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Preface

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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 second edition (HEAd'16) was held in Valencia, Spain during 21-23 June 2016. This preface gives an overview of the aims, objectives and scope of HEAd'16, 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'16

This volume contains the selected short papers and posters of the Second International Conference on Higher Education Advances (HEAd'16), which was held in Valencia, Spain during 21-23 June 2016. After this second edition, 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 selection of the scientific program was directed by M. Cinta Vincent-Vela and Raúl Peña-Ortiz, who led a team of 140 program committee members representing 40 countries in all five continents. Following the call for papers, the conference received 327 full paper submissions from 54 different countries. All the submitted papers were reviewed by at least two program committee members under a double blind review process. Finally, 104 papers were accepted as full papers for oral presentation during the conference and for inclusion in a special issue of "Procedia Social and Behavioral Sciences". This represents an overall full paper acceptance rate of 31%, in line with the acceptance rate of the previous edition (HEAd'15), which was 30%. This selection ensures a high-quality program which is greatly valued by the research communities. Additionally, 23 submissions were accepted as short papers and 40 as poster communications, all of them receiving high review scores and published by UPV Press in this volume. The program committee chairs congratulate all the authors for having their papers accepted in the proceedings of such a competitive conference.

HEAd'16 also featured three keynote speakers that overviewed important and actual topics: Prof. Lim Cher Ping (Hong Kong Institute of Education) talked about rethinking Higher Education teaching and learning from quality, equity and efficiency points of view. The talk by Prof. José María García Álvarez-Coque (Universitat Politècnica de València) dealt with the Massive Open Online Courses (MOOCs) and the experience they can give to trainers. Finally, Prof. Juan Manuel García Lara (Universidad Carlos III) focused on how to use teaching and student based data to answer broad interdisciplinary research questions.

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) 2015. 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.

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Study of ocean and wind energy potential with R: an innovative experience in the classroom

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Abstract

The Engineer School of Eibar initiated the Grade of Engineering in Renewable Energies four years ago. This pioneering educational project has shown many challenges to the teachers of the new grade. Among the different software skills used in this project, R programming language has been a very important one because of its capacity for spatio-temporal analysis and graphical visualization of wind energy and wave energy potential. A quarter of the subject's program in Wind Energy and Ocean Energy has been used via Problem Based Learning for the application of statistical calculus with R. The aim of this contribution is to show some paradigmatic problems solved by the students and the results obtained. Finally, the opinion of the students about the use of R and its learning potentiality have been gathered and analysed.

Keywords: *R programming language; Renewable Energies; Wind Energy; Ocean Energy; Learning by Problems.*

1. Introduction

In this paper we briefly show the computational techniques used by the research group EOLO of the University of Basque Country because they have been applied in the teaching of the Wind Energy and Ocean Energy subjects. The interesting results of this didactic challenge are described here. Firstly, we will describe the research work and the pioneering grade in renewable energies, and after that, we will show some paradigmatic examples of problem solving by our students applying the mentioned research techniques. The results identify several R programming packages which establish structured methods for spatial and potential problem solving in the classroom. The final discussion underlines the satisfaction of our students and concludes with some reflections about problem solving and the heuristic of experts and novices. The research group EOLO has a long trajectory in mesoscale models in meteorology and in the prediction of wind and ocean waves (Ibarra-Berastegui et al., 2015a; Ibarra-Berastegui et al., 2015b). A challenging educational project, the new Grade of Engineering in Renewable Energies (Engineering School of Eibar, 2015) in the University of Basque Country, was a very good space to apply these computational techniques in an educational way. The new grade started four year ago with 70 students. After basic typical subject in engineering, the students specialized in the third and fourth year in several renewable technologies. Our contribution, from the area of Fluid Mechanics, was related to Wind Energy (third course) and Ocean Energy (fourth course). The teachers have obtained great results in the student's surveys and in the opinion of the teachers the students have executed a very active work based on self-learning and cooperative problem solving (Newell and Simon, 1972). This problem solving work has been done by R statistical programming language (R-cran, 2015), which offers a high variety of possibilities in different scientific areas; for us, mainly in the graphical visualizations and spatio-temporal analysis of datasets. In this way, the students have been able to visualize wind energy and wave energy potential spatially in geographical maps combining R with (Geographical Information System) GIS analysis thought other computational applications as Quantum GIS (2015). For that, data from different mesoscale models (Weather Research and Forecasting, WRF) and remote sensing data (CCMP -Cross Calibrated Multi Platform-, QuikSat, RSS DISCOVER -Remote Sensing Data Discover-, TOPEX, ETOPO1) has been used, with refined datasets offered by satellites which are combined and improved via cross calibrated multi-platform systems. In this way, the students can obtain wind speed and direction at 10 m, isolines of the ocean bathymetry, wave height and period, or the direction of wave flux. Besides that, the students even have been able to compare satellite and mesoscale model data against observed data. In the case of ocean energy final grade pojects, several observations of sea buoys of the Spanish State Port Authority have been used for that purpose.

2. Learning by Problems

All this activity offers a real and pragmatic way of problem solving to our students, simulating what the scientist do every day and using the logic of discovery instead of the logic of justification (Hanson, 1958). As Clement says (Clement, 1988, 2008) in his deep study of scientific creativity that deals with a problem, there is no difference heuristically between the problem solving capacity of an expert and of a student. That is, the students should know the real scientific practice, and not only the final important and supposedly finished theories (Chi et al. 1981, 1989). The state of the art in this domain has been developed very quickly mainly in constructive problem solving via the use of analogy and different heuristic roles has been pointed out for that. The methodological analogy is an important one and this is our R programming purpose in the classroom for two subjects: Wind Energy and Ocean Energy. Only paradigmatic examples of the student's work are presented here, which together with the other raised problems design a suitable environment for constructive learning (Simons, 1993; Welsh, 2012) based on the versatility of the R programming language.

2.1. Wind Energy

In the subject of Wind Energy 23 teams of three students has elaborated the statistics of wind resource and the estimation of annual energy production for different turbine types. For that, Weibull distribution's *k* and *c* parameters have been obtained to fit the histogram of wind speed (see Figure 1). For example, for that purpose, *MASS* and *ismev* statistical packages have been used (see section 3. Results) by means of *fit.distr* function. Therefore, the Weibull fitting calculates the necessary wind parameters (*k* and *c*) to estimate the annual wind energy production of any turbine if we have its power curve.

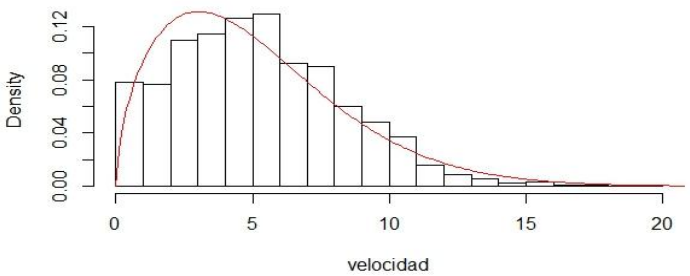

Figure 1. Histogram of velocities and Weibull fitting.

Besides that, wind rose has been plotted using the direction data vector to interpret the qualitative wind characteristics of the considered location (Figure 2). Two packages can be used for that: *openair* or *circular*. The wind rose of the figure fits the Von Mises

Distribution with different smoothness in red, green and blue colour, which is a specific distribution for wind direction that can be represented in polar coordinates. In this way, the main wind direction is visually expressed for different smoothness capacity. The fitting visualizes clearly that the main wind direction is the Northwest in the considered location.

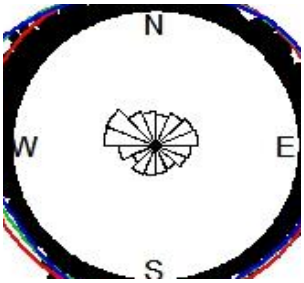

Figure 2. Wind Rose with three fitting resolutions.

2.2. Ocean Energy

12 problems about the estimation of ocean wave energy with a duration of a week (4 class hours) has been developed during the subject by two groups of 20 students. Wave energy flux and the spatial distribution of technologies that could capture this energy depends strongly on the depth of the ocean floor or its bathymetry. The data of the project ETOPO1 (2015), the newest generation of topographic and bathymetric global measures by NOOA, are directly linked with R by means of *marmap* package that can be immediately and freely installed by the students. Figure 3 shows one of the maps obtained by one of the students for the Gulf of Biscay. The possibility to draw isolines (isobaths in this case) and obtain colored maps in one of the great potentials of R in mapping spacial parameters.

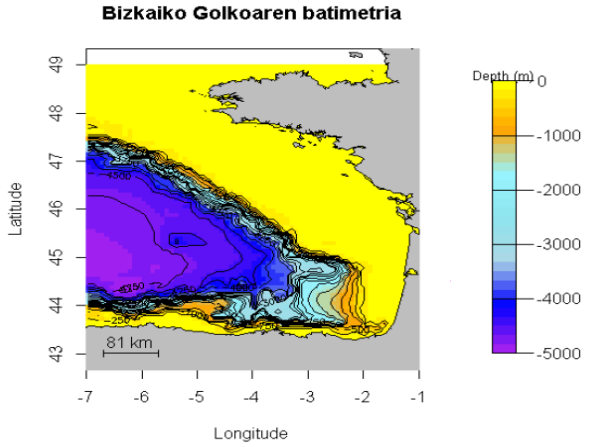

Figure 3. Bathymetry of the Gulf of Biscay.

