysis).

Table 1. Description of the projects.

Project	Place, description and solutions to analyze by each team
<p>NZEB* refurbishment in a natural park</p>	<p><i>Place:</i> Font Roja (Alcoi), the city of Alcoi is nestled between two natural parks.</p> <p><i>Description:</i> The city council decided to refurbish a group of houses at the core of the Font Roja natural Park as the basis for a sustainability program for the city.</p> <p><i>Solutions to analyze:</i> The project aims at the refurbishment of these houses which will demonstrate the feasibility of a sustainable built environment where different academic, innovation and social activities will be carried out. The rural activities and sustainable tourism are seen as a huge opportunity to boost the importance of Alcoi in this context.</p>
<p>NBSs** for the Benicalap neighbourhood</p>	<p><i>Place:</i> Tabarca island (Alicante).</p> <p><i>Description:</i> An old lighthouse will be refurbished under nZEB principles.</p> <p><i>Solutions to analyze:</i> The project focuses on refurbishing and locating an innovation center for academic and demonstration activities related to Sustainability through circular economy at the lighthouse. the perspective of a sustainability multi- stakeholder assessment.</p>
	<p><i>Place:</i> Benicalap neighbourhood, (Valencia city)</p> <p><i>Description:</i> In Valencia city the green infrastructure concept has been extended, to include new spaces such as "Casino del Americano" and "Alqueria de la Torre" that allow to capitalize the natural resources and promote population's well-being.</p> <p><i>Solution to analyze:</i> The project will propose a rehabilitation of the traditional gardens of the buildings, including solutions such as: vertical ecosystems for the decentralized treatment of gray water integrated into buildings; bioclimatic strategies using the garden components to comply with standards NZEB activities engaging the citizenship related to urban orchards.</p>

*Nearly zero energy buildings; **Nature based solutions

Source: Own performance

2.2. Implementation of the ISA lab workshop

The ISA lab workshop spinned around the students learning. As a PBL workshop students were goal-oriented to solve real problems in the Valencia region. However, the ISA lab was an experiment in the sense that the design and implementation of the workshop was concurrent. Thus, there were no pre-planned solutions or correct answers, just an outline brief and a search for sustainable solutions.

The students worked in small groups over 5 days to deliver new concepts for these existing challenges, making the most of their talents as individuals and drawing on their respective disciplinary background.

Each morning a faculty staff delivered a keynote based on their expertise exercising a role of information and theme topic. The keynotes covered a wide range of topics, all related to sustainability.

Then, the students were grouped by the academic staff in teams of 3-4. Each team was combining different students institutions and backgrounds in order to foster multiculturalism, interdisciplinarity. Each group was assigned a project. They were asked to provide solutions based on sustainability but without forgetting economic, social and cultural dimensions. In order to propulse the cohesion of the teams, a social programme was also planned, where students and Faculty could meet and get to know each other as individuals.

At the end of the week students had to present their findings to the all group. A board composed of the academic staff would provide feedback, comments, suggestions and questions to their solutions. The participants received a certificate of participation at the workshop but more important they met with peers but also with public and private institutions.

2.3. Assessment of the ISA lab workshop

Once the workshop concluded, students were reached by email and they were requested to provide feedback about the ISA lab workshop. They were asked the following 3 non-structured questions:

1. Can you identify any aspects of the workshop or its delivery that you found particularly useful?
2. Do you have any suggestions as to how the workshop or its delivery might be improved?
3. Do you have any other relevant comments to make on the workshop or on your learning experience around it?

All students (10 participants) emailed back their opinions about the workshop. About question 1, there was a complete consensus about the utility of the workshop. All participants agreed on the positive aspect of working on multidisciplinary teams. They also highlighted the social program helped them to team up and unify their efforts on the project. On the other hand, about question 2 participants provided different suggestions, mainly about how they would have appreciated to have more information about the projects beforehand to the training in Valencia. In addition, the project scope might need some reshaped and guidelines about how to find solutions should be provided. Finally the common answer to question number 3 was the gratitude shown by participants for how their knowledge had improved from an academic and professional point of view by participating in the workshop.

3. Conclusions

This work deals with the process of definition, conceptualization and implementation of a multidisciplinary international project based learning workshop. The success of the ISA lab workshop was achieved in terms of satisfaction coming from the participants (lecturers and students) to the workshop but also from the different stakeholders proposing the projects who valued positively the outcomes of the workshop and the competences acquired by the students throughout the workshop.

The success of the first edition of the ISA lab workshop will bring a new edition in 2018. The second edition of the ISA lab workshop will embrace the former parties but also new international Universities and projects ideated by public and private bodies. In addition, at the host University, UPV, the ISA lab workshop brings together lecturers from different disciplines working together in the continuous process of improvement of higher education.

References

- Arroyo-Cañada, F.J., Argila-Irurita, A.M., Solé-Moro, M.L. (2016). Competency-based Learning in a Real and Multicultural Marketing Consultancy Project, *Procedia - Social and Behavioral Sciences*, 228, 449-456.
- Barrows, H.S. (1986). A Taxonomy of problem-based learning methods. *Medical Education*, 20 (6), 481-486.
- Bell, S. (2010). Project-Based Learning for the 21st Century: Skills for the Future. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83 (2), 39-43.
- García, C. (2016). Project-based Learning in Virtual Groups - Collaboration and Learning Outcomes in a Virtual Training Course for Teachers. *Procedia - Social and Behavioral Sciences*, 228,100-105.

- Harden, R. M. & Crosby, J. R. (2000). The good teacher is more than a lecturer: the twelve roles of the teacher. *Medical Teacher*, 22, 334–347.
- Krajcik, J., & Blumenfeld, P. (2005). Project-Based Learning. In R. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (Cambridge Handbooks in Psychology, pp. 317-334). Cambridge: Cambridge University Press.
- Lasauskiene, J. & Rauduvaite, A. (2015). Project-Based Learning at University: Teaching Experiences of Lecturers, *Procedia - Social and Behavioral Sciences*, 197, 788-792.
- Lehmann, M., Christensen, P., Du, X., Thrane, M. (2008) Problem-oriented and project-based learning (POPBL) as an innovative learning strategy for sustainable development in engineering education. *European Journal of Engineering Education*, 33(3), 283-295.

Designing a programme for Sustainability in Vietnam: Smart Sustainable Vietnamese Cities, SSVC.

Rietbergen, Martijn^a; De la Poza, Elena^b; Orozco-Messana, Javier^c

^aResearch Group New Energy in the City, Institute Engineering & Design, Utrecht University of Applied Science, Netherlands; ^bCenter of Economic Engineering, Universitat Politècnica de València, Spain; ^cDepartamento de Ingeniería Mecánica y de Materiales, Universitat Politècnica de València, España,.

Abstract

This work deals with the design and development of the SSVC module, which is organised and implemented by European Higher Education Institutions in partnership with Vietnamese Universities. The reform of the Higher Education in Vietnam requires new pedagogical practices and methods which are used in the SSVC module. In addition, the process of design must include the adjustment of the European content and pedagogical methods into Vietnamese circumstances. Finally, the programme needs to be piloted and assessed.

Keywords: *stakeholder; environment; Higher Education; sustainability, alliance.*

1. Introduction

Vietnam has been one of the world's most dynamic developing countries during the past two decades. Alongside significant economic growth, the urbanisation process in Vietnam is happening rapidly, creating significant pressure on the sustainability in urban areas. The transition towards smart sustainable Vietnamese cities is therefore a huge challenge. In this context, universities have the responsibility to update their curricula, tune their programmes to what the market requires, and thus educate competent professional, with the right knowledge, skills and attitude. One of the major concerns in the current Vietnamese teaching programs is limited tuning between education and the workplace. The design of a so-called hybrid learning environment (Zitter and Hoeve, 2012) can facilitate the proper transition of knowledge, skills and attitude between education and the workplace. European Higher Education Institutions have a long distance traveled in this direction and can foster and guide others into the right path.

This work deals with the process of design and production of guidelines for a programme of sustainability in Vietnam. The purpose of this programme is therefore to educate young professionals in the field of engineering / natural science that are able to develop integrated smart sustainable solutions for economic, social and environmental challenges in Vietnamese urban areas.

2. The SSVC programme

2.1. Stakeholders of the programme

The title of the programme relies on the contents of the course. The Smart Sustainable Vietnamese Cities is a 15 ECTS (European credit transfer and accumulation system), comparable to one one quarter of an academic year, about 400 study hours including contact hours, group work, self study. The SSVC programme will be offered by various Vietnamese universities as part of or as an add on to of existing bachelor programmes. The SSVC programme does not lead to a degree itself.

The involved Higher Education Institutions (HEIs) is a consortium of Vietnamese and European Universities. Following in table 1, the HEIs are detailed:

Table 1. Involved HEIs in the SSVC programme

Hanoi University of Civil Engineering - HUCE - Vietnam
Danang University of Science and Technology - DUT - Vietnam
Ho Chi Minh City University of Natural Resources and Environment - HCMUNRE - Vietnam
Vietnam National University - VNU-HUS - Vietnam
Haiphong University - HU - Vietnam
Hue University of Sciences - HUS - Vietnam
Turun Ammattikorkeakoulu Oy - TUAS - Finland
Stichting Hogeschool Utrecht - HU - Netherlands
Universitat Politecnica de Valencia - UPV - Spain
The Manchester Metropolitan University - MMU - United Kingdom
Hochschule für Angewandte Wissenschaften - HAW - Germany

Source: Own performance.

The programme is intended to be fully implemented in the academic year 2019-2020. Until 2019 the programme will be piloted. The target group are students in their 3rd or 4th year of programmes at at European Qualification Framework EQF-level-6; European Higher Education Area, QF- EHEA-First cycle = Bachelor.

The programme is composed of 5 courses (table 2), each of those have the same weight (2.5 credits in ECTS), with the exception of the last course, the urban sustainability challenge (5 ECTS). The development of each course was coordinated by one European HEI and one Vietnamese HEI.

Table 2. Course overview

Course name	HEIs
SSVC Introduction and Methodology	HAW and VNU-HUS
Design for Social Sustainability	HU and DUT
Sustainable Entrepreneurship	MMU and HUCE
Engineering Sustainable Cities in Vietnam	UPV and HCMUNRE
The Urban Sustainability Challenge	TUAS and VNU-HUS

Source: Own performance.

2.2. Programme design process

The design process of the programme involves four stages. Each of those stages requires a change of paradigm in the Vietnamese Higher Education system. The involvement of the Vietnamese HEIs is a key issue for the success of the implementation and development of the programme. The four stages are detailed as follows:

1. Understand the concept of hybrid learning environments. For this purpose the Zitter and Hoeve framework was applied, (Figure 1). In each course, learning activities should be represented and be aligned in each of the four quadrants.

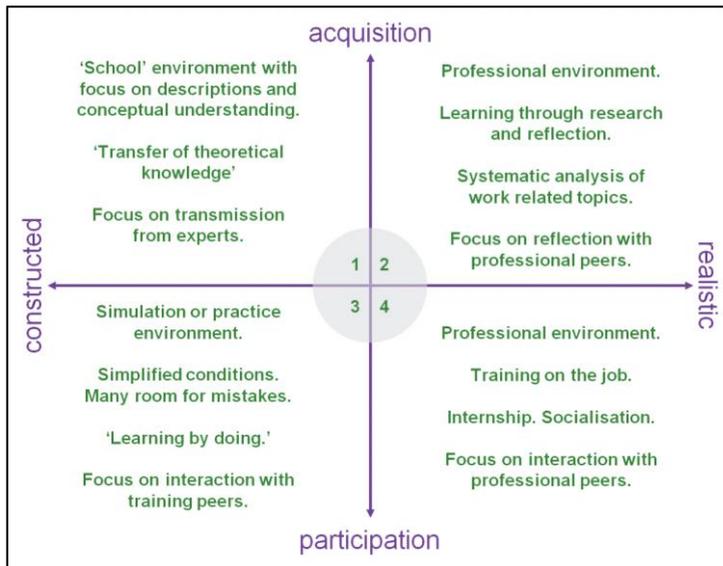


Figure 1. Hybrid Learning Environment. Source: Zitter, I. and A. Hoeve (2012).

2. Understand the concept of authentic tasks. The key element of the hybrid learning environment is the authentic task. The authentic task are assignments that are taken from practice. In other words these authentic task are original professional activities. The authentic tasks require further competencies in different domains, including specific knowledge, skills and attitude. The learning process to master the task should preferably takes place in all four quadrants of the hybrid learning environment.

3. Identify authentic tasks for the programme, preferably one per course. In table 3, examples of authentic tasks are described for each course and context.

Table 3. Authentic tasks examples

Course name	Example of authentic task	Context
SSVC introduction and methodology	Example: Quick scan of sustainability problems	Any
Design for Social Sustainability	Example: Making a Social impact assessment / Making a social design for building new communities	Students can choose one out of the three authentic tasks that relate to: 1) Waste / water; 2) Energy; 3) Land use planning
Sustainable Entrepreneurship	Example: drawing up a waste management plan, defining an energy saving strategy for a building / municipality ...	Students choose one out of the three authentic tasks that relate to: 1) Waste / water; 2) Energy; 3) Land use planning
Engineering Sustainable Cities	Example: Writing a business plan / business model for an energy service company	Students choose one out of the three authentic tasks that relate to: 1) Waste / water; 2) Energy; 3) Land use planning
The Urban Sustainability Challenge		Projects could relate to one of the three topics 1) Waste / water; 2) Energy; 3) Land use planning

Source: Own performance.

Then for each course the following aspects need to be defined: the title of each authentic task, a short description of the task, the environmental context, the most important domains of competence, the knowledge, skills and attitude required, and finally the assessment procedure.

Once the contents of the course are complete, the next stage will consist of sketching the students' learning process. Provide answers to the following questions, (Tafi, 2016):

1. how the student will learn through the hybrid learning model;
2. How is the teacher facilitating the learning? With what are students' learning?
3. With whom are they learning? Where are they learning? When are they learning?

Answers to these questions mean to apply new pedagogical techniques based on a more interactive relationship with the student. The future instructors of SSVC must train those pedagogical techniques. For this purpose, trainers perform several workshops. Each workshop is focused on a different methodology. After each workshop, there should be an assessment in which participants should apply critical thinking about what has happened during it and the changes they have experienced as instructors.

The participants need to answer to the following questions:

1. Which aspects of the workshop need improvement in your perspective?
2. Are there things that should be added?
3. What do you think of the quality of the output of the work delivered by the trainees?
4. What observations can you share about the trainees learning efforts/attitudes?
5. What important lessons can be learnt from the reactions of the participants?
6. To what extent did the content fit with the Vietnamese University context and cultural context?
7. What do you think the trainees specifically need as additional training as a follow up to continue with developing the course materials?