The following image (Figure 4) shows another coloured map, but in this case the wave energy potential is mapped in the Gulf of Biscay. TOPEX satellite data have been employed for that, calculating the mean wave height and period in its gridpoint where the satellite measures the surface of the sea. Since the wave energy potential is proportional to the period and to the square of the wave height, wave energy potential can be calculated in each gridpoint. After that, R is able to create a gradual coloured map over the original satellite resolution and to reference it by means of a colour palette (in the right).

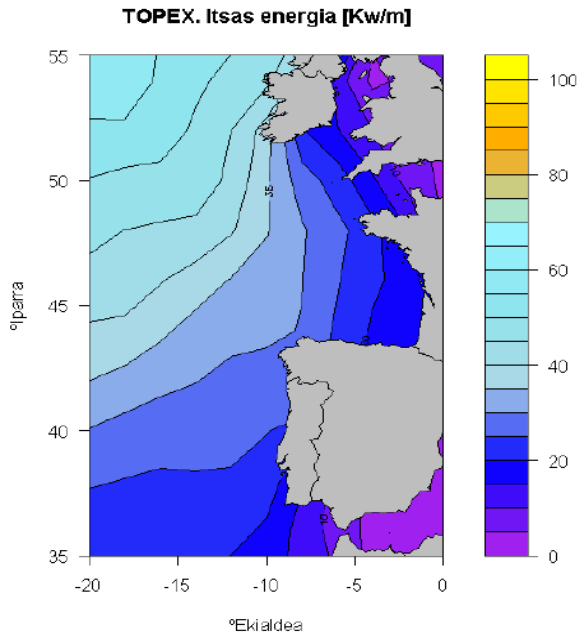

Figure 4. Wave Energy in the Gulf of Biscay.

Similarly, the students have obtained a global map of wave energy distribution (see Figure 5). Besides that, they have represented the maximum (green) and minimum (red) wave energy potential positions in the world, after developing a elaborated calculus with the dataframes offered by TOPEX. In this way, the treatment and transformation of different formats of datasets and geographical reference systems are also practical issues that our students have learned.

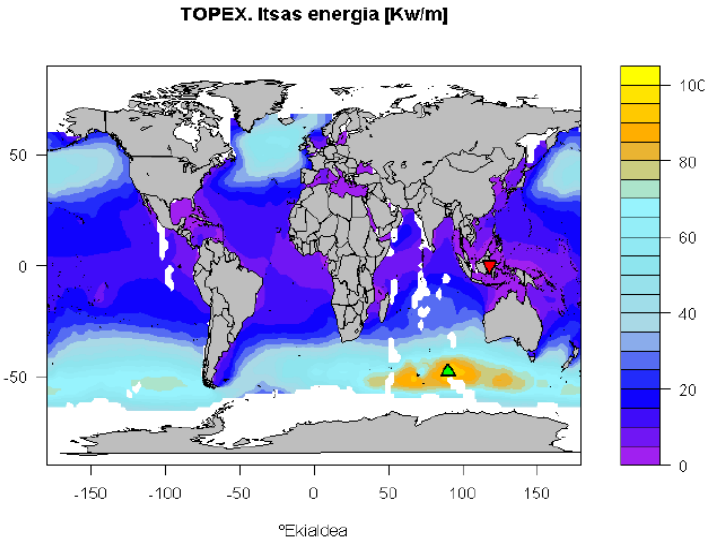

Figure 5. Global wave energy distribution.

3. Results

Several statistical methods for the estimation and analysis of wind and wave energy potential has been treated in our course. We want to emphasize the following practical skills that simulates everyday scientific activity developed by our students in the use of R and the constructive and potentially creative character of them:

- the *sp* package to import, export and manipulate geographical data that are structured by raster models (Bivand, 2011).
- The packages *maps* and *mapdata* which offer shorelines, rivers and political boundaries in low resolution (Becker eta al, 1995).
- The *marmap* package to study bathymetry and isolines on the ocean floor (Pante 2015).
- *Ismev* and *evir* packages to fit Gumbel's GEV model to the statistics of extreme events as huge waves on the coast (Gilleland 2012).
- The package RNetCDF (Network Common Data Form) to read and manipulate the common *.nc* dataset format in climatology, oceanography and meteorology.

Furthermore, surveys point to considerable success in the classroom. The general opinion about the two subjects and the use of R has been between 4.3 and 4.5 out of 5. The students

valued very positively the use of advanced software, and cooperative and practical *know how* in the estimation of offshore wind and ocean wave energy potential.

4. Discussion and Future Outlook

Compared with other similar subjects students' opinion establishes a hight mark, since many of them present general opinion below 4 or even 3 out of 5. We do not have data about the students' opinion for the same subject with other teaching methods because it is a new grade. But the mean opinion for all the University of Basque Country is 3.5, and this reference tells us that the opinion of our students is really good, better if we take into account that it is a totally new subject in our university. In fact, our teaching method weakens the rigidity of justification context in favour of discovery. This tendency is so important that the students design their own open problems as they are working with R. According to our experience, 15 hours are enough to develop the needed programming base for a creative disposition in the classroom. This new ideas suppose a constructive approach in a cooperative way, since the students work together helping each other in every moment. What is more, some final grade projects has been developed starting from the ideas surged in this didactic environment. We think that this educational challenge which binds programming and an open, innovative and exciting area as Ocean Energy offers a powerful example on problem based learning, not only for its capacity to solve many different problems, but because of its capacity to generate open problems in a constructive way. This constructive aspect creates a rich learning environment via cooperation. The teacher lecture work ends in the first third of the subject program and the following time can be used to solve several problems and to raise new ones. The idea is to learn while doing. Furthermore, this activity constitutes a fruitful heuristic work for students that is adaptable to any other environment. Briefly speaking and remembering Clement's work, if we take into account that there is no difference between the problem solving capacity of an expert and of a student, we simulate directly expert's *know how* in the classroom. In our opinion, this methodological focus is what encourages the motivation of our students and their creative confidence, which offers many educational variables for future planning based on problem solving and simulation of what experts do.

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Gamifying Impromptu Speech for ESL/EFL Students

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Abstract

This paper outlines an impromptu speech activity entitled "Dented Helmet vs. Spambot" intended as part of any introductory public speaking course. The activity is designed to overcome specific affective and cognitive challenges of ESL/EFL students, in particular Chinese learners, and is inspired by the principles of gamification (Kapp, 2012) with core gaming elements such as "freedom to fail", "rapid feedback", and "storytelling", The activity requires "Rory's Story Cubes" (a set of nine six-sided dice designed to spark creativity) and a special set of slides. An exploratory assessment of the effectiveness of our proposed activity was conducted on a sample of Chinese EFL sophomores enrolled in an international branch campus of a U.S. university in China, with 81 students completing our questionnaire. Overall, our findings provided some initial support to the effectiveness of our activity in terms of strenghtening students' ability to communicate orally "off the cuff", promoting students' understanding of the role of storytelling in effective presentations, fostering students' understanding of the major organizational formats used in organizing speeches, and increasing students' awareness of their nonverbal communication during oral presentations.

Keywords: *Gamification; speaking skills; public speaking activity; impromptu speech; Chinese EFL students.*

1. Introduction

Chinese demand for English-based education is on the rise. China is not only the leading place of origin of international students in the U.S., but also the second largest importer of international branch campuses (IBCs). Out of the 29 IBCs currently active in China, 11 result from partnerships with U.S. educational institutions, making the United States the largest exporter of branch campuses in China. However, introducing American-style educational practices in China is in many ways challenging: Chinese students tend to be unwilling to communicate orally in class. This reticence is particularly problematic in activities that target students' speaking skills (Girardelli & Patel, 2016).

The impromptu speech, namely "a speech delivered with little or no immediate preparation" (Lucas, 2005, p. 246), is probably the most intimidating activity. A first-level order of issues is based on emotional factors. The lack of (or very limited) wait-time has been found to be particularly anxiety-inducing in Chinese EFL students and may lead to inability or reluctance to speak as a result of such emotional pressure (Mak, 2011). This is coherent with Krashen's (1988) "affective filter hypothesis", which posits that emotional factors such as motivation, self-esteem, inhibition, and mistake-related anxiety may significantly influence students' outcomes and effective learning. A second-level order of issues is based on cognitive factors. Hsieh (2006) categorized the following problems confronted by Taiwanese students in impromptu speech competitions: 1) limited language skills (narrow knowledge of English vocabulary); 2) limited speaking skills (lack of skills directly related to public speaking, such as speech organization skills); 3) and limited background knowledge (limited life experience that is necessary to discuss about one topic).

In this paper, we describe an impromptu speech activity that has been designed to address typical issues of Chinese ESL/EFL students and present the results of an evaluation tool intended to capture Chinese students' experience and opinions regarding this new activity.

2. Gamifying Impromptu Speech for ESL/EFL Students

The proposed activity is entitled "Dented Helmet vs. Spambot" and has been inspired by the principles of gamification, namely the "application of game elements […] in learning programs" (Kapp, 2012). In particular, our activity includes the following core game elements:

1. *Freedom to fail*: De-emphasis of grading concerns by assigning a baseline "participation grade"; focus on lessons learned through the gaming experience;

2. *Rapid feedback*: Application of recently learnt concepts; multiple performance evaluations from both peers and instructors in a non face-threatening role playing context;
3. *Storytelling*: The activity is embedded in a unifying narrative. Participants are invited to contribute in developing a story with their speeches.

The use of gamification was intended to remedy ESL/EFL students' two levels of challenges: affective and cognitive. Affective factors are addressed by playing artificial roles in a fictional context. In this setting, ESL/EFL students can step outside the pre-established and potentially inhibiting student-instructor roles with relative codes and cultural conventions, while also saving face in case of mistakes. In addition, the activity addresses second-level, cognitive challenges in that it encourages the practice of certain organizational formats and it refers to areas with large background knowledge, such as super heroes, fairy tales, and other popular forms of fictional story telling. Because of the need of such mental stimulation paired with emotional comfort, the activity is expected to be challenging and rewarding for ESL/EFL students despite its simplifed aspects.The proposed gamified impromptu speech activity is intended as a part of any introductory public speaking course (see for instance Lucas, 2005), and its goals include:

- *Goal 1*: Building students' ability to communicate orally "off the cuff" with limited wait-time;
- *Goal 2*: Promoting students' understanding of the role of storytelling in effective presentations (vivid language, introduction/body/conclusion);
- *Goal 3*: Fostering students' understanding of the major organizational formats used in organizing speeches (cause/effect order; topical order; chronological order; spatial order; problem/solution order);
- *Goal 4*: Increasing students' awareness of their nonverbal communication during oral presentations (body language, paralanguage).

2.1. "Dented Helmet vs. Spambot:" Gameplay

The "Dented Helmet vs. Spambot" activity follows the format of popular music competition shows such as *X-Factor* with the instructor playing the part of the *host*. The class is subdivided into teams of a minimum 4 people in each team. One member of each team is selected as part of the *judges*. A list of presenters should be prepared in advance to ensure full participation. During each turn, one member from each team is called to give an impromptu speech. Judges should be provided with a score sheet at the beginning of the activity with the names of the presenters.

The activity requires: a) An overhead projector; b) "Rory's story cubes" (a set of 9 six-sided dice, each decorated with different images to spark creativity, see figure 1;

Gamewright, 2010); and c) a set of "story slides" (figure 2) where three randomly selected Rory's story cubes are placed at the beginning of every turn (figure 3). The complete sets of slides for both the "Dented Helmet vs. Spambot" and the alternative, martial arts inspired "Black Belt Jones" impromptu speech activities are available upon request by contacting the first author.

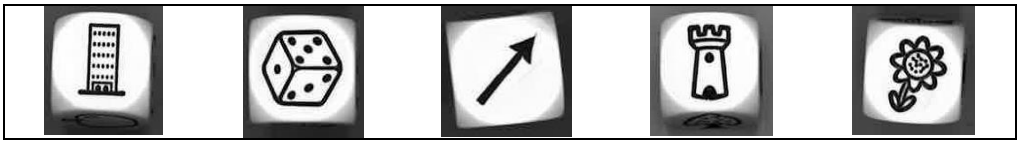

Figure 1. Example of images from "Rory's story cubes." Source: Gamewright, 2010.

Figure 2. Example of an "story slide"

Figure 3. Example of an "story slide" with ""Rory's story cubes" (Gamewright, 2010)

The instructor (*host*) introduces the activity clarifying the meaning of impromptu speech and introducing the *judges*, who are invited to evaluate the speeches of the *presenters* on a 1 to 3 scale, with 1 being ok, 2 being good, and 3 being excellent. The host then lists the characteristic of an excellent speech (see Lucas, 2005) in terms of effective body language (dominant posture, facing the audience, no "talking to the screen," open gestures, no defensive postures), eye contact (every member of the audience should be briefly included, no looking at ceiling/floor, no focus on only one part of the audience), and paralanguage (voice dynamics, no fillers). The host explains that participants will be also evaluated in their ability to complete their part of the "story" based on the "story slides" shown on the screen. There are no right or wrong answer; instead, presenters should create their own 2- to 3-minute narrative based on their imagination inspired by the "story slides".

The activity starts with a demonstrative "warm-up round" (figure 2 or figure 3 according to the chosen mode). The presenters can either create their own introduction or simply read the introduction available in the slide; then, they continue their speech following the pattern shown in the slide; finally, they are expected to end their performance with an original conclusion.

After the warm-up round, the actual activity begins. One member from each team is invited to leave the room. The host explains the basic premises of the story ("an endless fight between two archenemies") and places in the overhead projector the "story slide" for the first round. To add suspense, the host rolls the "Rory's story cubes" and randomly picks three dice to be placed in the "story slide". One by one, the presenters are invited to enter the room and to continue the story. At the end of each round, the host invites the judges to comment on each presenter's performance (they are expected to highlight at least one strength and one weakness) and to indicate the best presenter(s). After the judges' comments, the host invites the second group of presenters to exit the room, and so on and so forth, until the final "story slide."

2.2. Debriefing and End of the Activity

While a member of the jury computes the final score for each team, the host engages the entire audience, opening a discussion on the importance of nonverbal communication, effective organization, and vivid storytelling in successfull presentations. The host also introduces the organizational formats (chronological, spatial, cause-effect, topical, etc.; see Lucas, 2005) used in each "story slide". Following the principle of "rapid feedback" in gamification, participants receive during the activity an almost immediate feedback of their performance from their peer-judges in terms of both an overall score and suggestions on areas of strength and weakness.

3. Students' Evaluations of the Activity

In this section we present an exploratory assessment of the effectiveness of our proposed activity on a sample of Chinese EFL sophomores enrolled in a Sino-American international branch campus accredited by the Middle States Commission on Higher Education. All core classes are taught in English. Sophomore students are required to take a basic public speaking course, which includes two impromptu speech activities ("Dented Helmet vs. Spambot" and "Black Belt Jones") with similar gameplay.

Data were collected on the 11th week of the 15-week semester during the course evaluation session. After completing the SIR II survey, students were administered a questionnaire with a set of additional questions that specifically targeted their experience in the impromptu speech activities. Participants were informed that their participation was voluntary. The instructor was not present during the evaluation process.

Respondents were asked to indicate their degree of agreement or disagreement with a total of 11 statements on a six-point Likert-type scale with "strongly disagree" coded as 1, "disagree" as 2, "slightly disagree" as 3, "slightly agree" as 4, "agree" as 5, and "strongly agree" as 6. Following Mak's (2011) recommendation for similar samples of Chinese EFL students, a neutral point was not included in the scales to force respondents to commit themselves; in this manner we tried to avoid having most responses clustered in the neutral mid-point. Directions indicated: "Please be honest: your answers are completely anonymous. The following questions refer to the impromptu speech activities done during this semester".

3.1. Participants

A total of 81 students completed the questionnaire (N = 117; participation rate = 69.2%). Chinese Mandarin was the first language for the entire sample. 61.7% of the respondents were female, 38.3% were males. The vast majority of the participants were undergraduate sophomores majoring in accounting (72.8%); the remaining sample included International Business (16%), English (6.2%), International Marketing (3.7%) and Finance (1.2%). Participants have been studying English for an average of 12 ½ years (SD=1.66).

3.2. Findings

Our preliminary findings (see table 1) based on students' evaluations suggest that the proposed gamified impromptu speech may be effective in reaching the intended goals. First, students perceived that the activity was "fun" (Q1: M = 5.21, SD = .68) and "well organized" (Q2: M = 5.32, SD = .72). Participants believed that the activity was "useful" (Q4: M = 2.08, SD = 1.00; Q10: M = 1.86, SD = 1.14) and provided some feedback to understand their own strengths (Q7: M = 5.09, SD = .79) and weaknesses (Q8: M = 5.26, SD = .67). Interestingly, the activity was in general perceived as slightly difficult (Q3: M =

3.75, SD = 1.31). It is, in fact, paramount that the task be challenging enough to be stimulating and in line with the overall objectives of a university level course. At the same time, it is equally vital that the structure of the activity should be easily graspable for the students to avoid potential interference with the overall communicative and linguistic exercise. In the spirit of "gamification", the topics in the activity should be familiar and amusing and the rules of the games straightforwardly explained by the instructor and understood by the students.

Table 1. Summary of findings.

Statements	Mean	SD
Q1. The impromptu speech activities were **fun.**	5.21	.68
Q2. The impromptu speech activities were **well organized.**	5.32	.72
Q3. The impromptu speech activities were **difficult**.	3.75	1.31
Q4. The impromptu speech activities were **useless**	2.08	1.00
Q5. The impromptu speech activities helped me to **understand how to organize my speech**.	5.10	.83
Q6. The impromptu speech activities helped to **understand the importance of nonverbal communication**.	5.05	.96
Q7 The impromptu speech activities helped me to understand **my strengths as a public speaker**.	5.09	.78
Q8. The impromptu speech activities helped me to understand **my weaknesses as a public speaker**.	5.26	.67
Q9. The impromptu speech activities helped me to **understand the major organizational formats in public speaking** (topical, cause/effect, chronological, spatial, ecc.).	5.07	.83
Q10. The impromptu speeches activities were **a waste of time**.	1.86	1.14
Q11. The impromptu speech activities helped me to become **more confident in giving a short speech in English without much preparation.**	5.04	1.07

Regarding *goal 1*, namely "building students' ability to communicate orally "off the cuff" with limited wait time", our participants perceived that this activity provided a contribution in increasing their confidence in giving a short speech in English without much preparation (Q11: M = 5.04, SD = 1.07). Our findings also suggest that students felt that the activity promoted their understanding of the role of effective "storytelling" in effective

presentations (*goal 2*) by strenghtening their ability to organize their speeches (Q5: M = 5.10, SD = .83). *Goal 3* involved fostering students' understanding of the major organizational formats used in organizing speeches (cause/effect order; topical order; chronological order; spatial order; problem/solution order): also in this case, our sample perceived that the activity was beneficial (Q9: M = 5.07, SD = .83). Regarding *goal 4*, our findings suggest that the activity contributed in increasing students' awareness of the importance of nonverbal communication (Q6: M = 5.05, SD = .96).