3. Conclusions

The main goal of the course development was to support the modernisation of Vietnamese partner university curricula. The activity aims to build the capacity of the universities in Vietnam and their stakeholders to give them the tools to enable a transition in Vietnam through a number of activities that educate professionals and students to develop viable solutions for smart sustainable cities.

This new cooperation between universities, enterprises and public bodies provides valuable opportunities for students to learn by designing solutions for environmental challenges in the cities as part of their Higher Education studies. In the longer term participants will form sustainable alliances, not only between universities in Vietnam but also between universities and enterprises at the regional, national and international level.

References

- Lokhoff, J., Wegewijs, B., Durkin, K., Wagenaar, R., Gonzalez, J., Isaacs, A.K., Donà L. F., Gobbi, M. (2010). A Tuning Guide to Formulating Degree Programme Profiles Including Programme Competences and Programme Learning Outcomes. Deusto, Bilbao, Spain.
- Mulder, H., Ten Cate, O., Daalder, R., & Berkvens, J. (2010). Building a competency-based workplace curriculum around entrustable professional activities: The case of physician assistant training, *Medical Teacher*, 2,10, e453-e459.
- Tafi, T. (2016). Introductory course on SSC. Overview on course content and timing. ESSENCE.
- Zitter, I. and A. Hoeve (2012), "Hybrid Learning Environments: Merging Learning and Work Processes to Facilitate Knowledge Integration and Transitions", OECD Education Working Papers, No. 81, OECD Publishing. <http://dx.doi.org/10.1787/5k97785xwdvf-en>

A Reflection on Teaching Practice: A Masters Level 9 Microteaching Application

Wright, Angela

Department of OPD, School of Business, Ireland.

Abstract

I hear, and I forget. I see, and I remember. I do, and I understand

(Asian Proverb).

The context of this research is the examination of teaching practice through the lens of 'microteaching', thus affording the opportunity to reflect on and evaluate one's personal delivery with the view to instigating better actions for practice in the future. This study specifically contributes to a novel critical enhancement of level 9 teaching delivery where the cohort are adult learners. The focus of this evaluation on current practices is to establish where improvements could be made to teaching delivery through the direct scrutiny of peers. Reflection on the feedback and on the sessions was reviewed and recommendations were embraced and operationalised.

The empirical data was gathered through three peer review microteaching sessions that were recorded and where feedback was given after each session. The microteaching was repeated once a month over a 3-month interval process. Feedback from the sessions was analysed and recommendations for practice were developed. These recommendations will be considered, and relevant resultant changes will be made to improve future practice at level 9. It is envisaged that the findings of this research will better inform the author, the academic plan, and the faculty for future teaching practice.

Keywords: *teaching practice, microteaching.*

1. Introduction: Best Practices of T&L in Higher Education

At this juncture in the 21st century, higher education (HE) is abuzz with conversations and activities regarding teaching & learning (T&L). Institutions are measuring T&L and considering best practices that may facilitate this. Altering one's own teaching practice is even more challenging, and less prevalent than measuring T&L in general (Lewis, 2010). Improving T&L in higher education became an important international endeavour in the 1960s and 1970s, corresponding to an influx of students coming from a broader range of backgrounds, and with diverse expectations (Sorcinelli, et al., 2006:2). Academics now face even more challenges than before in higher education, with the engagement of students posing difficulties. Student and lecturer expectations can often be mismatched, posing much anxiety for both learner and those charged with delivery. Issues such as assessments and accountability, new technologies, diverse students, institutions striving to achieve 'the next level' etc., all impact on the pressures on both T&L. Today, students are not afraid to voice their opinion or protest on delivery of course content or even resort to litigation. Opinionated student behaviour has challenged post-secondary institutions to modify traditional ways of teaching. No longer is a thorough knowledge of the subject matter enough to teach effectively (Lewis, 2010). In Ireland, an emphasis on increased strategic focus exists within institutions on the quality of T&L (hea.ie). This has been supported by institution-level investments and through collaborative work undertaken in T&L networks¹.

1.1. Research Context: The Need to Engage Students and Facilitate Learning

For many faculty members who are accustomed to lecturing² while students listen, learner-centred teaching may require new and unfamiliar teaching skills, and raise fears about lack of coverage of content or less control over assessments. Learner-centred teaching allows students to do more of the learning tasks, and learn more from and with each other (Weimer, 2002). Students learn differently in different situations, and surface and deep learning, for example, vary according to the academic task (Ramsden, 1992). Meaning is never the same from one person to the next, and a surface approach to learning leads down a desolate road (Entwistle, 2009; Ramsden, 1992). A deep approach to learning on the other hand is what all lecturers want their students to experience (Ramsden, 1992). Teachers who believe their job is to cover their course systematically by transmitting information to students are more likely to encourage surface learning approaches, where

¹ Irish Learning Technology Association (ILTA), Educational Developers in Ireland Network (EDIN), All-Ireland Society for Irish Higher Education (AISHE). Since 2000, a total of €33.5m has been invested in T&L in Ireland in a period that has seen a transformation in the resourcing of T&L, with greater availability and uptake of professional development (hea.ie).

² Teacher focused (concerned with subject matter), student focused (encouraging students to develop their own ways of understanding, (Entwistle, 2009).

retention is temporary, generalisation of knowledge poor and learning how to learn is minimal. On the other hand, teachers who encourage student involvement in the learning process, for example by using Problem Based Learning (PBL), and focus on the quality of learning outcomes are more likely to encourage cognitively deeper and richer learning (cte.cornell.edu; Ingleton et al., 2000; Newble & Cannon, 1995).

2. Methodology

This researcher has lectured and supervised on a Masters of Business programme since 2006. The student cohort consists of adult learners who come from diverse situations and positions. For this programme, deep learning (delivered through PBL) is paramount as is student-centred learning. Over the past number of years, research has been undertaken on this programme to ensure consistency in assessment, analysis of student feedback, outside industry based and programmatic reviews etc., but never on the in-class lecture delivery itself. The researcher therefore believed that the time had come after 12 years to examine one's own delivery and teaching practices in the classroom context through peer review microteaching analysis. Microteaching was developed at Stanford University in 1961 by Dwight W Allen as one part of an experimental teacher education programme supported by the Kettering and Ford Foundations (Allen, et al., 1968; Spelman, Brooks, 1972). This Stanford technique involved the steps of "plan, teach, observe, re-plan, re-teach and re-observe" (Remesh, 2013). Microteaching involves a small group of peer instructors teaching short lessons in front of each other to gain feedback (Donnelly & Fitzmaurice, 2011). The lessons are recorded for later viewing and discussion. When the concept was first introduced peers were fearful of it as it was new for most and perceived as a stress to teach in front of one's peers. For the empirical element of this study, microteaching sessions took place over a three-month period – one session per month for 20 minutes (my regular lectures are 3 hours) on a topic familiar and comfortable for the researcher. The lecture took place in front of two colleagues from the T&L Unit and the session was recorded for review later. Feedback sheets were filled in by the two peer reviewers and all data was shared and discussed with the lecturer afterwards. After the first session, the researcher reviewed and improved on practice and repeated the process over the following two months. After the last session, the researcher reflected on their own personal practice to improve same. The whole process was then reviewed and documented.

3. Findings & Discussion: A Reflection on Microteaching Sessions

Microteaching can be a revealing and disturbing experience (Donnelly & Fitzmaurice, 2011), but many find it beneficial. The sessions forced this researcher to stop for the first

time, and take stock of my own teaching practices. I had to come out of my ‘comfort zone’. I knew from the beginning that this would be stressful (Donnelly & Fitzmaurice, 2011), but I persisted in the interest of improving practice. Certainly, presenting before one’s peers is stressful. Reviewing the video of the session was instructive and enabled reflection and self-assessment.

Table 1. Self-Assessment findings from the First Session

OBSERVATION	COMMENT
1. I felt rushed. I didn’t appear so in the video. I knew that timing would be an issue for me, as I have developed the habit in my own teaching of revisiting an unfinished topic in the next lecture	1. You may appear better to your audience than you are feeling in the session
2. Watch timing! I omitted outlining what I would cover in the session at the beginning	2. I will need to clarify this (Entwistle, 2009)
3. Always outline the content of the session in advance, allowing time for a summary at the end	3. Due to timing, I did not allow time for questioning to check for clarity of the session
4. Check for understanding through questioning	4. Develop a process for this

3.1. Self-Assessment from the Second Session

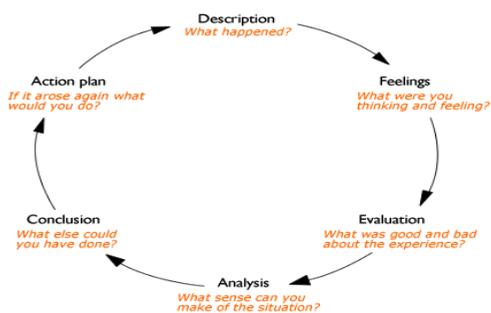
In line with the (MIT, n.d), I was able to hone my skills and focus more clearly for the second session after a thorough reflection on the first experience. Analysis of the first session provided a great basis to improve the second session. I felt much better equipped the second time. Timing was much tighter, I included an interactive session in the form of projective techniques for the audience, I had sufficient time for a Q&A session and I checked for clarity (Aithal, 2011; Entwistle, 2009). On the second occasion, I was certainly more relaxed. The peer feedback sheets also reflected these improvements.

3.2. Self-Assessment from the Third Session: Reflection

At the third session, this researcher was much more relaxed and by now well familiar with the process and constructive feedback from peers. Previous suggestions and corrections were implemented in this session. The peer feedback was encouraging and I had taken on board previous suggestions. At this stage, thoughts of how beneficial this overall exercise was in terms of future teaching in Higher Education were maturing in one’s mind. The

benefits of microteaching overall and how such sessions can be essential and most beneficial for lecture preparation came to the fore (Aithal, 2011). The final step now for the researcher was to reflect on the process for further betterment, and future implementation and this was enabled using (Gibbs, 1988). The following provides some (due to the limitations of this paper) but not all the insights of the reflection process.

3.3. *The Experience: Personal Teaching Practice Reflection–Gibbs six stages [A-F]*



(Gibbs, 1988).

Diagram 1. *The reflective cycle*

A: Description: What Happened?: The microteaching for the first time after 15 years of teaching forced me to examine and evaluate practice. In the past, I had been fooling myself into thinking that I had reviewed my practice, for example thinking – “That went well”, “Students seem happy”, “Results are good, the External examiner is happy”. I now realise that this is a less than satisfactory approach and did not align with HE student education.

B: Feelings: Where I was in my own mind prior to the sessions and where I am now are at polar ends. I came to microteaching a confident lecturer (in my own head), and very much in my ‘comfort zone’, nothing was a problem, but undertaking the microteaching sessions, made me nervous initially; I now had to present something from my own subject area to my peers. I had to take time to prepare so that I would not appear foolish. Even so, on the first occasion, I still made mistakes in this session. In hindsight, the experience was positive for me. It challenged me to focus on my own lecturing skills. By the end of the process, I felt more like my own self, more confident and in control. Maybe my everyday lecturing had become second nature—a certain routine had set in, and I hadn’t even realised this? The micro session was a complete new situation and experience for me and I found a new energy. I need to ensure that the ‘everyday’ does not become ‘mundane’ in my lecturing situation.

C: Evaluation: We evaluate to learn (Harvey, 1998). Microteaching forced me to evaluate and reflect on my own teaching and how my students learn. The evaluation in terms of

peer feedback, was a ‘first’ for me, and forced me to deeply reflect and find ways to learn from my mistakes (Ramsden, 1992).

D: Analysis:

Table 2. How Microteaching Developed my Teaching

OBSERVATION	COMMENT
1. Forced me to seriously reflect on my current teaching practices: critical self-evaluation	1. Embrace more peer discussion and review
2. Add more clarity to the sessions through questioning	2. Made me reflect on a new learning experience and how daunting this experience can be for students
3. Encourage more group discussion in class	3. Remind me of what it is like to be a student again
4. Change the habit of dragging topics over weeks	4. Forced me to look more deeply at the challenges that my own students face
Finally, I will embrace the set of seven features of lecturing outlined by Entwistle (2009): Clarity, Level, Pace, Structure, Explanation, Enthusiasm, Empathy.	

E: Conclusion: Recapturing the experience and ‘mulling over it’ is beneficial (Boud *et al.*, (1985). It is paramount that we embrace aspects of our own practices that have been exposed through reflection from this research. The relationship between learner and teacher is complex, (Karmas, 2006), and I have found this to be especially true in the context of teaching the adult learner.

F: Action Plan: Microteaching afforded insight into myself, my students, assignments, assessments, and course content. We have a lot of thoughts, feelings and ideas (Moon, 2001), but we just need to reflect on them and draw meaningful concepts from them through reflection. My philosophy of teaching has now changed. In the future, I will engage in meaningful deep reflection, and would advocate that all departments and schools set up new processes for their staff to facilitate reflection, peer feedback and advice. Also, there is an overarching need to be even more reflective. We must be more proactive and not complacent (Moon, 2001).

4. Final Conclusion

A love of learning is part of who I am, and this research afforded an opportunity to critique, learn again and embrace new techniques. An opportunity to gain valuable knowledge from one's peers, who provided very clever and interesting insights into their own methods and practices, is invaluable. Although a fearful prospect, the microteaching peer feedback proved most encouraging and supportive. The peer commentary was a very positive experience for me personally, and underpinned my confidence in terms of energy, movement, and gestures, which is reassuring (Aithil, 2011). Feedback offered me the opportunity to reflect (Donnelly & Fitzmaurice; 2011; Moon, 2001), on my overall lecture preparation and ultimate delivery. We are always learning which is a great gift. If we are open to constructive criticism, enable ourselves to reflect on this and learn from it, we will never become bored with ourselves or boring in the eyes of our students. Hopefully, we will provide excitement, energy, and inspiration for our students to take with them into their future lives and careers. Our influence as teachers can have a profound effect on our students and shape their future careers.