4. Conclusion

In this paper we have outlined an impromptu speech activity designed to overcome specific affective and cognitive challenges of ESL/EFL students by implementing the principles of gamification (Kapp, 2012). The activity appeared to be effective in strengthening students' ability to communicate orally "off the cuff", promoting students' understanding of the role of storytelling in effective presentations, fostering students' understanding of the major organizational formats used in organizing speeches, and increasing students' awareness of their nonverbal communication in presentational settings. Additional research is still required to demonstrate the effectiveness of our gamified activities both in absolute terms and in comparison with other treatments intended to overcome specific affective and cognitive challenges of ESL/EFL students.

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Influencing pre-service teachers' beliefs and practices: a case for an experimental teaching experience

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Abstract

Previous research has indicated that experience is a more effective tool than theory in changing the teaching beliefs of prospective teachers. This qualitative case study includes the perspectives of stakeholders of a teacher training programme in order to determine the influence of its practical components on pre-service teachers' beliefs and practices. The qualitative study corroborates the findings of earlier studies that showed the limited impact of theoretical knowledge, but also shows that even a comparatively limited experiential component can have a substantial influence on pre-service teachers' beliefs and practices. Additionally, the study includes a number of implications for teacher training curricula.

Keywords: *teaching belief; teaching practice; pre-service teacher; teacher training; experiential learning.*

1. Introduction: A Changing Educational Context in Flanders

This paper presents a qualitative case study in the Dutch-speaking region of Flanders, where the monolingual, monocultural classroom has become a thing of the past and a mixed-language student population has become the norm (Agirdag 2009; Van Avermaet 2012). During the same period, however, teaching practices have remained quite fixed. Dutch as a second language is just sketchily mentioned in theoretical classes on language didactics and not a required part of the teacher training curriculum. Moreover, transmission teaching is still the norm and innovative practices are the exception, even though innovation is what is called for when dealing with the multilingual context of heterogeneous groups (Vieluf et al. 2013). By and large, Flemish teaching practice has not kept pace with societal changes (Agirdag et al. 2014). One could wonder then, to what extent teacher training is able to prepare aspiring teachers for the multilingual classroom of today and to deal with the increasing need for teachers familiar with second language acquisition and cultural diversity in the classroom.

2. Context of this Study

In Flanders, the training that prepares aspiring teachers for the classroom encompasses both bachelor-level vocational programs and master-level specialization courses, called SLOs (*Specifieke LerarenOpleiding*, literal translation: Specific Teacher Training). An SLO is a one-year program for which universities have a large degree of independence when designing their curricula. This study is set in the context of one SLO in Flanders, but for reasons of confidentiality its name has been replaced with the pseudonym *Flemish University*.

Since 2009 pre-service teachers of Dutch at Flemish University can sign up to achieve 20 hours of the 60 hours compulsory teaching practice by teaching during workshops of Dutch for Academic Purposes (hereafter: DAP workshops) for the student population with Dutch as a second language (hereafter: L2 students). These DAP workshops form an opportunity to experiment with innovative pedagogic approaches and second language acquisition. Every DAP workshop has fifteen to twenty L2 students and is led by four pre-service teachers (hereafter: PST), allowing the larger group to be divided into four smaller ones. The student-teacher ratio has been kept small to stimulate meaningful interaction (Blatchford et al. 2011) and to allow for a didactic flexibility that benefits not only the

Following abbreviations will be used throughout this paper (in alphabetical order): DAP (Dutch for Academic Purposes), IST (in-service teachers), HSLO (head of the teacher training programme), L2 (second language or non-native speakers of Dutch), PST (pre-service teachers or teachers in training), SLO (*Specifieke LerarenOpleiding*, literal translation: teacher training specifically for Dutch).

stronger but also the weaker learners (Hattie 2005; Harfitt 2012). Since the L2 students attending the workshops have a clear goal – i.e. communicative mastery of the academic idiom in an academic context - the DAP workshops have adopted a task-based approach. Task-based language teaching focuses on interactive practice (Ortega 2007) based on learner needs (Long & Norris 2000; Van den Branden 2006). Examples of typical tasks include taking class notes based on video recordings of their classes; formulating hypotheses, based on scientific observations within their field of interest and writing a formal e-mail to a member of the academic staff. Additionally, the relaxed, communicative atmosphere serves to reduce any sense of hierarchy between the L2 students and the PSTs (Busch 2010; De Mets 2013).

The DAP workshops serve first to assist L2 students in strengthening their academic linguistic skills, and would still proceed without the involvement of pre-service teachers. During the PST's collaboration in the DAP workshops, they work together with two mentors to shape every aspect of the workshops, the only prerequisites being communicative language teaching and learner-centeredness. The PST's receive weekly feedback on the material they produce and on their didactic approach by the mentors and by their peers.

3. Literature on Learning to Teach: A Matter of Practice

Being a teacher requires more than passing on factual information as it also means balancing one's didactic and subject-specific knowledge with beliefs, contextual sensitivity and experience (Scheerens 2007), and translating those facets into educational practice (Basturkmen 2012, Sato & Kleinsasser 2004). Learning to be a teacher means changing perspectives. It means critically questioning one's own beliefs and it implies integrating new skills, rules and knowledge and making them one's own. Simply receiving useful information is not enough to stimulate this dialectic process, since new information does not become actual knowledge until it is internalized. In fact, there does not appear to be a direct relationship between the information that is offered and the way the recipient interprets that information (Timperley et al. 2007). Similarly, Woods & Çakır (2011) argue that new information offered during teacher training is not simply absorbed, but is weighed against existing beliefs in a self-validating dynamic that accepts belief-reinforcing knowledge but rejects information that contradicts existing beliefs (Kagan, 1992; Cabaroglu & Roberts 2000; Mattheoudakis 2007). Consequently, without offering prospective teachers a chance to practice and reflect on teaching, it does not appear possible to transform information into knowledge or instil new pedagogic insights into the minds of prospective teachers (Putnam & Borko 2000; Timperley et al. 2007).

The findings from the aforementioned literature has major implications for the theoretical component of teacher training and has led to a number of studies that address the importance of experiential learning (Busch 2010) and hands-on instructional activities (Hiebert & Morris 2012) in teacher training. It leads Borg (2011) to conclude that teacher education may have a limited impact on pre-service teachers if it focuses more on knowledge transmission than on experiential learning. Wang and Odell (2002) too consider practice as the catalyst for an aspiring teacher to critically assess her own teaching and to examine her pedagogic knowledge. How much practice is needed for it to have a lasting impact, is unknown.

Teaching beliefs, however, are slow to change. Firstly, the beliefs and practices of experienced teachers who act as mentors for aspiring teachers are often quite resistant to change (Vescio et al. 2008). Secondly, the teaching beliefs of pre-service teachers are primarily based on their experiences as learners rather than on their experiences as teachers (Zeichner, 1981; Raths 2001). Society may change faster than educational practices, but if future teachers are to keep pace with these changes and their impact in the diverse classroom, teacher training should prepare aspiring teachers for diverse, multilingual and evolving contexts and should give them the tools to do so (Timperley et al. 2007).

This study determines how effective teacher training is in preparing prospective teachers for classrooms in which an increasing number of pupils and students are L2 speakers of Dutch and consequently, classrooms that ask for an innovative approach. Since teacher training at *Flemish university* relies strongly on theory, the effectiveness of a experiential teaching practice with L2 speakers of Dutch will be examined, as will the perception of in-service teachers on the effectiveness of the theoretical approach.

4. Research Questions

The qualitative case study presented in this paper is set within the context of the teacher training at Flemish University, where theory makes up for more than two thirds of the credits. It seems relevant to determine whether the dominance of theory in the curriculum is reflected in the views and actions of the prospective teachers.

RQ1: How do stakeholders of the teacher training programme perceive the effectiveness of the theoretical teacher training component in offering innovative didactic knowledge?

The literature review indicates the need for pre-service teachers to critically examine their own beliefs, which can be facilitated by experiencing a context that deviates from the educational norm. At *Flemish University*, pre-service teachers usually gain experience in secondary schools where transmission teaching and hierarchic student-teacher relationships

are the norm, where there is very little cultural and linguistic diversity and where there is no involvement with second language acquisition didactics. RQ2 focuses on the effects of gaining experience in an alternative context, as a part of the teacher training programme, are examined.

RQ2: Do stakeholders of the teacher training programme consider an alternative experience in a multilingual and diverse context an effective method in offering innovative didactic knowledge for teaching Dutch?

5. Methods

This qualitative study is based on information obtained from three groups of respondents: (1) five pre-service teachers who worked as PSTs in the DAP workshops during the data collection, (2) eighteen in-service teachers (ISTs) who worked as PSTs in the DAP workshops during teacher training and (3) the head of the teacher training programme for Dutch at Flemish University.