References

- Allen, D.W, Fortune, J.C., Cooper, J.M. (1968). *The Stanford Summer Micro Teaching Clinic in Microteaching: a Description School of Education, Stanford University* (Mimeo).
- Aithal, S.C. (2011). "Micro Teaching Skills", Dept. of Microbiology, Dnyanopasak College, Parbhani (MS) 431 410, available at <http://www.scribd.com/doc/41047012/Micro-Teaching-Skills>.
- Boud, D., Keogh, R., Walker, D. (1985). "Promoting Reflection in Learning: A Model". In D. Boud, R. Keogh, & D. Walker (Eds), *Reflection: Turning Experience into Learning*. London: Kogan Page.
- Cte.cornell.edu. "Problem-Based Learning; available at <http://www.cte.cornell.edu/teaching-ideas/engaging-students/problem-based-learning.html>
- Donnelly, R., Fitzmaurice, M. (2011). *Towards Productive Reflective Practice in Microteaching*, Learning, Teaching and Technology Centre, Dublin: Arrow, Dublin Institute of Technology.
- Entwistle, N. (2009). *Teaching for understanding at University, Deep approaches and distinctive ways of thinking*, US: Palgrave Macmillan.
- Gibbs, G. (1988). "The reflective Cycle", available at <https://www.brookes.ac.uk/students/upgrade/study-skills/reflective-writing-gibbs/>.
- Harvey, J. (1998). *Evaluation Cookbook*, Edinburgh: The Learning Technology Dissemination Initiative.

- Hea.ie. "Review of the Allocation Model for Funding Higher Education Institutions Working Paper 10: Funding Teaching & Learning Activity" available at <http://hea.ie/assets/uploads/2017/06/HEA-RFAM-Working-Paper-10-Teaching-and-Learning-072017.pdf>.
- Ingleton, C., Kiley, M., Cannon, R., Rogers, T. (2000). *Leap into Student-centred Learning*, Adelaide: The University of Adelaide AC.
- Lewis K. (2010). "Pathways toward improving teaching and learning in higher education: International context and background". *New Directions For Teaching & Learning*, 2010(122):13-23. Available from: Academic Search Complete, Ipswich, MA.
- Karmas, C. (2006). "Active Learning in the Humanities Classroom, Everything, Nothing, Something, Anything", *The international Journal of the Humanities, Active Learning in the Humanities Classroom*, Vol.3. No.6.
- MIT. Critical Moments Reflection Methodology, A Method for stepping back and draw lessons from the experience Center for Reflective Community Practice, available at <http://www.kstoolkit.org/Critical+Moments>.
- Moon, J. (2001). "PDP Working Paper 4, Reflection in Higher Education Learning", *LTSN Generic Centre*.
- Newble, D. and Cannon, R. (1995). *A handbook for teachers in universities and colleges: A guide to improving teaching methods*. London: Kogan and Page.
- Ramsden, P. (1992). *Learning to Teach in Higher Education*, NY:Routhledge Falmer.
- Remesh, A. (2013). Microteaching, an efficient technique for learning effective teaching. *Journal of Research in Medical Sciences : The Official Journal of Isfahan University of Medical Sciences*,18(2), 158–163.
- Sorcinelli, M. D., A. E. Austin, P. L. Eddy, and A. L. Beach. (2006). *Creating the future of faculty development: Learning from the past, understanding the present*. San Francisco: Jossey-Bass, p.2.
- Spelman, B.J., Brooks, St. John, C. (1972). Microteaching and teacher education: A Critical Reappraisal, *Irish Journal of Education*, vi, 2, pp.73-93.
- Weimer, M. (2002). *Learner-Centered Teaching*. San Francisco, CA: Jossey-Bass Publishers.

Development of a conceptual model of multi-skilled specialist training

Mammadov, Javanshir^a; Talibov, Natig^b; Huseynov, Agil^c; Abdullayev, Loghman^d and Mammadova, Samira^e

^aChair of Process automation, Sumqayit State University, Azerbaijan, ^bVice-rector on Learning and Teaching technologies, Sumqayit State University, Azerbaijan, ^c Chair of Information Technology and Programming, Sumgait State University, Azerbaijan, ^d Chair of Finance and Accounting, Sumgayit State University, Azerbaijan, ^eDepartment of International Cooperation, Sumgait State University, Azerbaijan

Abstract

In order to develop the higher education system of Azerbaijan, training of highly skilled specialists using the innovative methods in teaching process and scientific research had been discussed at Sumgayit State University. The conceptual model of the process of preparation of highly qualified (multy) specialists was proposed on the basis of chairs in engineering and economics faculties of Sumgayit State University.

Priority specialties and scientific directions of the departments of Engineering and Economics of Sumgayit State University were determined and the functional scheme of complex educational training - scientific research - production - commissioning system was proposed based on the principles of flexible production. An activity block diagram for the development of an innovative project in training, scientific research, production and commercial system has been developed.

Keywords: *Multi-specialty; conceptual model; innovation; scientific - research; flexible manufacturing.*

1. Introduction

One of the special areas of the Republic of Azerbaijan in modern period is the education system. In the recent decisions made by the President of the Republic of Azerbaijan was based on development of the education system, application of new innovative methods and projects in higher education institutions, the professors and students (directions of the reforms had been determined due to the Decree of the President of the Republic of Azerbaijan dated May 22, 2009, No. 295) improvement of the social situation of the teaching staff and the promotion of higher education in Azerbaijan to the international level. In this sense, the creation of a flexible scientific – research - production system in the framework of the introduction of new innovative science and education principles, technologies in higher education schools is one of the urgent issues of the modern era.

In Sumgayit, the industrial city of the Republic of Azerbaijan, scientific-research institutes, higher education institutions, technological parks and industrial enterprises function individually. However, the analysis of existing world scientific research and technological processes shows that their work is carried out in a complex form: educational and scientific research - production - business scheme [Prencipe A.].

2. Justification of preparation of multidisciplinary qualified specialists in the higher education system

The level of training of graduates of Azerbaijani higher education institutions in engineering or economics does not allow them to be admitted directly into large enterprises. Due to the fact that high requirements in the workplace, engineering and economically less practical experience do not allow working as a professional specialist in direct production. So, Sumgait State University (SSU) focuses to the preparation of multidisciplinary specialist in a complex teaching-learning, scientific-research and flexible production system.

As a result of the global application of new information technologies and computer techniques in the 21st century, medical informatics, bioinformatics, and so on scientific directions have been formed. Some scientific directions have been formed. New innovative and scientific specialties are taught in the modern education system. Automation and intellectual management of technological processes in the chemical, metallurgical, automotive and mechanical engineering industries, automation of economic issues; the opportunities for automatic control and management of environmental processes have been expanded. In higher education schools, including SSU, scientific research and studies of physics, mathematics, energetics, chemistry, medicine, biology, geology, ecology, and others are carried out by the synthesis of new information technologies and computer technology [Lamperti, F.].

In order to continually increase the country's economic potential and to be competitive in the international area, it is desirable to prepare specialists who know the principles of modern finance, accounting and business in various fields of application [Dezilacruz, M.].

It is important to create a new training and training center, specialized research laboratories, flexible production areas and economic management division for economically stimulation and preparation of professional specialists due to the mentioned specialities. these principles are based on the issue of developing a conceptual model of preparing specialists who can use theoretical and practical skills in the teaching process of computer science and economics management.

The purpose of the thesis is to develop a conceptual model of multidisciplinary training of specialists with the help of complex learning and training, modern research and testing laboratories, flexible production area and commercial center on the basis of Chairs operating in the Faculties of "Engineering" and "Economics" at SSU.

3. Development of SDU educational curriculum - scientific research - production - operating system functional scheme

To achieve this goal, the priority specialties and scientific directions of the Chairs of "Engineering" and "Economics" faculties at SSU have been defined:

- intelligible automated information systems;
- corporative information systems;
- automation and management of technological processes;
- development of software applications;
- accounting;
- economics management and management;
- marketing.

Based on the working principles of the specialty, scientific directions and flexible manufacturing areas of the faculties of "Engineering" and "Economics" of SSU, a complex functional scheme of learning training production research - production - commercial system is offered (figure. 1).

Due to the proposed functional scheme of learning training - scientific research - production - commercial system, issues of certification, conducting of scientific research and production of innovative projects, studying the fundamentals of economics and business organization should be implemented. In this regard, laboratories of chairs of

"Engineering" and "Economics" faculties, their visual technical, software and methodical resources and proposed new learning training - scientific research-production-commercial system (TLSRPCS) is processed (figure.1).

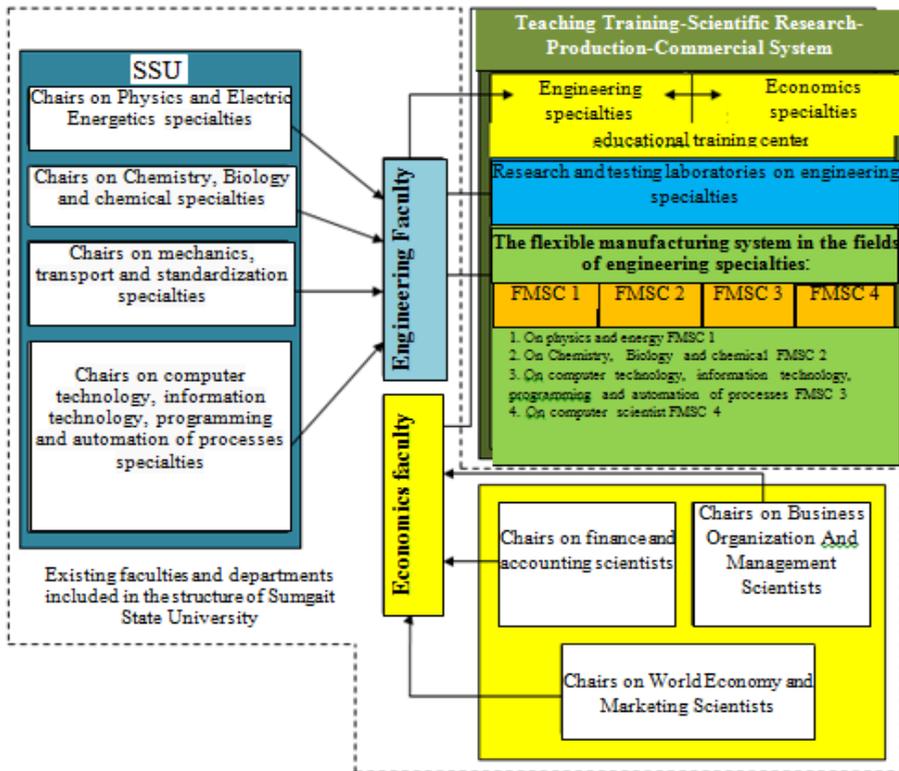


Figure 1. Functional scheme of teaching learning- scientific research – production - commercial system at SSU.
Source: Own performance

The training center of TLSPCS has a three-level architectural structure. Teaching – training departments for the specialties of power engineering, standardization, programming, automation of processes and economics are replaced in the sub - level. The teaching-learning center, which carries out the qualifications for students studying at SSU consists of equipment, machine tools, devices, manipulators, measuring instruments, multimedia tools, automated work places and other teaching and learning tools. Includes informational, methodological teaching aids that provide a mid-level learning process. A technical library functions to provide theoretical and practical lessons on each specialty section. In order to improve the quality of teaching learning process at this level center's social network, educational programs of each department, exam questions, test templates, and specialized electronic libraries are planned.

An upstream level assessment and certification department of educational training center organizes an official exam that provides students to master theoretical and practical knowledge in learning process. Practical knowledge is checked in written and oral form by the specialists and evaluated by 100-point system with the help of a special template. Theoretical knowledge is checked by an electronic assessment system prepared in accordance with the qualifications test. Students who successfully passed the test are given a certificate that allow them to work in production.

One of the main tasks of TLSRPCS is to explore the process of developing innovative projects in the training center by theoretical methods in engineering and economics departments and initially conduct practical work. However, the solution of the issues on the development of new project is implemented in scientific research and testing laboratories in engineering and economics.

Research and testing laboratories of SSU's TLSRPCS in engineering specialties are equipped with modern automated work places, specialized visual equipment, measuring instruments, multimedia equipment, local and global computer networks. The innovative project selected by the experts is designed virtually in research laboratory, checked by computer experiments, worker model is prepared and after testing the product is manufactured according to the international quality standards in a flexible production area (FMC). Exemplary composes scheme of qualified mechanics of FMC included in flexible production system is shown on figure 2.

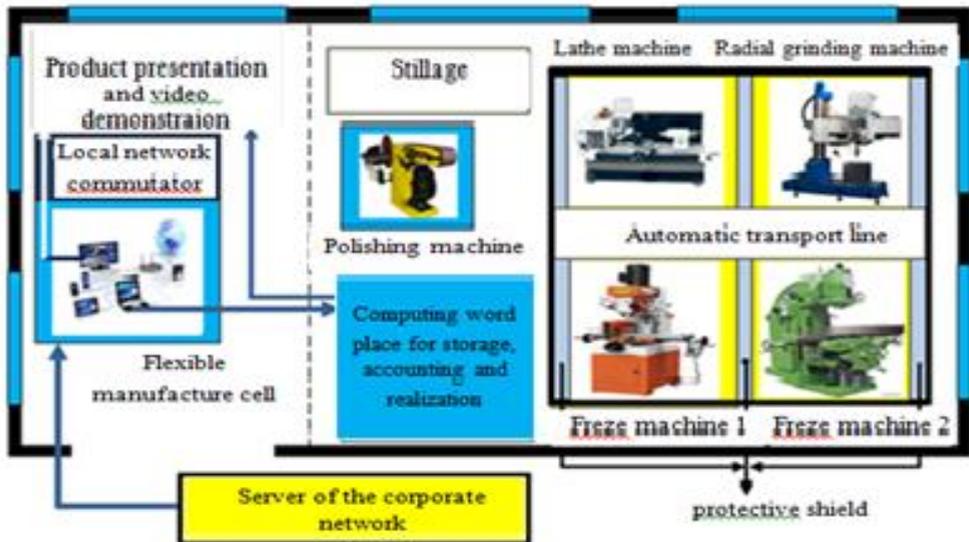


Figure 2. Composes scheme of FMC consisting of mechanical machine tools. Source: Own performance

- managing body. The task of this organization is to design and build TLSRPCS objects in the field of high technology [Faraco R. A.];

- expert council performing expert evaluation and selection of projects. It includes experts of research and testing laboratories in engineering and economics, managers of FAC, expert professionals, and specialists of funds providing development of enterprises in scientific and technical.

The following stimulus issues should be used to support the development of various business processes at TLSRPCS (Kirchberger A.):

- "tax reform" - favorable tax and administrative conditions allow for free development of teaching, scientific research and production commercialization ;

- separate commerce issues (finance, accounting, and leasing, marketing, management) of teaching, researching and flexible production areas should be provide with the help of economics section.

- supplementary wage (based on labor contract) of teachers working at the expense of payments by students or trainees who receives second-year specialization in economic education training should be provided;

-students who receive second-year specialization in teaching and learning department should have preferential payments (50% lower) than those of the trainees;

- provision of favorable rental of workplaces (use of technological equipment and devices, equipment, automated workplace, local and global computer network) in research laboratories and production should be provided to the student and teachers working on innovative projects;

-a free economic zone should be provided for the winners of the startup projects organized in TLSRPCS. Small businesses are given opportunity to operate profitably.

-provision of favorable rental of workplaces for the development of projects "Scientists of tomorrow" in TLSRPCS's scientific-research and flexible manufacturing cell.

The following activities should be carried out at the stages to provide comprehensive training, research and production activities in TLSRPCS of SSU [Mamedov J.F.]:

Stage 1. TLSRPCS's architects, designer designs documentations are prepared and approved;

Stage 2. TLSRPCS's engineering and economic oriented training center, research and testing laboratories are built and repaired in accordance with modern construction requirements and are provided with main equipments;

Stage 3. Flexible manufacturing cell of TLSRPCS are constructed in accordance with construction and security requirements and maintained;

Stage 4. Designing and building of engineer network, social infrastructure facilities are provided.

Stage 5. TLSRPCS's corporate information system is being created, implemented and checked.

TLSRPCS is created as a joint enterprise to ensure mutual relations with SSU and State Research Centers. SSU concludes contracts with executives of scientific innovation projects. Systematic monitoring of the innovative projects prepared by TLSRPCS is ensured and their commercials are provided. A database management system is being developed for research, scientific potentials, specialties, visual aids, electronic libraries, scientific publishing (local and international) and research opportunities for engineering and economics departments of SSU to carry out mutually beneficial research and development between Scientific-research and FMC. Additionally TLSRPCS provide business planning, marketing, and financing for business of FMC .

4. Expected results

1. Qualified students have the opportunity to acquire new specialties at TLSRPCS established on the basis of engineering and economics faculties of higher education schools. Professors - teachers and young researchers may have the opportunity to master business, financial management and other issues of economy along with their speciality.
2. Professor –teachers and young researchers at scientific-research laboratories established on the basis of the Faculty of Engineering at the Higher Education School can have the opportunity to carry out and implement their own research work.
3. There may be opportunity of certification, patenting and exhibiting of innovative projects. International patenting and certification of new innovative projects developed by professors - teachers and young researchers can be achieved.

5. Conclusion

1. A functional scheme of the training – scientific- research –production - commercial system which provides training, certification, scientific research and production of innovative projects, studying the basics of economy and business organization in higher education institution has been proposed.

2. A Composes scheme of flexible manufacturing system for preparation of innovative projects in applied mechanics and machinery parts has been proposed.

3. Stages of complex activity of training, teaching, scientific research and production areas in higher education institution has been proposed.

References

- Dezilacruz, M. D., Fregonezi, G.A. (2015) Science and Technology Parks: Laboratories of innovation for urban development - an approach from Brazil. *Journal of University-Industry-Government Innovation and Entrepreneurship*, DOI: 10.1186/s40604-015-0018-1, 22 p.
- Faraco, R. A., Mussi, C., Angeloni, M.T. (2014) Social Networks and Knowledge Transfer in Technological Park Companies in Brazil. *Journal of Technology Management and Innovation*, Vol. 9, № 2, p. 172-185.
- Kirchberger, A., Larissa, P. (2016) Technology commercialization: a literature review of success factors and antecedents across different contexts. *Journal of Technology Transfer.*, Volume 41, Issue 5, pp. 1077-1112.
- Lamperti, F., Mavilia, R., Castellini, S. (2015) The role of Science Parks: a puzzle of growth, innovation and R&D investments // *The Journal of Technology Transfer*, DOI 10.1007/s10961-015-9455-2.
- Mamedov, J. F. (2011) Organization of Technology Park and its structure at high educational school of Azerbaijan. *European researcher*, № 10 (13). p. 1370-1375.
- Prencipe, A. (2016). Board Composition and Innovation in University Spin-offs. Evidence from the Italian Context. *Journal of Technology Management and Innovation*. Vol 11, № 3, pp. 3

Education Facing Globalization in Post-communist Country: Azerbaijan

Isaxanli, Hamlet

Department of Education, Khazar University, Azerbaijan.

Abstract

Contemporary education, especially, the development of higher education is tightly bound with globalization and is also one of those indications characterizing the globalization. The impact of globalization on higher education is very wide and complex in post-communist countries. This research paper looks at the main characteristics of globalization as a whole, its influences on post-Soviet societies: the refusal and acceptance of the trends brought by globalization in post-communist countries, its impacts on education systems of less developed and developing countries, import of features of long-established education systems from abroad. The weaker education systems' vulnerability before those powerful, well-established and long-standing education systems and the hard competition conditions encountered by them have been touched upon in this article. Subsequently, Azerbaijan, the pathways of its education history beginning from Russian Empire and Soviet Union, the language and alphabet changes, and aftermath the modern education system of Azerbaijan, newly established universities such as Khazar University, their local and international achievements and challenges and the overall situation of higher education in the country have been discussed as the case study.

Key-words: globalization, higher education, post-communist country, Azerbaijan, Khazar University.

1. What is Globalization?

Globalization is the integration process in the world. It is the increase of communication in high degree, unification and compaction or “diminution” process of the world, the activity of humans of delivering their ‘hand’ or thoughts to the world. Globalization is openness, vast augmentation of political and cultural influences, and getting across the national borders. Globalization is internationalization of competition. Globalization is acting in the world market and it is beyond the power of the states. Globalization is standardization of main services, growth in migration, turning the science, technology, information and higher education to be world network, as well as severely worsening of energy, climate change and other environmental problems. Networking (including making ground of narcotics and terrorism), strengthening of cooperation and mutual dependence have become the driving force of modern globalization. That’s where the contradiction appears and deepens between modernism which is derived from globalization and society’s tradition system, as well as between generations.

Extraordinary amplification of the means of transport and communication played an important role in becoming of globalization the main trend of the time. As the consequence of globalization, the acceleration of time comes to agenda, that’s to say, big changes happen within a short time, the distances get shorter or fade out, it means instant virtual contact and travelling the long distances with high speed. Only in two or three decades, thanks to the technologies like internet and mobile phone, the power of international communication made a giant leap.

The power of the English language increased fantastically as the result of globalization, it turned to be lingua franca of the world. English became, in fact, a tool and sign of globalization. Globalization raised the number of people speaking two or more languages.

Critics of globalization consider that the globalization process empowers those who have more powerful political, technological and financial opulence; creates conditions for stronger ones to exploit the weaker ones; damages the spiritual values and social norms, traditions, and inherent collective identity of so-called weak countries. Educated and competent people leave their own countries and head to more developed ones, in other words, brain drain takes place.

The collapse of traditional socialism, spread of market economy, and expansion of democratic movements approximately overlapped; in fact, these are the events, related to one another. The idea of supplying the varying demands of people not by private initiatives and private investment, but by the state planning got failed. The Soviet Union could not find the solution of this problem and collapsed, on the contrary, China improved the existing governing method without breaking it and applied the market economy, and grew stronger. Though, the expansion of democratic principles is one of the elements of globalization, the West tries to implement it by the same ways everywhere, without taking into account the historical

developments and local culture and traditions; consequently, it takes to overwhelming civil wars, external interventions, and terror (for instance, Afghanistan, Iraq, Libya).

1.1. Globalization in Higher Education

In most countries, especially in small, also in less developed and developing countries, there is almost no national education system (especially, higher education); even though they don't express it openly, they are integrated to one of the long-established education systems. The states holding certain geographical, economical and ideological bounds prefer to gain "harmonization" in the substantial components of education, to build a unified education system or to bring educational systems closer to one another (or to a mutually acclaimed model), instead of protecting their distinctive education system. The Bologna Process is a bright example of this. The spread of European education system to the globe is a striking manifestation of globalization and modernization process of the world.

While the world has been globalizing, the numbers of students going abroad to study, as well as the numbers of teachers and men of science changing their places and countries have grown bigger. Distance education has become more appealing through the internet and other technologies. Transnational companies employ university graduates in distinct countries. Amplification of these opportunities sets the mission upon the universities on nurturing global citizens, which, in its turn, might have a negative impact on the development of local cultural identity.

Globalization confronts the academic culture with the market or corporate culture. Academic culture is firmly established and tends to change slowly. Yet, technology and lifestyle change more rapidly, and neither it can be neglected, nor not taken into proper consideration. In contemporary times, the university is required to incorporate entrepreneurial elements into academic culture, and pursue a company-type financial policy (Weber and Duderstadt, 2008).

Worldwide spread of private universities is also appearance of globalization (Altbach and Levy, 2005), though post-communist countries also show lameness in this context. The main reason to this is the fact, that most of the public universities in these countries are inefficient, inflexible, resilient against changes, and cannot adjust themselves to globalization.

Beginning from 2003, the Global Ranking of the Universities were launched (particularly, Jiao Tong University - Shanghai, THES = Times Higher Education Supplement and QS). The rankings have the greatest focus on scientific research, but it is difficult to properly identify the quality of education; it can be done partly through certain statistical information. This competition, this race has gained a great popularity, as in sport. Different countries set as their goals to include own universities to the list of World Class

Universities or to increase their number, and some countries established pertinent plans to achieve their aims. The existence of too much competition, the long-standing success and reluctance to significant decline of the majority of the popular universities, complicate the inclusion of young universities into the well-known universities list. The combination of qualities such as proper funding, rightful state policy and strive for creativity and management culture are essential.

Marx (and the Marxists) considered the transition to socialism by overthrowing of capitalism, as the way to eliminate the inequality, inherent to capitalism. Socialism, which achieved relative equality, also largely restricted human freedom. However, historical experience has shown that human freedom is related to a free economy, that is, capitalism. People of post-communist countries in the transition period tasted the bitterness and sweetness of both experiences. The society and individuals were delighted with freedom, but felt dismay because of inequality. The way to weaken and reduce inequality, first of all, is possible through education; education creates relatively equal opportunities! For getting admission to a better university, the child of poor family gains the upper hand over the child of rich family by demonstrating good knowledge. This is the great value of education!

1.2. Azerbaijan

There are two territories named Azerbaijan. The first is the Republic of Azerbaijan. The second includes the North-Western provinces of Iran, the names of which contain the word Azerbaijan. The populations of both places speak mostly the same language - Azerbaijani, or Azeri, or the Azerbaijani Turkic language. The population of the Republic of Azerbaijan is close to 10 million. Nobody knows the exact number of Iranian Azerbaijanis, but there are estimations of 17 to 27 million.

As a result of wars between Russia and Iran from 1796 till 1828, Russia occupied the Caucasus and the Azerbaijani people were divided. The Northern part (Caucasus) passed to Russia, while the Southern part remained in Iran. From that time onwards, the two Azerbaijanians followed different paths, although the connections between them were not totally lost. After the 1917 Revolution in Russia, the independent Azerbaijan Democratic Republic, the first Azerbaijan Republic, was established (May 28, 1918 - April 28, 1920) which then was incorporated into the Soviet Union as the second Azerbaijan Republic (1920/22 - October 18, 1991). Azerbaijan regained its independence as the result of the collapse of the USSR and became the third Azerbaijan Republic (since October 18, 1991).

1.3. On History of Education in Azerbaijan

The entire 19th century and beginning of the 20th century may be considered as a colorful era of new search and novelty for education in Azerbaijan, which became a part of the Russian empire. Alongside the traditional religious schools, a network of secular schools was growing, and Russian-Azerbaijani (“Rus – Tatar”) schools were increasing in number and gaining good reputation. Schools functioning entirely in the native language were also being formed by well-known educators, poets, and writers. Azerbaijanis went to the cities of Russia and Europe (Germany, France, Belgium, Poland...) to obtain higher education in various fields. During the First Azerbaijan Republic, Baku State University, the first European-Russian type university was founded and up to 100 young people were sent to higher education institutions of Europe.

The Second Azerbaijan Soviet Republic, replaced the Arabic script with a Latin-based alphabet (1924 to 1939). The anti-illiteracy campaign of this era must be noted. In 1939 the literacy rate in Azerbaijan was 82.8% (men-88.8%, women-76.1%); In the 1960's, the literacy rate was practically 100%. The universal compulsory education was implemented step by step. On January 1, 1940, the Latin alphabet was replaced with the Cyrillic alphabet. Administration of higher education was directly linked to Moscow. Only in 1959, when the slogan “Complete and Final Victory of Socialism” was announced (socialism would collapse 30 years after its “complete and final victory”), the Azerbaijani Ministry of Pre-Higher Education changed into the Azerbaijani School and Higher Education Ministry, thus, some kind of decentralization was introduced. Even though control of higher education institutions was given to Azerbaijan, the creation of new higher education institutions still depended on permission from Moscow.

It was possible to earn high school and higher education in one of two languages in Azerbaijan: Azerbaijani or Russian (the number of students studying in Azerbaijani was higher).

2. Modern Age Higher Education in Post-communist country: Azerbaijan

2.1. New Type of University

The decline of the Soviet Union and the political and economic downfall resulted in a great crisis in the fields of research, education and technology, which had already been falling behind. Corruption was widespread not avoiding education system. During the last academic year of the collapse of the Soviet Union (1990-1991), a new university with a new form and new substance was in the process of being founded. This was Azerbaijan's first private university, which would soon be named Khazar University (*Khazar* means *Caspian*). What were the goals of founding this university? 1) to create curricula and course

programs like those of the leading universities of North America and Western Europe, 2) to use a student-centered, credit-based education model that would give students an opportunity to choose their own trajectory, 3) to be an institution with academic freedom, 4) to develop broad international environment and partnership programs, 5) to merge national and international human values, 6) to implement three-level Western type education with bachelors, masters and PhD programs, 7) to become a cultural center in addition to being an academic and research institution, 8) to develop university-industry relations, 9) to choose English as the main language of instruction (to facilitate student and instructor exchanges as well as the usage of cutting-edge class materials and textbooks), 10) to veto corruption (Isaxanli, 2006a).

Khazar University created a new path for itself and for Azerbaijani education. It paved this road and established a new university culture.

2.2. Education Law

In 1992, the Azerbaijani Parliament passed the Education Law, which contained many of the principles, that Khazar University was already promoting. The new Azerbaijani government also replaced the Cyrillic alphabet with a Latin-based alphabet.