From October 2012 until May 2013 the five pre-service teachers participated in five focus groups, held in October 2012, November 2012, December 2012, March 2013 and May 2013.

In order to determine whether the outcomes of the focus groups were generalizable to a wider population, eighteen former workshop PSTs, currently working as teachers, were also consulted through a short online questionnaire, they filled out in March 2013.

The head of the SLO at Flemish University was interviewed in June 2013. He was consulted about the approach of the teacher training programme, about its theoretical component and the nature of teaching practice within the SLO.

The focus groups and the interview were video recorded and transcribed. All data was analysed and coded using the NVivo 10 qualitative research software to generate ideas and help identify patterns.

All quotes used in this study have been translated from the original Dutch transcriptions by the main author and have been checked for accuracy by the second author.

6. Discussion

One might expect the comparatively limited time spent teaching working in a different pedagogic context to have relatively little impact. Still, the 20 hours spent teaching in the workshops has influenced the teaching beliefs and practices of nearly all respondents on an intercultural and pedagogical level.

Interculturally, the workshops were an eye-opener for prospective teachers. The ISTs state that the experience "shaped" their view on L2 learners while the pre-service teachers testify to a change in their deficit view on L2 learners. All PSTs used to associate L2 speakers with low proficiency and low socio-economic status.

At *Flemish University* the student population of colleges of education primarily consists of middle-class students from the dominant culture. In the four years the DAP project has been running, no ethnic minority student registered for the Dutch teacher training programme. Simultaneously, the teacher training programme spent no time on intercultural sensitivity, on L2 pedagogy or on training prospective teachers how to work with L2 students, even though it is of primary importance to offer L1 prospective teachers ample opportunity to interact with non-native speakers (Busch 2010).

The pedagogical experience the PSTs gained in the DAP workshops contrasted with their experiences as learners and with the pedagogy they were to embrace in the secondary school context, where transmission teaching was the norm and interactive teaching was out of the question. Still, the DAP experience has influenced the PSTs enough to make them embrace different pedagogic approaches.

The influence of the DAP experience is visible in two ways that can both be seen as different expressions of the same underlying observation: the DAP workshops allow pre-service teachers to gain experience in a new, non-threatening context where they can interact with students instead of instructing them. This experience caused the PSTs to doubt traditional teaching beliefs and, to move away from transmission teaching while allowing for spontaneity in the classroom.

At the start of the workshops, the PSTs intuitively preferred lecturing to interaction, but after a few DAP workshops, they began using more innovative approaches in secondary education too - only to be rebuffed by their mentors. For the pre-service teachers involved in this study, teaching in a way that appealed to the learners was a theoretical concept they had never applied before. All respondents shared stories about teaching classes in secondary schools where they were required to lecture in front of the class. For the pre-service teachers, working from their students' interest was a new, but transformative experience. The in-service teachers confirm the influence of the workshops. Sixteen of the eighteen ISTs still use the approach in their daily teaching, indicating that it is indeed possible to work in an interactive way in secondary education.

Similarly, the pre-service teachers are not convinced that a hierarchic relationship between teachers and pupils is the best way to approach teaching. On the other hand, like the head of the SLO, the pre-service teachers are not sure whether the existing school culture allows for

such an approach. Indeed, when consulting the former workshop PSTs, classroom hierarchy appears to be the most problematic workshop characteristic to maintain in mainstream education. Eleven out of eighteen former PSTs maintain a collaborative approach to teaching in their daily practice. Those who do not use a collaborative teaching model, refer to the school culture as an explanation.

7. Results

The respondents in this study testify to the belief and practice-altering potential of experience-based teacher training. Additionally, they show the theoretical component of teacher training to be largely ineffective if it is unsupported by a diverse experiential component (Busch 2010; Hiebert & Morris 2012). Consequently, even though the respondents in this study received ample theoretical knowledge, knowledge alone did not appear to influence their teaching (Woods & Çakır 2011). This research has no data to support a theory-driven approach to teacher training, but it does indicate that classroom experiences during teacher training have the potential of altering prospective teachers' beliefs and practices (Basturkmen 2012). Even a comparatively limited 20-hour experience in an atypical context influenced the teaching beliefs and practices of the five pre-service teachers and the eighteen in-service teachers in the short term and during the first years of teaching.

If teacher training practice is at its most effective when it is of an experiential nature (Borg 2006), it seems advisable to provide pre-service teachers with a wide array of approaches and contexts of practice to challenge or expand their beliefs. If prospective teachers gain experience only in traditional, belief-reaffirming contexts, it is unlikely that teacher training programmes will become a vehicle for educational and societal change.

The testimonials of the head of Flemish University's teacher training programme and those of the former and current workshop PSTs highlight the influence of experience over knowledge in changing teaching beliefs and practices. Additionally, they affirm the need for a teacher training that is in tune with educational and social realities.

In the Flemish educational system one's academic success is largely determined by one's L1 and one's socio-economic status (Smet 2013). In such a context it seems self-evident that teacher training should offer prospective teachers the tools to help them empower students at risk. Preparing prospective teachers for an educational reality that is no longer the case, seems irrelevant at best.

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Researching Recognition of Prior Learning; the significance of assessor's values and beliefs within the Totally Pedagogised Society

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Abstract

This research is exploring the values and beliefs of academic assessors around Recognition of Prior Learning (RPL) in order to better understand their mindset and provide a foundation for best practice informed by all actors. An interpretative research design and random stratified sampling allowed for 31 interviews with assessors in an institute of technology setting in Ireland. Bernstein's theories of classification and framing of knowledge and the related ideas of power and control provided the conceptual framework for analysis of the data. The notion of assessors as actors within the totally pedagogised society also supported analysis.

Two themes emerge from the data. The first relates to the primary values and beliefs of assessors around RPL that are related to defending the standards of the formal learning system. The second theme balancing, diverges from this and provides further understanding of positions taken with the assessment of RPL. The research concludes that practitioner networks are necessary to cultivate pedagogic agency for RPL through both the official and pedagogic recontextualisation fields.

Keywords: *Recognition of Prior Learning; Totally pedagogised society*

1. Introduction

Recognition of Prior Learning (RPL) is a key aspect of lifelong learning allowing for the validation of all forms of learning within programmes on national and international frameworks. RPL allows for non-standard admissions or for advanced entry onto programmes. RPL can also be used to award credits for individual modules. While RPL is delivered through a range of approaches within faculties and schools around the world (Starr-Glass, 2012; Werquin, 2010), common to all is assessment which should be "grounded in comparison and equivalency" (Starr-Glass, 2012, p. 1). This research focuses on the perceptions of academic assessors of RPL, the individuals engaged in delivering and assessing modules within approved programmes in higher education.

In practice, assessors of RPL find it can be challenging to provide for and difficult to assess (Cooper & Harris, 2013; Hewson, 2008). The unique nature of any individual's pathway coupled with the many settings where learning can occur are often challenging for the RPL candidate to identify and for the higher education system to accommodate. The identification, selection and evidencing of an individual's learning for RPL and the presentation of this learning in a form suitable for assessment are complex tasks. The literature states that it is past graduates who most easily approach RPL case preparation, and that RPL is rarely accessed by those marginalised in society, the very candidates it is intended to support (Hamer, 2011; Hewson, 2008).

This research investigates the values and beliefs of academic assessors (Friesen, 2011), arguing that having a better understanding of the common values and beliefs of RPL assessors may provide insight about how to better support RPL assessment and cultivate pedagogic agency for its practice (Cameron, 2006). The rapid changes in society are reflected in Bernstein's (2000) writings, which provide a conceptual framework here to support analysis of data arising from 31 academic assessors within a third level institute of technology in Ireland.

1.2 Bernstein's theories and the totally pedagogised society

Bernstein (2000), provides insight into how various forms of knowledge can be structured, transformed and reproduced as curriculum. Bernstein also provides the concept of the totally pedagogised society wherein populations are encouraged to access learning opportunities over a lifetime for various purposes such as life, work, or community involvement (Bernstein, 2000). He presented the totally pedagogised society as a hollow construct, one where trainability and the generic performance mode are used as a means of regulating society, one where various modes of employment and professional identities are rapidly replaced and superseded by other newer emerging identities. Within this realm the

values and beliefs of the academic assessor of RPL are of key significance where increasingly they are presented with requests for RPL. Despite that fact that many institutions have policies and procedures in place for RPL it is often perceived as a marginal activity (Harris, 2000).

Bernstein (2000), provides the 'pedagogic device' as a concept which provides codes and rules to underpin pedagogic practices. By situating RPL assessment within the pedagogic device this research can more effectively explore how the values and beliefs of the assessor might impact on the outcome for the candidate. Of interest is the field of recontextualisation within the pedagogic device. Robertson (2009), provides a model which includes a 'lens of disposition' as a key element. This research argues that the values and beliefs of the assessor will provide a lens through which they assess the RPL case, and that having an understanding of these are key to supporting the assessor, through acknowledging their viewpoint.

This research is significant in that it is the first time that the values and beliefs of the academic assessor around RPL are investigated. It provides a better understanding of their typical mind-set so that higher education providers will able to take a more holistic approach to providing RPL and be better equipped to respond to the European Commission recommendation of 2012 requesting all higher education to have arrangements in place by 2018 (Council of the European Union, 2012).