In 2005, Azerbaijan joined the Bologna Process for higher education. Khazar University played a leading role in understanding this process and organizing related trainings. Unfortunately, a new Education Law, passed in 2009, did not pave the way for hope or reform, nor did it lead to progress in administration and management of education institutions; the phrase often repeated in this legislation, “determined by the respective executive authority,” does not say anything serious from a legal perspective. The new education law solved the problem of academic degrees by borrowing both from Western and from Soviet models; a four-level degree system was introduced including bachelor, master, PhD and Doctor of Science (in which the PhD degree stands for Doctor of Philosophy, saying, for example, “Doctor of Philosophy in Chemistry” or “Doctor of Philosophy in History”).

2.3. Governance

The autonomy of higher education institutions in Azerbaijan leaves much to be desired. Even private institutions do not have freedom in admission of students, in starting new academic programs, or in giving diplomas to graduates. This creates difficulties for the institutions in working on and implementing action plans or strategic development plans. Government is mostly, defender of status quo, rather than initiator of a reform. At the same

time, certain controlling government policy in terms of accountability of higher education institutions and social protection of employees is comprehensible.

The rectors of state higher education institutions are appointed and removed by order of the President of the Country, and the vice-rectors are also practically chosen “from above”. There is no such thing as a Board of Governance, Board of Directors or Board of Trustees in these institutions. Khazar University is an exception; it has applied an administrative model close to a synthesis of collegial consensus and a polycentric model.

There is no “buffer” between the internal and external worlds of higher education institutions, no role in leadership and administration for stakeholders. There are no real and well-established Alumni Organizations. Without Board of Trustees (Governance, Directors) it is always impossible to formulate mission statement and strategic development plan of the institution, to provide political leadership, and search for key leadership. Rector’s duties with both managerial and political activity, double leadership is not right and effective way. The Academic and Administrative Councils (Senates) not only do not share the rector’s power, but they even facilitate the rector’s ability to abuse and manipulate his/her authority. It is said that the presidents of American colleges and universities have more authority than their European counterparts (Trow, 1994). In general, American universities enjoy the extraordinary power in its full meaning (Kerr, 2001). In my opinion, Azerbaijani rectors are more powerful than the American ones (not in the sense of effectiveness or excellence, but simply with regards to their authority). But, at the same time, rector of public university can be fired any time by the President of Azerbaijan, without preliminary notification.

When higher education institutions were founded in Azerbaijan in the 1920s, they did not have their own scholars, like in America’s colonial period, which probably necessitated responsible and authoritative rectors. The obligation to serve the ideology of the time also increased the rectors’ responsibility and areas of control. Rectors of Azerbaijani higher education institutions can completely interfere with the activities of academic departments and the selection of instructors, and this is not always done for quality assurance (an American university president does this in very exceptional cases, such as “putting into receivership”, see, Trow, 1994, pp. 280-281).

There are no independent accreditation agencies in Azerbaijan; and it does not allow for objective observation that would help solve central problems such as increasing the quality of education. There is no link between the level of quality in education and state funding. Instructor salaries are categorically insufficient, but, some improvement at some universities may be observed in recent years (Guliyev, 2018; Isaxanli, 2006b; Isaxanli, 2014).

2.4. Research, PhD Programs and Academy of Science

One of the most concerning problems is that PhD programs and academic research in higher education institutions are not suitably developed. The PhD and Doctor of Science degree-awarding process has been preserved as it was in Soviet times. Because of this archaic system, fixed Academic Defense Councils were established in different institutions for different academic fields (in higher education institutions and in the Academy of Sciences), and the defenses of dissertations take place only before those Councils. Each council usually have 25 permanent members, as a rule, those who understand the topic being defended and are specialists of the relevant field make up minority, so majority council members vote without any understanding of the research. Dissertations that have been defended and related documents are sent to an organization called the Supreme Attestation Commission, where they are evaluated and approved. Experience shows that this bureaucratic system does not breed quality, just contrary, creates way to bribery.

It is necessary to take extraordinary long and wearisome steps before the dissertation defense. Confirmation of topics in centralized councils, conducting examinations in centralized places (for example, candidate for a degree of the higher education institute, which is much stronger in computing sciences, should go to the Academy's Institutional Examination ...). After the dissertation defense, a disruptive Supreme Attestation Commission steps out. Some people go through this system by pulling strings or giving bribes, others must wait for six months, one year, one and a half year to approve their degrees. While higher education facilities confer thousands of bachelor's and master's degrees, extraordinary, unnatural and inefficient system continues to function instead of PhD and higher scientific degrees being awarded by universities, based on accurate assessment of 5-6 specialists. The Baltic states and Georgia in this issue have also switched to a rapidly developing world model.

Material basis (buildings, number of employee, ...) of the Azerbaijan Academy of Sciences is bigger than cumulative material basis of four well-known academies (Royal Society, UK; Académie des sciences, France; National Academy of Sciences, USA; Leopoldina Academy of Germany). However, Azerbaijan Academy of Sciences is quite weak in terms of scientific research. Majority of employees are old and unproductive. Young and talented persons do not go to the Academy. The issues like vastitude and covertness of Soviet system, planned economy peculiar to socialism, and employment for everybody provided by the state, divided the science and education into three units: higher education system, academy of sciences consisting of a network of research institutions, and field institutions related to industry, ministries and distinct committees. Alas, encompassing the Academy of Sciences in this system serious reforms have not been enforced.

In recent years some positive steps have been taken that are worth noting: higher education institutions have been given exemption from value-added taxes; relatively good quality private universities have been able to obtain merit-based state scholarships for students (these scholarships are much less than the tuition fees for private institutions); The National Science Foundation conducts activities, to assist scientific research; and attention is paid to construction and renovation activity for educational institutions. Unfortunately, there is no place yet in this list for an effective student loan system. Instead of the process of reunification and strengthening of universities and research institutes in Azerbaijan, the process of fragmentation, disintegration and multiplication of universities persistently goes on. This rather reduces its effectiveness and capacity.

3. Conclusion

Globalization being a major trend in modern days, has a significant impact on all aspects of life, including the education system. Less or not highly developed countries are compelled to go in the same pathway as the firmly established countries, and make changes in that direction, either voluntarily or constrainedly. Post-communist countries are striving to resolve the dilemma of complete imitation or synthesis, deliberating between life style, dictated by legacy and globalization.

Azerbaijan, formerly, was set to establish European-Russian type educational institutions within the Russian Empire, in 1918-1920, during the First Republic, embarked steps towards higher education, and during the Second Republic, in other words, in Soviet Era, acquired education system intrinsic to Socialism. During the new independent Third Azerbaijan Republic (since October 18, 1991), several trends appeared in the education system: creation of a flexible private higher education system that suggested new content and forms, endeavours made to keep up with a global educational movement like the Bologna Process and implementation of the appropriate reforms in the education system.

Although a number of positive changes have taken place, the content of education as a whole, the governance of education, development of system with regards to scientific research and high academic degrees are not adequate and satisfactory, thus, there is a need to establish research-education system that would pertain to worldwide trends and could give an impetus towards economic, technological, and cultural development of the country.

References

- Altbach, P. G., and Levy, D. C. (eds.) (2005) *Private Higher Education: A Global Revolution*. Rotterdam: Sense Publishers.
- Guliyev, F. (2018) 'The Enigmatic Connection Between Education and Civic Apathy in Azerbaijan'. *PONARS Eurasia Policy Memo* No. 519, March 2018. Elliot School of International Affairs, The George Washington University.
- Isaxanli, H. (2006a) *In Search of "Khazar"*. Baku: Khazar University Press.
- Isaxanli, H. (2006b) *On Education System in Transition Economy. A View from Azerbaijan*. Baku: Khazar University Press.
- Isaxanli, H. (2014) 'Diversification of post-secondary education in Azerbaijan' In Varghese, N.V. *The diversification of post-secondary education*, pp. 45-58. UNESCO, International Institute for Educational Planning.
- Kerr, C. (2011) *The Uses of the University*. Harvard University Press.
- Trow, M. (1994) 'Comparative Reflections on Leadership in Higher Education' In Altbach, P. G., Berdahl, R. O. and Gumpert, P. J. (eds.) *Higher Education in American Society*, pp. 269-288. New York: Prometheus Books.
- Weber, L. E. and Duderstadt J. J. (eds) (2008) *The Globalization of Higher Education*. London: Economica.

Hungarian ethnic minority higher education students in different countries of Central Europe

Pusztai, Gabriella^a; Márkus, Zsuzsanna^a

^aCenter for Higher Education Research and Development, University of Debrecen, Hungary

Abstract

There are about 3 million Hungarians living as a minority outside Hungary in 7 countries of Central Europe. In some of those countries they still live in a nearly homogeneous block, whereas in others they live in diaspora. Their access to education in their mother tongue also differs. Our research covered the Hungarian institutions of higher education in the four countries with largest Hungarian minority groups, and we undertook a comparative study of their students. For our investigation we compared the families' social status. We used data on 1739 students from 13 institutions. We concluded that indigenous Hungarian minority students did not produce homogeneous results in the categories that were examined, which led us to the discovery of important differences.

Keywords: *Hungarian minority; higher education; family background, comparative study.*

1. Introduction

Hungarians have been incorporated into the 7 CEE countries involuntarily after World War I, which left large Hungarian communities under the control of countries they had not been attached to by any form of linguistic, cultural or national identity (Kozma, 2003; Pasztor, 2006). The new majorities, although to a varying extent in different eras, questioned their right for a mother tongue schooling. As a result, the controversial relationship between national identity and citizenship still has its negative effects. Communism proclaimed the disappearance of nations, and “communist ethnic diversity mismanagement” (Cordell et al., 2013: 236), i.e. the suppression of human rights of ethnic and linguistic minorities by communist totalitarianism, led to the collective institutional discrimination and glass ceilings in education of ethnic minorities, similar to other castelike minority groups (Ogbu, 1982; Kanu, 2007).

During the communist era there were political obstacles to mother tongue education; therefore it became one of the central political issues addressed by the representatives of Hungarian minority groups after the democratic transition (Agarin et al., 2016; Lambrev, 2016). On the one hand, minority schools are means of protecting a minority and maintaining their identity; on the other hand, access to mother tongue education is crucial to a successful school career. Their goals are in accordance with the UNESCO statement: indigenous groups in the world “often face discrimination in school that is reinforced by the fact that the language used in the classroom may not be one that they speak” at home. In order to avoid collective institutional discrimination, it is essential that all learning materials, tools and students’ assessment are provided in a language they are familiar with (Despaigne, 2013). In spite of the European integration there is a “de facto inequality between individual members of society belonging to communities different from the majority population” (Cordell et al., 2013: 237).

2. Ethnic Hungarian Students

Ethnic Hungarian communities in the different countries show different features in terms of their proportion in the population, social status, geographical distribution, settlement structure and language use. From the perspective of education politics, the countries with ethnic Hungarian communities can be classified into two groups. One of the main differences accounting for the other variances is that most ethnic Hungarians in Ukraine, Rumania, Slovakia and Serbia live in areas where Hungarians are in majority, while most Hungarian communities in Austria, Slovenia and Croatia do not (Csete et al., 2010). Our study focuses on four relatively large ethnic Hungarian groups. Our data are from the regions populated by Hungarians,

Indigenous Hungarians are behind the ethnic majority in all regions in terms of participation in, and level of, education. There is a tendency for the disadvantage to grow as higher education is approached (Veres, 2013; Gábrity & Takács, 2015; Orosz, 2015; Bacskai et al., 2015). It is an appalling fact considering that before 1920 Hungarians' education statistics in Austria-Hungary were much better than those of Slovaks, Romanians, Ukrainians and Serbians (Hanák, 1983). After that, the mother tongue education of minority Hungarians was continuously declining because of the nation states' educational policies, which failed to support minorities' equal opportunities and were interested in the abolishment of ethnic communities (Csata, 2004; Agarin et al., 2016). During the last 25 years there has been a slight expansion in the structure and capacity of education. In spite of this short revival, minorities' level of education is still behind that of the majority, and there is a statistically significant fall in the Hungarian population. Social mobility mainly means one step upward; it is due to structural changes, and the majority population's statistics are much better in this respect as well (Papp Z., 2011). Recent data clearly show that in each country ethnic Hungarians with higher education degrees are underrepresented in comparison to the majority population and to Hungarians' proportion in the population (Csernyicskó & Ferenc, 2014). Hungarian communities, which have been living as a minority for a century, only have access to a very limited range of public and higher education in their mother tongue. The system of vocational training has not been developed yet; there is no medical and legal, and only sporadic technical and economic training in higher education. Owing to the lack of variety in Hungarian degree programmes, several Hungarian-speaking families opt for state language education from the beginning in hope of more promising life and career prospects. Their other option is emigration, which deprives the Hungarian minority of its highly qualified members (Papp Z., 2011).

We can keep track of ethnic Hungarian students' mother tongue education on the basis of national statistics and conservative estimates. In general, owing to the expansion of minority education after the end of communism, a significant proportion of ethnic Hungarian children started their education in a Hungarian-speaking primary school in the 2010s. This was the case with 80% of Hungarian children in Romania, Ukraine and Serbia and 75% in Slovakia. As a result of the expansion, there is an increasing number of Hungarian students in higher education, but the variety of degree programmes in Hungarian does not meet the demands (Papp Z., 2011; Pletl, 2015). Generally, the higher the level of education, the lower the proportion of Hungarians taking part, so they are likely to attain a lower level of education. According to the 2011 census in Romania, which has the largest Hungarian minority, 14.8% percent of Romanians and only 10.3% of Hungarians have higher education degrees (Veres, 2013). Statistics are worse in Slovakia. Whereas 10.4% of the entire population have higher education degrees, only 5.3% of Hungarians do so. Even in the 2000s there were 1000 settlements with a Hungarian majority where there was no Hungarian primary education available (Törzsök, 2008). Since Ukraine achieved its

independence, the number of Hungarian education institutions have been on the increase, and so has been the number of Hungarian classes at each level of education. In the Hungarian region of the country 10.4% of the age group attended Hungarian primary schools in 2001, but only 4% of university and college students studied at Hungarian institutions (Molnár & Molnár D., 2005).

Statistics on education in the Hungarian region of Serbia show that the number of Hungarians in higher education is increasing. In 2004 the proportion of Hungarian college students (their training is shorter) was 11.25% and that of Hungarian university students was 6% (Szügyi, 2012).

The performance of education institutions and their students can be compared on the basis of the PISA test results. Data from 2003, 2006 and 2009 clearly show that minority students' performance was below majority students'. However, in Serbia and Romania Hungarian students who were educated in their mother tongue performed better than those who were educated in the language of the majority. In contrast, in Slovakia the performance of mother tongue education is declining year by year (Papp Z., 2013). To make matters more complicated, minority students who take part in majority education usually achieve worse at school and come from a more disadvantaged background. The phenomenon is termed "assimilation spiral" by Papp: deprived of the chance to be educated in their mother tongue, the number of poorly performing minority students will grow, which will prevent the improvement of their social status and will even add to their social disadvantage. The process will reverberate as low-status minority parents do not tend to make informed choices about their children's schooling.

3. Data and Variables

For our analysis, we used an international student database called Institutional Effects on Student Achievement (IESA), which was created during the winter of 2014-2015 (Pusztai et al., 2016) by the research centre CHERD-Hungary . We analysed data on 1739 Hungarian students from 13 higher education institutions in five different countries of Central Europe, focusing on one region in each country. We compared data on students from Hungarian institutions or faculties of higher education in Romania, Ukraine, Serbia and Slovakia to corresponding data from universities in Eastern Hungary, as the latter were the most similar to the minority institutions in terms of the social composition of the student population. The database represented full-time, both state-funded and tuition-paying students. The sampling frame was established on the basis of the data provided by the institutions. We contacted the student groups when they were taking part in their university/college courses. The randomness of the sample was achieved by the random selection of these groups.

During our analysis we tried to find out about the social background of students in minority Hungarian higher education and about the composition of the sources of social capital available to them. We attempted to focus our analysis on the diversity of the composition of the student population across the regions. We formulated our hypotheses on the basis of the statistical features of the communities and the findings of our own research, which goes back over a decade (Pusztai, 2007; 2015). We expected that the proportion of students whose parents had a low level of education would be higher in minority institutions than in schools in Hungary because of the expansion of minority education and the academic and residential mobility of the high-status population.

4. Students' Social Status

One of the essential research conclusions of the sociology of education is that there is a close correlation between students' academic achievement and careers and the social status of their families (Pusztai, 2015). According to this approach, students' academic success follows as a result of their families' investment into cultural capital. That is to say, children from higher status families have a greater chance of a successful academic career and entering higher education, which reproduces the disadvantage of the not so well-schooled Hungarian minority.

Our empirical findings showed that in the case of minority families both the fathers' and mothers' level of education was lower than in the case of families from Eastern-Hungary, and the proportion of parents with higher education degrees was relatively low (around 20%) in each region of the survey. From this it follows that over four fifth of the students of minority higher education institutions will be first-generation intellectuals after graduation. This leads to the conclusion that minority institutions are socially open and support low-status students' careers.

Of the regions of the survey, Hungarian students from Ukraine were in the best position with the highest proportion of parents with university degrees (25% of mothers and 16% of fathers) and the lowest proportion of parents with only primary education (18% of mothers and 18% of fathers). The proportion of parents with the lowest level of education was the highest among Hungarian students in Romania (38% of fathers and 20% of mothers), and they were followed by their peers from Slovakia (30% of mothers and 31% of fathers) and Serbia (22% of mothers and 27% of fathers). It is worthwhile to note that statistics on the level of education of the entire Hungarian minority population are different: Hungarians in Romania have the highest level of education, followed by Serbians, Slovaks and Ukrainians. However, one has to consider that in Ukraine the structural advantage of the parents' age group is due to the fact that in the Ukrainian system some secondary and "half-tertiary" qualifications, which have not belonged to higher education anywhere else on the

basis of their curricula and the duration of the training, count as higher education qualifications. The still lower total education levels of Romanian and Slovakian parents may suggest that mother tongue higher education is socially even more open there, but they may also imply that high status minority people send their children to majority higher education institutions or to Hungary.

The minority groups of the survey also differed in terms of parents' position on the labour market. The firmest position – second only to parents from Eastern Hungary – was held by parents from Slovakia, with over 80% having a legal income. They were followed by Romanians (more than 70%), Ukrainians (more than 60%) and Serbians (more than 50%). Labour market position depends on the countries' economic performance. What the regions have in common is that mothers' employment figures are below fathers' although their education level is higher. The widest gap is in the data from Serbia.

However, our data also showed that it was not unemployment but being a housewife – which does not provide any regular income – that accounted for the women's side of the above statistics. Human capital theories put unfavourable labour market position down to a low level of education. Another possible explanation might lie in the value system of ethnic Hungarian families and their more traditional division of labour. Compared to the economically more developed regions in Hungary and Slovakia, the proportion of housewives was outstandingly high in Ukraine, Serbia and Romania. It is important to note, however, that there is research evidence that mothers who are not employed (full time) outside the home are more efficient in bringing up their children, with a larger input into their children's future (Coleman, 1988).

The students in the regions of the survey have to face considerable difficulties because of the presence of unemployment in their families; the unemployment rate among fathers is especially high in Ukraine and Serbia. It has already caught our attention during our earlier research that the proportion of fathers on disability pension has been permanently very high in Eastern Hungary and – according to our present data – in Slovakia as well. Although there is a connection between access to work providing a decent income and health statistics (Kopp & Skrabski, 2006), the above figures do not necessarily suggest that the number of people with a reduced capacity of work is much higher in these two regions, but they rather indicate what kind of escape routes from unemployment there are in each system. The differences between the regions depend on the given country's economic situation, the strictness of work capacity requirements and the range of work opportunities in the black economy. It is important to note that these conditions are not only data on families' social background but they may also influence young people's work-related plans and ambitions.

Regional diversity is further increased by students' perceptions on their economic situation. Our database was suitable for the measurement of the different dimensions – objective, subjective and relative – of economic status. First we analysed students' objective financial status by asking them to mark the durable goods they owned from a list of nine. There were significant differences between the countries. Students from Slovakia appeared to be in the best position (6.56), followed by Serbians (6.06), Hungarians (5.96), Romanians (5.73) and Ukrainians (5.47). However, objective financial status measured in this way is often more indicative of the family's, and not the student's, financial status. The family's house, holiday home or other durable goods might have come from earlier savings, so we also found it necessary to measure students' subjective financial status. Our findings confirmed the advantage of students from Slovakia: over 40% claimed to have everything they needed and could even afford extra expenses like travelling. 28% of students from Hungary, 30% from Romania, 22% from Serbia and 19% from Ukraine were of the same opinion.

The differences between the data on the various dimensions of students' financial status lead us to the conclusion that these variables can be presented only in a descriptive way. For the interpretation of our results we also have to find out about students' and their families' consumption habits and value systems. It is rather obvious that in a community where materialistic values have priority, hardly anybody is satisfied with their economic status. The differences in perception are also due to the countries' different economic performance in the present and recent past. When evaluating one's financial status one inadvertently draws comparisons with the past or the status of other groups. It is important to clarify who students look upon as members of their reference group. For that purpose, it is useful to look at the indicator measuring relative financial status in our questionnaire. We asked respondents to mark their financial status on a 1 to 9 scale in relation to that of other families in their country. On the whole, students considered their own status to be slightly above average, but there were considerable differences between regions. At one end of the scale were Hungarians from Slovakia (6,33), who felt somewhat luckier than their environment; at the other end were Hungarians from Serbia (4,67), who thought they had average financial status. The other ethnic Hungarian communities were in between, i.e. above average. On the whole, among indigenous minority students in higher education it was students from Slovakia who – in spite of their parents' low level of education – had the best financial status even when it was measured from a number of different perspectives. This was primarily due to the country's favourable economic situation.

The position of one's place of permanent residence in the hierarchy of settlements is an important indicator of social status. It is so because residence at a small settlement means worse access to education institutions, cultural and employment opportunities. Large sample data from earlier CHERD-H surveys (2003, 2005, 2008, 2010, 2012) showed that a great proportion (almost four fifths) of Hungarian students from Ukraine came from

villages, whereas the majority of students from Romania came from cities (Pusztai, 2015). The survey area was extended in 2016. As regards Romania, the dominance of students from county seats (69%) was still present. The proportion of Ukrainian students from low status settlements was still outstandingly high (60%), and so was the case with Serbian (52%), and Slovakian (56%) students. Comparison to institutions from Eastern Hungary reveals that minority higher education institutions are more open to students coming from villages (21%). This is, of course, a natural consequence of the settlement patterns of the regions and of the fact that a fair number of urban students enter majority higher education in their country or choose institutions in Hungary.

It is a central issue in education research what communities students become involved with and what spaces they frequently appear in during their years of study. The framework of their interaction is of crucial importance. Previous research has shown that there are considerable differences between on-campus and off-campus students: those who live on campus are less likely to drop out, are more satisfied with their institution, are more likely to continue their studies and take a more active part in extracurricular activities (Tinto, 1993; Windchief & Joseph, 2015; Pusztai, 2015). Under the circumstances of minority existence the frequent opportunity for establishing intergenerational and intragenerational relationships within an institution may give students a clue to the objective and subjective aspects of the minority experience and strengthen their collective identity. Of the range of possible relationships, this study focuses on living on campus i.e. in a dormitory. According to our data the proportion of students living in dormitories is the largest in Ukraine (42%). This rate is the second highest in Hungary (33%), followed by Slovakia (27%), Romania (23%) and Serbia (19%). Given a dominantly rural student population, the number of dormitories available is of great importance. Unfortunately, there is a shortage of dormitory places in Slovakia and Serbia.

Owing to the context-dependent interpretations it is difficult to compare the circumstances of students from regions so distant from one another, yet there appear to be a few conclusions. There are significant differences between students of minority Hungarian institutions of the different countries in terms of parents' level of education and position on the labour market. Minority existence does not necessarily mean a disadvantaged position in every respect. On the whole, students look upon their families' situation as favourable, but there is a significant diversity among the regions. Students from Slovakia have an indisputable advantage in their relative financial status, while students from Serbia and Ukraine have the most disadvantaged position. The majority of students in Ukrainian, Serbian and Slovakian institutions grew up in villages, while there are more students from cities in the other countries. However, the same settlement type may mean various actual environments in the different regions.

5. Conclusion

Our study gave a picture of the social background, education choices, work attitudes and world views of indigenous Hungarian minority students studying in four countries at higher education institutions where the language of instruction is Hungarian. The point of reference was the subsample of students from such a higher education region of Hungary where students' social background is the most comparable to the minority regions. We also compared the groups to one another. We concluded there is no uniformity among the different countries regarding ethnic Hungarian students' family backgrounds. Minority institutions are very open socially: over three-quarters of their students will be first-generation intellectuals. However, the proportion of students whose parents only have primary education is higher in Hungary than in Ukraine or Serbia. Parents' position on the labour market is the best in Slovakia and the worst in Serbia, which correlates with these states' economic situation. Students in Slovakia have the best positions in all aspects of financial status. As for the settlement type of students' places of residence, there is a large number of students in Romania who come from an urban environment, whereas the proportion of students coming from villages is high in Ukraine, Serbia and Slovakia.

References

- Agarin, T. & Cordell, K. (2016). *Minority Rights and Minority Protection in Europe*. Lanham: Rowman & Littlefield
- Bacsikai, Katinka & Morvai, T. & Csánó, J. (2015). Development and competition. Teacher training in the hungarian language in Slovakia. In Pusztai, G. & Engler, Á. & Revák-Markóczi I. (Eds.), *Development of Teacher Calling in Higher Education* (pp. 26-36). Budapest-Oradea, Hungary-Romania: Új Mandátum Könyvkiadó-Partium PPS
- Coleman, J. S. (1988). Social Capital in the Creation of the Human Capital. *American Journal of Sociology*, 94, 95–120. doi:
- Cordell, K. & Agarin, T. & Osipov, A. (2013). *Institutional Legacies of Communism: Change and Continuities in Minority Protection*. London, England: Routledge
- Csata, Zs. (2004). Az iskolázottsági esélyek társadalmi meghatározottsága az erdélyi magyar fiatalok körében. [The social determination of educational opportunities among Hungarian youth in Transylvania] *Erdélyi társadalom*, 1, 99–132.
- Csernyicskó, I. & Ferenc, V. (2014). Hegemonic, regional, minority and language policy in Subcarpathia: a historical overview and the present-day situation. *Nationalities Papers. The Journal of Nationalism and Ethnicity*, 42, 399-425. doi: 10.1080/00905992.2013.867933
- Csete, Ö. & Papp, Z. A. & Setényi, J. (2010). Kárpát-medencei magyar oktatás az ezredfordulón. [Hungarian education in Carpathian Basin on the turn of millennium] In Bitskey, B. (Ed.): *Határon túli magyarság a 21. században*. [Indigenous Hungarians in

- 21 century] (pp. 44–54). Budapest, Hungary: Köztársasági Elnöki Hivatal [Office of the President of Hungarian Republic].
- Despagne, C. (2013). Indigenous Education in Mexico: Indigenous Students' Voices. *Diaspora, Indigenous, and Minority Education: Studies of Migration, Integration*, 7, 114-129. doi: 10.1080/15595692.2013.763789
- Gábrity-Molnár, I. & Takács Z. (2015). Hungarian-language higher education and primary teacher training in Vojvodina. In Pusztai, G. & Engler, Á. & Revák-Markóczi I. (Eds.), *Development of Teacher Calling in Higher Education* (pp. 11-26). Budapest-Oradea, Hungary-Romania: Új Mandátum Könyvkiadó-Partium PPS
- Hanák, P. (1983). Magyarország társadalma a századforduló idején. [Hungarian society on the turn of the century] In Hanák, P. (Ed.), *Magyarország története, 1890-1908* [History of Hungary, 1890-1908] (pp. 403-515). Budapest, Hungary: Akadémiai Publishing House
- Kanu, Y. (2007). Increasing School Success Among Aboriginal Students: Culturally Responsive Curriculum or Macrostructural Variables Affecting Schooling? *Diaspora, Indigenous, and Minority Education: Studies of Migration, Integration*, 1, 21-41. doi:
- Kopp, M. & Skrabski, Á. (2006). The significance of health psychology approach in transforming societies, *European Health Psychologist*, 3, 7-9. doi:
- Kozma, T. (2003). Minority education in Central Europe. *European Education*. 35, 35-53. doi: 10.2753/EUE1056-4934350135
- Lambrev, V. (2016). Minority rights and minority protection in Europe, by T. Agarín and K. Cordell. Book review. *Diaspora, Indigenous, and Minority Education: Studies of Migration, Integration*, 10, 255-257. doi: 10.1080/15595692.2016.1205018
- Molnár, J. & Molnár, D. I. (2005). Kárpátalja népessége és magyarsága a népszámlálási és népmozgalmi adatok tükrében. [Transcarpathian population and Hungarians in the light of demographic and census data] Ungvár, Ukraine: Kárpátaljai Polo Print.
- Ogbu, J. U. (1982). Cultural discontinuity and schooling. *Anthropology and Education Quarterly*, 13, 290–307. doi:
- Orosz, I. (2015). Hungarian-language teacher education in Ukraine. In Pusztai, G. & Engler, Á. & Revák-Markóczi I. (Eds.), *Development of Teacher Calling in Higher Education* (pp. 36-48). Budapest-Oradea, Hungary-Romania: Új Mandátum Könyvkiadó-Partium PPS
- Papp, Z. A. (2011). The Education Issue. In Bárdi, N. & Fedinec, Cs. & Szarka, L. (Eds.), *Minority Hungarian communities in the twentieth century* (pp. 480-492). Boulder, USA: Atlantic Research and Publications.
- Papp, Z. A. (2013). Types of Minority Education: Possible Analysis in Pisa. In Ljubov, S. (Ed.), *Russia and Central Europe in the new geopolitical realities* (pp. 184-197). Moscow, Russian: Russian Academy of Sciences Institute of Europe.
- Pasztor, A. (2006). National Minorities with Respect to Education. The Case of Hungarians. *Review of Sociology*, 12, 17-35. doi: 10.1556/RevSoc.12.2006.2.1
- Pletl, R. (2015). The situation and issues of mother-tongue vocational training in a bilingual educational system: the relations between mother tongue - the language of instruction and the language of the state. In Pusztai, G. & Engler, Á. & Revák-Markóczi I. (Eds.),