2. Method

The research took place within an institute of technology in Ireland where a higher education system consisting of both traditional universities and institutes of technology provides a complimentary but distinct provision. Institutes of technology operate on a regional basis and provide more applied programmes than the traditional universities. Ontological and epistemological considerations informed the research, which was designed around the following question;

> *What are the values and beliefs of academic assessors of RPL, and how might these values and beliefs support pedagogic agency for RPL?*

The research design took an interpretative stance in order to explore the realities as experienced by the academic assessor, specifically their values and beliefs as identified around RPL. The analytical framework incorporated pilot testing, review and amendment of the research questions in order to extract suitable data (Bryman, 2012). The researcher acknowledges Heidegger's concept of 'being-in-the-world' and that of researching from within a system (Heidegger, 1996).

An academic assessor is defined as any individual responsible for the delivery and assessment of modules within higher education programmes. Ethical guidelines were strictly followed. Random stratified sampling resulted in 31 semi-structured interviews with academic assessors from within four faculties in an institute of technology, namely 2 from within the faculty of art of and design; 4 from a maritime background; 10 from business and humanities and 15 from science and engineering. Table 1 presents the interview questions.

Table 1; Interview questions

Q1	In considering RPL what do you think are important values[1] to have?
Q2	Why do you say this?
Q3	What beliefs[2] do you hold which support RPL?
Q4	Why are these beliefs important?

Note:

1. A value is that which is held as important and provides a framework as to how we live, think or act (Turner, 2004)
2. Beliefs are 'understandings, premises, or propositions about the world that are felt to be true' (Richardson, 1996, p. 103).

3. Results

Transcription resulted in 160 pages of text and Nvivo software was used to support initial analysis. A total of 50 and 39 codes were assigned against values and beliefs respectively. Table 2 presents an extract of these results showing the three most dominant codes arising in response to the interview questions. The third and fourth column illustrate the number of sources that arose and the number of times each code occurred within the transcripts.

Bernstein's theories of classification and framing of knowledge coupled with the related notions of power and control provided a conceptual framework to examine the values and beliefs of assessors around non-traditional forms of knowledge and epistemological access for RPL candidates. Following analysis data was grouped into two themes:.

1. Defending the standards of the formal learning system,
2. Balancing between acknowledging what the candidate knows and maintaining the standards.

Table 2. Interview transcripts; most dominant codes.

Question	Most dominant codes	Sources	References
Q1. Values	Upholding standards of awards	13	24
	No ego in the way non judgemental	9	11
	Fairness or objective	9	12
Q2. & Why	Maintaining the standards	16	25
	The ability to perform in the world of work	8	8
	Give people a chance	8	12
Q3. Beliefs	Providing alternative pathways into education	13	20
	Value of learning gained non formally and informally	9	19
	RPL is legitimate	9	11
Q4. & Why	Equal access	13	32
	Trust in the process	13	26
	Integrity	9	15

4. Discussion

RPL has only occasionally arisen within the literature on Bernstein's theories (Cameron, 2006), yet it is deserving of consideration. The values and beliefs of the actors within RPL are key to understanding the complex interactions between people.

As reported in Table 2 the primary values and beliefs of academic assessors as they relate to RPL are strongly aligned around defending the standards of the formal learning system. This came across clearly in the data and is to be expected. All of the assessors (A1 to A31) interviewed, believe that RPL must never devalue a qualification, as the following comments extracted from the interview transcripts illustrate:

> A5 "It is to uphold the standards of the college, the educational standards must always be met. That is really important".
>
> A8 "Again a third level education, most people would love to have it. A lot of people cannot have it, you know it costs a lot of money, so it is an honour and a privilege to have a qualification, and not to be taking it for granted really by people who say, 'lets find a shortcut'".

> A21 "The comparison of standards is very important, but not only that, and the practical, theoretical, but also the cultural dimension of where the applicant is coming from.

Assessors strive to uphold the standards as expected by society and their values and beliefs reflect this in order to deliver graduates with the ability to participate successfully in life and work (Massaro, 2010).

Aside from defending the standards, what is compelling in Table 2 however is that half of the data arising from the interviews is around balancing between the standards and acknowledging what the candidate knows. This is significant within the totally pedagogised society and will be further explored here. The assessor is caught between the traditional approaches of the formal learning system when assessing RPL cases and the unique and diverse nature of non-formal and informal learning and requires support to develop capacity around its evaluation.

> A3 "So there are individuals who have obtained learning and are making a contribution to society but for which it is not acknowledged, and if it was acknowledged it would give them more versatility and possibilities to maybe move around in the workforce".
>
> A9 "It is important to assure them that there are different paths to learning".
>
> A31 "I would see that I sit between both of these, support and gatekeeper".

The significant amount of data around the notion of balancing is an unexpected result, however the institute of technology setting may explain why this aspect is so strong. In the totally pedagogised society, the production and distribution of knowledge are essential elements of economic performance. The academic assessor is expected to be a key actor, updating curricula to incorporate emerging knowledge in a form available for pedagogic discourse and evaluation in order to satisfy market demands for trainability (Bonal & Rambla, 2003). The rapid pace of change within the workplace, and the constant nature of this change acts to place the assessor, "in an uncertain position between knowledge and pedagogy" (Bonal & Rambla, 2003, p. 180). This results in an uneasy reality for the assessor who is called upon to deliver in more responsive, flexible ways and increasingly to deliver the capability for carrying out other forms of assessment.

The comparison of the RPL case with the standards of the frameworks and their evaluation to establish equivalency involves reaching out, taking a different viewpoint, being open to the unexpected. The frameworks act to provide protection in their own right. The ability to step aside from traditional curricula and to value the inherent tension that will naturally arise will support RPL assessment (Starr-Glass, 2012). This balancing capacity is a key ability for successful RPL provision (Starr-Glass, 2012). Nurturing this ability with

appropriate supports may support the cultivation of pedagogic agency for RPL practice amongst academic assessors.

5. Conclusion

Cultivating pedagogic agency for RPL should most effectively take a dual approach through both the official and the pedagogic recontextualisation fields. Academic assessors require significant support. This research suggests practitioner networks operating at a micro and macro level incorporating supports where practices are shared and scenarios relayed will act to reassure and build capacity with RPL assessment. It can be argued here that the institute of technology setting of this research piece is within the totally pedagogised society, responsive in general to RPL and accustomed to rapidly changing higher education provision. It can also be argued that a more traditional university setting may result in a different data set and is worthy of further exploration.

The values and beliefs of RPL assessors act to support their real-time evaluation of non-formal and informal learning. The rapid pace of renewal and reinvention within higher education more often results in assessors meeting requests for RPL and subsequently managing their evaluation on their own terms (De Graaf, 2013). Researching the values and beliefs of the academic assessor provides insight into how to cultivate pedagogic agency for RPL practice in a real and supportive way, and open up debate about the inherent difficulties within RPL practice in general. Such debate, grounded in practice, and arising from practitioners within the pedagogic recontextualisation field will cultivate links across the formal learning system.

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Artist Graduates: Are they Ready to do Business?

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Abstract

Businesses must expose their products and services to customers so as to make sales and be heard. The world of the artist[1] *is no different, and, in the words of the late Luciano Pavarotti, the artist must 'be heard and be seen'. The aim of this paper is to examine if there is a need to ensure that our artistic graduates are 'market ready'. The paper specifically examines this concept in the context of an Irish Institute of Technology (IT). Artists generally do not view the world in terms of business & commerce, only as a creative space. This research study investigates if there is a need for a special purpose award that would allow already qualified or working artists who have missed out on business education to take business modules at any stage in their careers. The findings in this study are rich and the attitudes to the business world by participating artists are interesting. Having established that artists need some business education, this paper then proceeds to outline what may be needed now, and in the future.*

Keywords*: Artist; Musician; Business Education; Business World.*

[1] For the purpose of this paper, the term 'artist' is deemed to refer to both performing and visual artists.

1. Introduction

Artists are creative and generally do not view the world in terms of business & commerce. Their brain activity is right-hand sided, which is perfect for creativity, but not for commercial activity. With the exception of one IT in Ireland, artistic students are not catered for in terms of business programmes or business subjects for creative students. This paper will examine if there is an appetite among musicians and artists already operating in the field to study some business modules later in their careers if a special purpose award were made available; for example, a certificate in business for the creative arts. Special purpose awards (SPA) meet specific, relatively narrowly focused, legislative, regulatory, economic, social or personal learning requirements. A SPA would afford the artist a new opportunity to up-skill. The focus of this research therefore, is specifically on artists who are currently 'working artists' and not on existing artistic students and to examine this concept in their specific context.

2. Background & research context

The nature and content of courses need to be determined by the 'needs and wants' of those who are leaving the educational system at any particular point in time (Carter, 2010). In this context, does the working artist have the knowledge to work and operate in the wider world of commerce? This sets the context for this research. There is a lack of structure for involving the student's voice in decision-making in relation to creative arts courses (HEA, 2013). Dramatic changes which have been taking place in higher education and the consequential disruption to the "traditional identities of place, of time, scholarly and student communities" is changing the structure and functions of third level education (O'Connor, 2006). The genesis of this research is founded in the fact that it is now incumbent upon us as educators to be ready to adapt and change to students needs. The aim of this research is to investigate whether an additional award would benefit 'artistic graduates' (those who previously engaged in psychomotor taxonomy[2] of learning) for their future careers. Thall (2002) is adamant that all artists need a working knowledge of law, for example. For every engagement, a business contract is drawn which must be read, understood and signed. If an appetite is found for this proposed certificate for artists, it is anticipated that, in addressing the educational aim & learning outcomes, students will have an opportunity to acquire relevant business acumen.