- Development of Teacher Calling in Higher Education (pp. 49-59). Budapest-Oradea, Hungary-Romania: Új Mandátum Könyvkiadó-Partium PPS
- Pusztai, G. & Bocsi, V. & Ceglédi T. (Eds.) (2016), A felsőoktatás (hozzáadott) értéke. [Value added of higher education] Oradea–Budapest, Romania - Hungary: PPS, Új Mandátum.
- Pusztai, G. (2007). The long-term effects of denominational secondary schools. *European Journal of Mental Health*, 2, 3-24. doi: 10.1556/EJMH.2.2007.1.1
- Pusztai, G. (2015). Pathways to success in higher education: Rethinking the Social Capital Theory in the Light of Institutional Diversity. Frankfurt am Main, Germany: Peter Lang Verlag
- Szügyi, É. (2012). Iskolaválasztás a Délvidéken [School Choice in Voivodina]. *Kisebbségkutatás*, 21, 514–535. doi:
- Tinto, V. (1993). Leaving college. Rethinking the Causes and Cures of Student Attrition. Chicago-London, USA-England: The University of Chicago Press.
- Törzsök, E. (2008). Jelentés a külhoni magyarság helyzetéről. [Report on the Situation of Indigenous Hungarians]. Budapest, Hungary: Miniszterelnöki Hivatal [Office of Prime Minister]
- Veres, V. (2013). Népszámlálás [Census] 2011. A népességszám, foglalkozásszerkezet és iskolázottság nemzetiség szerinti megoszlása Romániában [The distribution of population size, occupational structure and level of education by ethnicity in Romania]. *Erdélyi társadalom*, 2, 23-54. doi:
- Windchief A. S. & Darold, J. H. (2015). The Act of Claiming Higher Education as Indigenous Space: American Indian/Alaska Native Examples. *Diaspora, Indigenous, and Minority Education: Studies of Migration, Integration, Equity, and Cultural Survival*, 9, 267-283. doi: 10.1080/15595692.2015.1048853

Integration of HE system of Azerbaijan in the Global World

Abbasova, Ulviyya^a and Babayeva, Natavan^b

^aDepartment of International Relations, Baku Slavic University, Azerbaijan; ^bDepartment of English Philology, Baku Slavic University, Azerbaijan.

Abstract

This article deals with the analysis of some important reforms and innovations implemented in the education sector by the government in Azerbaijan. After gaining the independence Azerbaijan started successfully to move forward towards the development as an independent country. The country established the close relations with different international organizations and institutions. After Azerbaijan signed on to the Bologna process, the Ministry of Education developed a comprehensive action plan, calling for the modernizing of the higher education system, a transfer to the credit system, the elaboration of new diploma and the recognition of international documents on higher education. As a result, the government of Azerbaijan started the implementation processes of reforms focused on the improvement of the quality of education in order to integrate to international standards. The Ministry of Education of Azerbaijan closely collaborates with major international organizations such as: The Council of Europe, UNESCO, World Bank, UNICEF, ISESCO, EU and so on. Cooperation between Azerbaijan and the EU is carried out within the framework of TEMPUS/TACIS, Erasmus+, Twinning/TAIEX programs. This article provides a brief overview about the above mentioned programs, their application processes, as well as the results and their influences in education system of Azerbaijan .

Keywords: *reforms, education system ,integration ,international relations, Bologna process, standard*

1. Introduction

In a current world of globalization, education like any other spheres of political, economic and social life with an easier access to universities, the education systems now are expected to provide better quality and meet the demands put forward by external environment, generally reforms and innovations undertaken to improve the quality of education is a thorough process based on multiple and comprehensive approaches to elementary, secondary as well as higher education system.

There is a high attention to the development of education in order to secure the country's future sustainable development. In this regard the legislative frameworks to recognize the system of education, as well as reforms in international context, are continuing processes of improvements and innovations.

After Azerbaijan gained its independence, the need for fundamental reforms in education as in other areas emerged. The start of transition process from the Soviet education system to modern and international standards education system goes back to the mid-90s of the last century. The modern education system of Azerbaijan consists of three historical periods: the first period being from 1918 to 1920, the next period from 1920 to 1990 imposed by the Soviet Union, and the current education system which has been maintained since the country became independent from the Soviet in 1991.

In 1993, the higher education system became a two-tier higher education system consisting of undergraduate education and post-graduate education. Since then, significant reforms have been carried out in the higher education system, as the existing regulations were improved and a credit system was adopted by the higher education institutions. After the first Bachelor degree alumni graduated in 1997, a total of 32 higher education institutions (both public and private) started providing post-graduate education in the second tier of higher education (www.edu.gov.az).

Azerbaijan's education is open to global reforms. The process of reforms leads to quality transformation.

The involvement of the students in the decision – making process became average for promoting quality counted overall. Student's opinion was considered in curriculum design, students are able to select or reject a course and students' assessment becomes an important part in course and teacher evaluation.

2. Methods

In 2005 Azerbaijan joined the process made a need to get higher education in the country, meeting the Common European Standards. Since 2005 reforms are carried out in this direction. One of the most important steps in higher education reform is the adoption of the state program approved by the president. The purpose of this program was the integration of higher education in Azerbaijan to European education space. (www.euroeducation.net, The Eurapion Education Directory)

Recognizing diplomas' grades in Europe and in other countries is one of the achievements in the education system of Azerbaijan.

Development of education in Azerbaijan, providing of children and young people with world class education, training of highly qualified personnel comprise of important part of the strategy of the country's president on turning of oil capital intellect to development of professionalism. Nowadays more than 5000 students are studying abroad in different universities. Azerbaijani youth sent for study abroad in the expense of state on all levels of education for bachelor's, master's, residency, doctoral degrees as well as qualification improvement and retraining exchange of students among higher education institutions.

They are sent for education to developed countries like Australia, South Korea, China, Malaysia, Singapore, the US, Germany, France, the Netherlands, Norway, Sweden, Finland, Italy, Belgium and Great Britain. (xaricdetehsil.edu.gov.az.-State Scholarship Program)

The country joined the Bologna system in 2008. One of the main requirements of the Bologna system is the organization of educational process in accordance with the European credit transfer system.

Joining the Bologna process has a special role in the reforms in higher education. After launching Bologna system the universities approached this process individually.

The introduction of the "Bologna process" in the education system Azerbaijan creates conditions for academic recognition of educational programs inside and outside the country. The system also allows students to continue their education at other universities and increase their competitiveness on a labor market.

The principle goal of the system of higher education in Azerbaijan is to educate and train highly-skilled specialists in line with the demands of the community and labor market.

At the same time the integration of the higher education system of our country in the European space of the higher education ensuring mutual recognition diplomas and development of students and teaching mobility. At present these rules are of great

importance as the adjusting frame document and from the point of view of integration into educational systems of the European countries.

Government covers all tuition fee expenses of the following students;

- Students from refugee families and children of national heroes
- Students who deprived of parental care
- Special talented students who get the highest points from admission examinations
- Language instruction, besides of Azerbaijani, Russian and Turkish courses are offered in English and French

Today each university has its own international relations with universities in Europe.

In 2009 Azerbaijan government adopted a new law on education after the public debate in the parliament and its implementation started. Reforms in the higher education field are implemented within the cooperation with European institutions, The European Union with European Commission. The new Law “On Education” introduced a three-cycle higher education system. Since then the higher education system of Azerbaijan is comprised of the following levels;

- 1) Undergraduate (with the exception of medical studies)
- 2) Post-graduate (with the exception of medical studies)
- 3) Doctorate

Undergraduate courses generally take four years (five years for part-time programs) and cover a wide range of domains. Undergraduate courses provide student with possibility of employment in certain specialized jobs after graduation. Upon completion of undergraduate courses, students are awarded the academic title “bakalavr” (Bachelor degree), within a specific field, and they can work in various fields except in scientific and pedagogical areas at scientific research institutes and higher education institutions.

Post-graduate courses typically last for 2 years (two and a half years for part-time programs), provide students with training in a certain field of study from scientific research or professional viewpoints and enable them to engage in professional activity, scientific research and pedagogical activity. Upon completion of graduate courses, students are awarded the academic title “magistr” (Master degree).

Doctoral education is the highest level of the higher system and is carried out at higher education institutions and academic departments (doktorantura) of scientific organization. Upon completion of doctoral studies students are awarded the academic title of Doctor of

Philosophy-Ph.D. or Doctor of Science-D.Sc.(Law of the Republic of Azerbaijan “About Education”2009)

Strategy of the government is to improve HE sector .The President of the Azerbaijan Republic issued an instruction on the preparation on the Development Concept “Azerbaijan-2020 Vision of the Future” and National Strategy for the Development of Education in the Republic of Azerbaijan. (Development Concept: Azerbaijan – 2020: Outlook for the future, 2012)

As it was mentioned above Azerbaijan has accepted the Bologna Declaration and during the last decade, the Azerbaijan Republic has demonstrated impressive achievements in the education system. One of them and the main one is cooperation between EU which is carried out within the framework of Erasmus+ program. Here we can mention the PETRA project which shows its benefits by transferring the knowledge and experience established in European Universities to Azerbaijan Universities. The objective of the project is to promote teaching and learning excellence in Azerbaijan HEI’s. The benefits of this project let us contribute to the improvement of the learning and teaching process within the university and across universities in Azerbaijan.

Besides, a number of TEMPUS projects were implemented in the country,initiated the modernization process at HEI’s. More than 80% of the TEMPUS projects in Azerbaijan have been implemented in the field of curriculum development and university management. Currently 15 universities are already involved in TEMPUS projects in different priority areas. (www.tempus-az.org).

3. Conclusion

Alongside with it, nowadays it would be better to benefit of the programs which are held in our country by the Ministry of Education. As we mentioned above Azerbaijanis open to global reforms especially in education system because education is one of the structures of the government. We have our own institutional ESG system which is held by the Ministry of education of Azerbaijan or by the universities. But it is appreciated to see or observe our results from aside. We can improve this sphere sharing and exchanging ideas, views, opportunities and competences.

Saying without any doubt, we believe and hope the educational development in Azerbaijan. The Government takes all necessary steps, through improvement of quality in education, to increase the social welfare of its population and facilitate the country’s progress.

References

Azerbaijan Teachers Institute news, 2009

Development Concept: "Azerbaijan-2020; Outlook for the Future". December 29, 2012

European Ministers of Education (1999). The Bologna Declaration of 19 June 1999 Joint declaration of the European Ministers of Education. Available at: http://www.ond.vlaanderen.be/hogeronderwijs/bologna/documents/MDC/BOLOGNA_DECLARATION1.pdf Accessed on 28/01/2016

[http://www.ond.vlaanderen.be/hogeronderwijs/bologna/links/National-reports-2007//National Report Azerbaijan2007.pdf](http://www.ond.vlaanderen.be/hogeronderwijs/bologna/links/National-reports-2007//National%20Report%20Azerbaijan2007.pdf)

Law of the Republic of Azerbaijan "About Education", 2009

Law on Education – [http://www.azertag.com/store/News/Decrees Orders Laws/ GANUN-TAHSIL% 20 Hagginda.htm](http://www.azertag.com/store/News/Decrees%20Orders%20Laws/GANUN-TAHSIL%20Haginda.htm) Baku 2009

Mikailova, U. & Radsy, V. (2013) School Leadership in Azerbaijani early childhood education: implications for education transfer. Center for Innovations for Education Azerbaijan

Ministry of Education of the Republic of Azerbaijan . Available at: <http://www.edu.gov.az>

National Tempus Office in Azerbaijan. Available at: <http://www.tempus-az.org>

Seyidov, S (2011) Reforms In Education International Integration :The Case of Azerbaijan

State Scholarship Program . Available at: <http://xaricdetehsil.edu.gov.az>

The European Education Directory. Available at: <http://www.euroeducation.net/prof/azerco.htm>

The State Statistical Committee of the Republic of Azerbaijan

Azerbaijan Education System: Transition from Traditional to Modern Teaching and Learning Strategies. A Review of Literature

Musayeva, Aygun^a; Jafarov, Elchin^b; Badalov, Bakhtiyar^c; Mammadova, Samira^d

^aSocial Work Department, Azerbaijan University, Azerbaijan; ^bEducation Department, Azerbaijan University, Azerbaijan; ^c International Relations Department, Azerbaijan University, Azerbaijan; ^d Department of Foreign Languages, Azerbaijan University, Azerbaijan

Abstract

Education plays important role in the society and in the everyday lives of plenty of people. Education influences people in different ways, and the significance of high quality education is indisputable. Particularly, innovation in education is a light that shows the humankind the right direction to surge. The advancement of the society directly dependent on the development of education and its quality. The fact is that, technological progress and innovative technologies application in education system bring new tools for struggling with complicated obligations in education systems. People get opportunities to express themselves, communicate and interact with other peoples in local, national and global context by using innovative technologies in education. The main purpose of study is to examine traditional and modern, innovative methods of teaching and learning, to explore the impact of these methods on educational environment and specifically discuss different teaching and learning methods regarding Azerbaijan education system.

Keywords: *active teaching learning, teaching strategies, teaching techniques, benefits of active learning, active teaching in Azerbaijan.*

1. Introduction

The large-scale application of information technology to human life in modern age, the digitalization of everyday life in the context of globalization processes has given a boost to the development of society, and the discrepancy has been created between this speed and human development speed. Therefore, adapting the human development pace to the society's pace of development is one of the most urgent issues facing the modern era. In each society, this function is implemented by the education system. Thus, the education system should be built so that the individual can acquire knowledge in the field of narrow specialization selected in terms of the abundance of modern information, as well as the achievements of people separated into different groups can be coordinated and assembled. In fact, all the leading countries in the world are looking for this optimal model of education (Constitution of Azerbaijan Republic, 1995, Article. 42).

Studies show that education serves three different purposes depending on its level and trend: firstly, knowledge and experience to be used in this or other fields of action, to be applied in practice; secondly, to teach others knowledge and experience; thirdly, to raise the level of knowledge and experience, to gain new knowledge. The first one serves the application, the second - dissemination, and the third - increasing of knowledge and experience.

The educational system that aims at gaining success in each of these three areas, or the separately taken high school, should also put the proper organization of work on the easy-to-master knowledge and skills acquisition. Because of this, world-wide learning and teaching methods should be analyzed, compared and the relevant method should be chosen according to the specificity of the subject. When making this choice, external experiments applied successfully should be studied, the applying possibilities of information technologies should be investigated, and new teaching and learning methods are to be applied, taking into account the needs of the globalized world. In our opinion, the succeed opportunity of higher education institutions in the teaching acted in the former Soviet Union is due to the above.

Over the past few years, active learning has attracted considerable attention. Often presented or perceived as a radical change from traditional learning, the subject often polarizes the ability. Active learning has attracted strong supporters among faculties who are looking for alternatives to traditional teaching methods, while the skeptical faculty sees active learning as another in a long series of educational fads. There are still questions about what active learning is and about its difference from traditional education teaching and learning methods.

This study determines active learning and distinguishes between different types of active learning, most often discussed in the literature, and also analyzes their effectiveness compared to traditional teaching and learning methods.

At last, this study helps the Faculty of Engineering, summarizing some of the most relevant literature in the field of active learning (Cambridge International Examinations, 2015).

2. What does mean active learning?

Class room where students actively participate in the learning process and respond to learning opportunities by created knowledge and understanding is recognized as active learning. This contrasts with traditional chalk and talk model of learning which transmit knowledge from the teacher to the students.

Active learning is described with various terminologies in different research studies.

These terminologies include:

- Learner-centered, where students are actively engaged in learning, teachers play learning activist role rather than instructor.
- Problem-based/discovery-based research, where students examine and articulate different scientific issues, analyze related evidence, apply appropriate theories to collected evidence, come up with the conclusions and reflect on the results.
- Experiential learning, were students learn from direct experience.

Many authors define these terms somewhat differently, and such classifications of learning overlap with each other (Eison, 2010).

3. Theoretical basis of active learning

According to the theory of constructivism in active learning process students build or construct their own understanding. Within this process student create meaning, based on their prior knowledge gain deeper and more qualified level of understanding. Effective learning environment interaction between instructor and students provided by qualified training contribute to in-depth training (Li, M. P. & Lam, B. H. 2005)

Social constructivism theory states that interaction with professor or with same age students generates learning.

Lev Vygotsky (1896-1934) as one prominent social constructivist has described the zone of proximal development (ZPD). This is an area where learning activities should be focused,

lying between what the students can achieve on their own, and what the student can achieve with the help of the teacher's expert guidance. The objectives of the forest, providing guidance and support that challenge the student on the basis of their current abilities, and by providing rich feedback using the assessment for learning (see Separate Compendium), the teacher actively helps students to develop their deeper levels of understanding.

However active learning is consistent with other learning theories:

- According to the study conducted by Jean Jacques Rousseau (1712-1778) and other authors as John Dewey (1859-1952) and Maria Montessori (1870-1952) learning should be relevant and be in a meaningful context. It means that, human being better understand and learn when he/she practically sees the usefulness of knowledge and have an opportunity to connect it with the real world.
- Learning is development. Therefore, the study of experience for children should correspond to age, although the level of development and age do not always coincide (Eison, 2010).

4. What are the advantages of active learning?

Before discussing why it is important to use active learning and learning strategies, first, let's try to find an answer to the question "What is wrong with 50-minute lecture?".

In first glance, it seems that if lecture presentation is well designed and captures big amount of information, it would be time efficient way to cover course material by instructor.

Interactive lectures are presentations that provide students with multiple brief opportunities for structured engagement. In contrast to the traditional lecture, in interactive lectures instructor talks with periodic pauses for structured activities and for provision of long-lasting student concentration, a short structured in-class activity is assigned. In contrast with interactive lectures in traditional lectures instructor talks & students listen with minimal interruptions, students-to-student talk is discouraged. If instructor asks questions, students commonly respond by raising their hands. In most of cases, students are not provided with opportunities to correct misunderstandings during the lecture. Students listen to the instructor and take notes independently. All these factors, impact attendance rate of students in traditional lectures. In interactive lectures, students are encouraged to talk to each other and work with partners or in group. In the result of opportunities provided to students in interactive lectures, often high rates of attendance are reported.

According to various sources, promotion of deep and lasting student learning is cannot effectively achieved by listening to a classroom lecture. While lecturer transfers the information from his/her notes to students, transferred information is not passing from their minds and as a result, students are daydreaming, casually participate in the lecture, playing

on laptops and listening music. The number of students who take notes in the lectures become less and less. If lecturer provides lecture by using Power Point Presentations student become careless, as they feel assured that slides are available and have easy access to them. At the same time, it is important to mention that, lecture method of teaching is considered relatively poor strategy for maintaining student attention. Thus, research findings suggest that student concentration during lectures begins to decline after 10-15 minutes (Michael Prince, 2004).

Different researches and national reports indicate that using active teaching learning strategies in the classroom is very important to achieve maximum student learning. In the result of large-scale analysis of studies was reported that, examining small group learning in SMET compared to traditional instruction methods high test scores and more positive student attitudes can be achieved.

Application of interactive teaching-learning strategies and creating active environment, result in change of instructor's, as well as student's roles in the class (Northern Ireland Curriculum, 2000).

Interactive techniques revive students from their passive mode and they become more attentive and engaged in class environment. Their activity and engagement are two main prerequisites for effective learning.

Examples of effective teaching and learning techniques are given below. However, it is important to mention that depending on teaching style and personality of the instructor his/her choice of interactive teaching-learning technique is influenced.

Think Break – instructor asks a kind of rhetorical question, and then lets students go into the details of the problem prior to explanation of the answer to the question for 20 seconds. Such method, even if discussion turns to be impossible, can motivate students to join the problem-solving process. When students take a note (while you are also writing answer), try to make sure that they are really involved in the problem-solving process (http://www.nsead.org/downloads/Effective_Questioning&Talk.pdf).

Examining into notes – Instructor stops asking questions for a few minutes, so the students can get an opportunity to make comparisons among what they have written down through the given minutes, complete the gaps and prepare questions in concrete with the fellow students.

Skip the Chalk –Instructor brings a chalk or any kind of motivating item to students. Among the students the one who holds the chalk or that any item and answers the instructor's following question shall hand them over to any students he wishes.

Table1. Roles of instructors and student in both active and passive teaching methods.

Instructor's roles	
Passive	Active
Teacher-centered classroom	Learner-centered classroom
Product-centered learning	Process-centered learning
Teacher as a 'transmitter of knowledge'	Teacher as an organizer of knowledge
Teacher as a 'doer' for children	Teachers as an 'enabler', facilitating pupils in their learning
Subject-specific focus	Holistic learning focus

Student's roles	
Passive	Active
Being passive recipients of knowledge	Active and participatory learners
Focus on answering questions	Asking questions
Being 'spoon fed'	Taking responsibility for their own learning - reflective learners
Competing with one another	Collaborating in their learning
Wanting to have their own say	Actively listening to opinions of others
Learners of individual subjects	Connecting their learning

Source: Own performance

Tournament– Instructor divides the students into two or more groups and starts a competition to check their knowledge on the practical tests. So, it is better to allow the students to look through the topic with their group mates and complete the task to gain a point in the contest.

After completing every single series of the contest, the instructor pauses for some minutes, so the students study the following task before scoring once more. The points the students gain are passed on to every next round of the contest. Students' stimulation and motivation for the contest will help them take a part and focus on the given materials.

One-minute papers – Students start writing answer to the given particular question during one minute, which is summarized as “write memorable things you have learned this lesson”. This is one of the best methods to use at the end of each lesson (Thomas A. Angelo/K. Patricia Cross, 1993).

Gallery walk – Instructor provides stickers of different colors to students and assigns them to vote for any actions they have consented to with a greater number of class students. To complete the task, students must use small number of points for the topics written in advance and presented in the classroom on whiteboard or large printed pictures.

Think-Pair-Share –Instructor provides a few minutes for students, so students exchange their opinions with their team mates and make comparisons among their answers to the given question before discussing the responses with the classroom (ibid).

The task of written review for peers –Instructor asks the students to pass their project on to their peer team mate. The team mate looks through the project and notes 3 points he could focus on as it was his own project: the first paragraph of the essay underlines the high qualities of the project; the second part features the problems of the project whereas the third part gives a short conclusion the team mate has to pay attention to.

Jigsaw (Group experts) – Instructor asks each group to work on various subjects and separates them again into groups, assigns an experienced expert who will be teaching and guiding his peers for each subject. For the first day, it can be fruitful for the experts to teach the other distinct parts of the task.

Application for movies –The group members put forth a list of some films related to the subject or theme they have talked over in the classroom and make an effort to identify one or more (at least one) methods that directors of those films have properly realized and one or more methods to remove them.

TV-commercial –Students working in teams create a 20 or 30-second TV ads or commercial regarding the subject they debated on in the classroom. Upon completion of the ads creation, the instructor asks them to present their advertising.

Blender –Students take notes about definitions on their own and then talk through the main idea for two or three minutes on paper. After the discussion, the students are separated into groups, two of which voice their ideas and combine the key aspects of each one. The third one also reads and then as previous one, integrates it with the previous two. Such process

continues until every student of the group tried to unite the key elements of their ideas with the one coming before.

Simulation –To facilitate the Problem-Based Learning (PBL) student-centered teaching method, instructor exposes the students to a longtime simulation (for example, a model as a business).

Video-demonstrations –Using the advantages of modern technologies (for example, webcam), the students prepare a presentation connected with their subject and post it on Youtube or other websites.

Student videos –Instead of making PowerPoint slides, the lectures, discourses, projects and presentations of students can be presented by videos and be downloaded to get the fellow students to watch it.

Method of closed eyes –Instructor gives an assignment to the students to make their presentation with closed eyes to keep them from scrutinizing these presentations outside the classroom (here are included poems). The instructor should also remind the students of downloading the presentations on YouTube or other website that allows for class reviewing.

Video clips –Instructor shows short parts of well-known movies to draw attention to the point, opens a debate in which students pursue the fact the film is not correct, etc.

Colored boards –Under the guidance of the instructor, students generate a collection of three or more paper size cards. Such cards can be used to vote for the issues they discussed during class sessions by lifting up the relevant board or poster in the air. Probably the backside of each card will be white, which enable the students not to see the answers of fellow students.

Answer any three –Instructor writes 6 or more questions on the board and assigns the students to stand up (or stand beside the board) and answer any three of the given six or more questions written on the board.

Crossword –Before giving tests to students, instructor invents a crossword puzzle to help students view terms, meanings of words and general notions. Using some websites, such crossword puzzles can be automatically created (<http://www.usf.edu/atle/documents/handout-interactive-techniques.pdf>).

Considering the fact that students acquire knowledge by learning a language, student-centered instructor should enable the students to get knowledge from conversations, reading and writing. To facilitate the understanding of the entire class, instructors should focus on using dialogues, debates and team works. Before generating a plan of teaching students, student-centered teachers will put their learning in a real-life context and try to know the

key initial aspects of the understanding of students. Therefore, student-centered instructor pays attention to the process of differentiating and applies the following strategies appropriate to the assessment of learning:

- Practical questionnaire;
- Exchange of assessment factors;
- Giving feedback;
- Expert appraisal;
- Application of the assessment information in practice to adapt their teaching.

Students should understand that comprehension is more important than learning by heart. Through long-term comprehension the students will be able to memorize facts better rather than just studying them. They should realize the fact when approaching the lessons that, their future success in studies depends on their readiness to make mistakes, to take part in debates, to apprehend and acknowledge that they can sometimes make mistakes or learn from others' mistakes. So they have to actively "apprehend" ideas rather than just memorizing the facts.

To sum up, by generalizing the references on active learning we believe that, that this leads to an enhancement of the approaches of students and to development of their ability to think and write (Silberman, Mel., 1996, VanGundy, Arthur, 2005, Watkins, Ryan, 2005).

5. Conclusion

Since presently, the traditions of Soviet education are still in use as in most of CIS countries, the conformation of the education system to the Western standards is only of formal nature. Therefore, the key issue facing the countries of this region is not to be satisfied with formal reforms in education, but to make fundamental changes in accordance with the philosophical nature of education, real economic and social situation, new opportunities and requirements. We believe that, it is better to start the process of teaching and learning with a new point of view for all stages of education.

References

- Constitution of the Republic of Azerbaijan 1995, Article 42, http://azerbaijan.az/portal/General/Constitution/constitution_01_e.html
- Cambridge International Examinations (2015). Active learning. Retrieved from <http://www.cambridgeinternational.org/images/271174-active-learning.pdf>

- Eison, J. (2010). Using Active Learning Instructional Strategies to Create Excitement and Enhance Learning. Retrieved from <https://www.cte.cornell.edu/documents/presentations/Eisen-Handout.pdf>
- Li, M. P. & Lam, B. H. Copyright 2005-2013 The Hong Kong Institute of Education All rights reserved. www.ied.edu.hk/aclass/
- Michael Prince (2004). Does Active Learning Work? A Review of the Research. *J. Engr. Education*, 93(3), 223-231. Retrieved from http://www4.ncsu.edu/unity/lockers/users/f/felder/public/Papers/Prince_AL.pdf
- Northern Ireland Curriculum (2000). Active learning and teaching methods for key stage. The Partnership Management Board. Retrieved from: http://www.nicurriculum.org.uk/docs/key_stage_3/altm-ks3.pdf
- Silberman, Mel. *Active Learning: 101 Strategies to Teach Any Subject*. Allyn and Bacon: Boston, 1996.
- Thomas A. Angelo/K. Patricia Cross, *Classroom Assessment Techniques*. 2nd Edition. Jossey-Bass: San Francisco, 1993.
- VanGundy, Arthur. *101 Activities for Teaching Creativity and Problem Solving*. Pfeiffer: San Francisco, 2005.
- Watkins, Ryan. *75 e-Learning Activities: Making Online Learning Interactive*. San Francisco: Pfeiffer, 2005.