[2] E.G:Dave's (1970) and Ferris & Aziz's (2005) adaptation of Bloom's original Taxonomy. The key categories in this competence capture the development in learning from initial exposure to final unconscious mastery (O'Neill & Murphy, 2010).

3. Challenges for creative students

Artistic and creative people face unique business challenges and they do not view the world from a business perspective. Creative people are 'divergent thinkers' and jump from one thing to the next. Students of creative programmes are unleashed into the world as brilliant performers, artists, dancers, but rarely, if ever, possess any experience of what the competitive marketplace holds for them. The reality is that, to survive, they will have to earn a living in some way. Business students on the other hand, if successful, may also have the benefit of a work placement initially, and find themselves working in a business environment, where they are given clear direction as to what is needed. For the solo artist on the other hand, the problem is just that—'solo'. These gifted creative people are 'on their own' to make business decisions about their futures. *My heroes are the ones who survived doing it wrong, who made mistakes, but recovered from them,*[(Bono, U.2) in Lawton, Harrington, Cunningham, 2008]. For the purposes of this specific piece of research, is was decided to narrow the focus, and only working musicians (+part-time teaching), performing artists, and art painters whose occupation comes solely from art were chosen to participate in this study. Artists with other revenue streams were not chosen to participate. This research therefore investigates *if there is a void in the education of artistic students?*

4. Methodology

Drawing from the Interpretivist approach, a post-positivistic qualitative method was applied in this research study, as the researcher wanted to extract a rich meaningful depth of data from participants. Qualitative approaches have their philosophical origins in phenomenology (Burnell & Morgan, 1979), & a phenomenologist believes that the world & reality are constructed socially where meaning is found from people (Easterby-Smith *et al.*, 2015). The researcher wanted to delve into the feelings and attitudes towards the research topic. An initial pilot study was conducted to establish if there was an appetite for business knowledge among established artists. Following the positive indications from these initial research findings, full in-depth interviews were then undertaken with a further 11 artists. Theorists [Baker, 2012; Easterby-Smith, 2015; Malhorta, 2015; Saunders *et al.*, 2012] outline that a relatively few number of participants are needed for qualitative in-depth interviewing, (between six and a dozen); therefore, in line with such theorists 11 interviews were completed. The approach adopted in the selection of the number of interview participants was based on 'theoretical sampling', where the number of cases studied is relatively unimportant as outlined by (Glaser & Strauss, 1967). The researcher had the benefit of having access to these artists directly. Ten interview questions were posed to 11 participants. A semi-structured interview guide was used for the face to face interview

element, and the findings were analysed using grounded theory, developed by Glaser & Strauss (1967), thus enabling the researcher to extract meaningful data. In grounded theory, the researcher begins with the transcript from the interview and sifts through the data to group and categorise it. Participants included visual and graphic artists, keyboard players, string players, composers, conductors, and singers. The pool consisted of part-time performers (supplemented their income teaching their instrument) and full-time artists and musicians, with both a national and international profile. To triangulate the data, ensuring reliability & validity, one focus group with a further 6 artists drawn from a different pool was undertaken to tease out ideas arising from the interviewee process.

5. Literature

5.1. The Artist

An artist can be defined as a person who produces works in any of the arts that are primarily subject to aesthetic criteria, a person who practices one of the fine arts, especially a painter or sculptor, a person whose trade or profession requires a knowledge of design, drawing, painting, etc., a commercial artist, a person who works in performing arts, as an actor, musician, or singer; a public performer—a mime artist; an artist of dance, *a* person whose work exhibits exceptional skill , (Dictionary.com). The oxford dictionary defines an artist as the various branches of creative activity, such as painting, music, literature, and dance, (Oxforddictionaries.com).

The question of what is art has long occupied theorists and philosophers, but the issue of who or what is an artist is no less vexing (Grant, 2010). The artist defines art, and it seems increasingly true that nowadays artists also define who and what they are. Definitions by nature are confining and restrictive, while art and its makers seek to be expansive and inclusive: It may be simpler to state what makes an artist a professional than what defines an artist (Grant, 2010). 'Artist' has become a universal statement of creativity or, someone who does something well. Socially, artists are often defined by the positive (freedom-loving, convention-defying) or negative (egotistical, bohemian) characteristics that other people attribute to them. Part of an artist's job is to understand how artists are seen and what is expected of them, whether that be a certification committee that wants to see the art, a funding source that wants to read an artist's proposal, or the government that wants to see receipts (Grant, 2010). According to the HEA (2013), in the creative arts in Dublin, for example, what is problematic in terms of defining art is where there is a level of innate prioritisation and separation in the system between the perceived 'fine arts' and applied arts and crafts. "Under contemporary and inclusive definitions of the arts, the high and low arts should not be viewed as opposites or even as a continuum, but rather as a transformation of contemporary practice", (HEA, 2013:44).

Grant (2010), outlines that in the US, the Internal Revenue Service (IRS)[3] takes a narrow view of what or who can be defined as a professional artist. Specifically, in relation to individual taxpayer's returns, nine criteria are applied by the IRS in order to separate professionals from hobbyists (professionals may deduct their expenses, hobbyists may not). Some of the criteria for example includes—is the activity carried on in a businesslike manner, does the artist intend to make the artistic activity profitable?, does the individual depend in full or in part from income generated by the artistic work?, are business losses to be expected, or are they due to circumstances beyond the artist's control?, does the activity generate a profit in some years and, if so, how much of one?, will the artist make a profit in the future?, Does the artist have the knowledge to make the activity profitable?, (Grant, 2010). Ironically, Thall (2002) purports that it is widely accepted that really creative people will not know or understand their business. After all, "aren't they living in the realm of the idea—the eigenvelt—the world that is interesting precisely because it is not the mitvelt—the shared world, the concrete, tangible world that can be objectively evaluated?" (Thall, 2002:x). Grant (2010) states that the artist need not answer 'yes' to every IRS question in order to legitimately deduct business related expenses. The IRS demands proof, however, that an artist makes a genuine effort to earn a profit in three years out of a five-year span. Artistic credentials may help an artist make a case that he or she is a professional for tax purposes, including earning a bachelor's or Master's degree in fine arts, membership in an artists' society, inclusion in Who's Who in American Art or some similar directory (Grant, 2010).

A knowledge of business in vital (Thall, 2002), and corporations, for example, know that, in order to make sales, they have to expose their products to consumers over and over again. They 'brand' their names into the minds of buyers, so that their products are easily recognized and most likely to be purchased. Through mass advertising on television, newspapers, billboards, etc., big businesses continually drum their identities into ones head; "Ford, Ford, Ford; Pepsi, Pepsi, Pepsi; McDonald's, McDonald's, McDonald's" - Art is no different, (artbusiness.com). In the new environment of technological advance, with the need for the artistic community to adjust to the manifold changes occurring both in the creation and delivery, there is more reason that ever before to examine the industry so that we can better fine-tune our business relationship (Thall, 2002:x). Grant (2010) concurs that artist must have business knowledge, which is confirmed in the IRS statement of what an artist is (IRS.gov) to make the activity profitable and be defined for law enforcement. The best formalised arts education should prepare the student, appropriately, for a career in the creative and/or entrepreneurial world (HEA, 2013). Irish higher education should equip students with the skills to play a strong part on the world stage. This is not just in terms of

[3] The IRS is the U.S. government agency responsible for tax collection and tax law enforcement (IRS.gov).

quality and reputation, but as a strategy for innovation that builds a robust future for the Irish society (HEA, 2013).

6. Research findings

The findings of this study are very interesting. Artists really do not understand the world of business and in the words of one contributor, "the world is consumed with numbers and trying to make profits. Art is not about that it is about creativity. Their rules don't apply! Business men fail to see the non-monetary and immeasurable benefits of music and arts". The reality of course, is that all musicians and artists must make a living and eat. Survival and a need to pay the bills was the main theme that emerged from the focus groups, but the majority, with the exception of 2 contributors, had no idea of how to apply business skills to their own business—either being a musician, or a visual artist. Of the 11 interviewees, 4 had masters' qualifications in their specific artistic field, (performance/ visual art), 4 had relevant degrees, and 3 had no qualifications in their artistic endeavours. 100% (all) of participants viewed themselves as 'artists' even though, as one stated, "I am a musician but an entrepreneurial description is more realistic, but I can't see myself in that light at all!". We were never thought to be business people, only top performers, this is where the pressure was applied". Another artist outlined that "you had to fight to be the best artist that you could be. The idea of how we would sell our paintings was never to the fore in college". Another participant stated that, "we only worried about coming out on top of our class and getting noticed!" Another interviewee said, "I burned my fingers off of me trying to be the best in my field. This was my only focus".

This current research has found that artists find themselves "at sea" when faced with the challenging business world. All participants agree and believe that there was a gap or void in their education due to the lack of business knowledge and experience. One participant outlined that "it would have been great to have had financial planning advice in college". 82% cited knowledge of marketing as an issue, while 100% of contributors stated that legal issues and contracts were challenging. 90% of participants relayed that they needed marketing and online training to access markets. "On the go learning" is the only way that I can manage". Social and new media are also mentioned by participants, and one surmised that they had "spend years practicing the piano keyboard, and now half of the time as a musician is spent on the computer keyboard"—"how ironic is that?".

One contributor stated that, in Europe, musicians are "more into their art and themselves, whereas in the US they tend to hustle much more and are not afraid to promote and put themselves out there". Another contributor described that the international arena is a difficult one, especially, in the United States. "I write movie scores, and I have to be in the US market for this". "In the states, you must have all of your paper work in order or you

would not be allowed entry into the states". Another participant concurred and outlined that "Visa applications are a mine field". They are very difficult and all paper work and taxes must be in order"—and don't start me on the dual taxation issues". Mirroring Grant (2010), the participant went on to outline that if "your tax returns are not in order for example, you will lose your visa and that is it! We are routinely audited by IRS and this incurs serious costs and the need for many personnel. The only way that we can handle this is to have a full time business manager, accountant, & attorney". The risk and stakes are too high for us otherwise. After a few mistakes you learn fast, but it would have been a great help if I had some initial business understanding". "My business partners (that's funny/artistic partners) always say the same thing". "When we went into the international arena we had to set up two new corporations to handle all of the various aspects of the business". The findings of this research indicate that the Irish as a nation are shy, and need the benefit and confidence that comes from formal training—in this case, business training. All contributors agreed that there is a definite need to study business subjects. The findings of the focus group session echoed the sentiments of the interviewees in terms of educational gaps, and it also proved very beneficial in discussing the modules and subjects that would be beneficial for artists in the future, such as ;Law , Accounting, Marketing, website design, PR, & Entrepreneurial skills for business start ups. Having established that a need exists for business learning and education for artists, the next step is to consider the specific findings.

7. Recommendations

There is a need to provide business education for new entry artistic students in Higher Education by integrating business modules into their existing courses. This can be achieved by offering already approved business subjects as electives initially, with a view to introducing them as compulsory elements later.

For already working artists who are out of the educational system, a need exists to develop a Special Purpose Award (SPA) for artists who have no business education. For a SPA to be successful learner access must be considered and, according to the HEA (2013), the Irish higher education system must continue to develop clear routes of progression and transfer, as well as non-traditional entry routes.

For proper integration, for learners graduating from a BMus, for example, it is recommended that these learners may progress onto the special purpose award, but will need to attend a short introductory business induction course for 1 week as this field of study is completely new.

For a 'stand-alone' artist or artists that have been out of education for a long period of time, or, indeed, those who have never attended a third level institution, it will be necessary and

recommended to partake in a longer bridging/transitional course that would include writing skills, an introduction to business subjects, computer skills etc.

Higher education alone cannot be held accountable for all creative and cultural learning. There needs to be complementarity and consistency in the approach to curriculum design and delivery (HEA, 2013). This study specifically considered already working artists and solutions for them to fill the void in their education; however, other short-term solutions could be considered such as running non-accredited courses to up-skill for such artists. Such workshops could coincide with some of the major festivals operating throughout the year, and research could be undertaken to see if opportunities could arise to acquire some funding for same from the arts council, for example, [http://www.artscouncil.ie/available-funding/]. This could prove to be challenging, however, given the current economic climate and also the competitive nature of such funding.

Funding avenues could and should be identified and explored. The HEA outline that the success of research funding in the creative arts is largely judged on the quality of the outcomes and impact of that research.

8. Conclusion

For many artistic graduates, learning business skills 'on the job' is now the norm. Higher Education Institutions in Ireland (with one exception) need to address this educational gap for its new undergraduate intake for the creative arts in the future.

A new programme, a SPA award in line with the QQI (Quality & Qualifications Ireland) Level 6 Certificate (qqi.ie) should be developed for former graduates who have missed out on any business education to date, and also for other creative working artists who have no business education or knowledge. This new programme fill a void in the education of our creative students. The objective will be that the student will achieve practical knowledge of business in the future. Other educational opportunities should be examined in the form of short-term courses for working creative artists. The benefit of these short courses is that they would 'ease' the artist back into the educational system.

As an immediate imperative, an internal review of specific academic offerings within the institutions is needed in order to inform a coherent and inter-related system that is conducive to optimal quality, efficiency and a type of critical mass better suited to a connected and creative milieu (HEA, 2013). Thoughtful consideration must be given to the implementation of business education in the future planning strategies by management in Higher Education in Ireland.

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Analysis of a teacher training process through the study of educational interaction

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Abstract

The purpose of the study is to describe and analyse the configuration of joint activity in a teacher's training process from a teaching and learning sociocultural perspective. From this theoretical perspective, formal learning is conceived as a mediated social construction process of meanings around learning content, and teaching as a process of planned, systematic and sustained support for that construction process. Taking this into consideration, an assessment course was video recorded to analyse the interaction between teachers and students undertaking this course. The findings describe how mechanisms of educational influence emerge in the form of assessment situations, specifically as instances of correction and feedback of the assessment results. The findings make it possible to visualise the way in which these training processes of university teachers are structured and the need to expand the research to the analysis of the interaction. This raises the need to consider the teaching of assessment as a complex process that acknowledges different situations that could be favouring self-regulation, beyond teaching a set of criteria, techniques and strategies to assess learning.

Keywords: *Teacher training process; Sociocultural perspective; Mechanisms of educational influence;Interaction analysis*

1. Introduction

Recent changes in knowledge management and in the way of conceiving learning have brought the need to implement important teaching innovations, not only in higher education, but also at different educational levels and scenarios. In this sense, training programs in university teaching have acquired particular relevance at the time of carrying out teaching improvements in higher education (Postareff, Lindblom-Ylänne, & Nevgi, 2007). In this context, most of the studies on training processes have been limited to aspects related to student satisfaction measurements, as well as to the teaching-learning approaches of teachers and students (Åkerlind, 2004; Prosser & Trigwell, 2001). This has led to a series of questions related to the need for in-depth qualitative studies associated with activity that takes place in a process of university teacher training (Stes et al. 2013). In this context, it is necessary to complement the existing research with referential frameworks that consider the analysis of educational activity, oriented at understanding the structure of the activity carried out by teachers and students participating in that process (Mercer & Coll 1994; Mercer, 2010).

The present study aims to describe and analyse the configuration of joint activity that takes place in teachers' training processes, while placing emphasis on educational influence mechanisms (EIM). This study also seeks to determine how these processes facilitate changes in university teaching practice.

2. The study of educational practice: a theoretical model for analysis

From a constructivist perspective of sociocultural orientation, formal learning is conceived as a social construction process mediated by meanings around the content of learning, where teaching is a process of planned, systematic and sustained help in support of that construction process (Coll et al. 2008). In this relation, this research focuses on the structure taken by the educational support provided by the teachers and the students themselves while they interact in a teaching and learning situation. Understanding"educational support" as the support given by the teacher to the students in response to their requirements and needs during the teaching and learning process (Coll & Rochera, 2000).

Most of the work in this perspective focuses on complete instructional processes because it enables to comprehend the complete unit or the temporal dimension of the teaching and learning process, since the construction of knowledge requires time for its elaboration (Coll et al. 2008; Mauri & Barberà, 2007; Sánchez & Rosales, 2005; Rosales, Iturra, Sánchez & De Sixte, 2006; Scardamalia & Bereiter 2006; Schwarz, Dreyfus, & Herschkowitz, 2009). Once the analysis unit –a complete didactic sequence (DS)– has been chosen, it is necessary to identify the interactivity episodes or segments that compose it, which can be described as a series of performances shared by all the participants (Coll & Rochera, 2000; Cubero, 2005).

For the purpose of identifying the segments, two conditions must be fulfilled. First, the following questions must be answered: who can do what, with whom can it be done, and how can it be done. In the second level of analysis, and as a consequence of the first, there is the discursive activity carried out by the participants, which is focused on the analysis of the activity's semiotic content. In this level the objective is to identify how the meaning of the activity is constructed and reconstructed through the interpretation of the discourses of the participants, leading to analytical categories that arise from it.

Some studies show by means of maps how the activity is organized (Coll & Rochera, 2000). These maps, called "interactivity maps", allow visualizing better the way participation is structured from the observation of the configuration (duration and evolution of the segments in the didactic sequence) of the interactivity segments (Coll et al. 2008). Another element that must be considered is that EIM are enacted in the sphere of interactivity, which is defined as the «accumulation of the actions of teachers and students around a given task or content», giving rise to different forms of organization of joint activity (Coll & Sánchez, 2008). There are numerous research reports that operate on this concept of interactivity (Harris & Williams, 2011; Rochera & Naranjo, 2007; Wilson, Andrew, & Below, 2006).

In synthesis, the application of this framework with its different levels of analysis, allows for a theoretical and practical basis for the study of activity specifically the activity of teaching and learning that takes place in university training scenarios (Chávez & Jaramillo, 2014).

3. Method

With the purpose of understanding how the joint activity is configured in a process of training in university teaching, a qualitative approach was used. The process of data analysis considered a complete video recorded didactic sequence (DS), consisting of four whole sessions of an “Assessment of Learning” course for a Diploma in university teaching in a Chilean university. In total, 9 hours and 46 minutes of video recordings were collected. The topics dealt with in the sessions are related to theoretical and practical aspects of the assessment of learning in higher education. The participants in this study were 15 teachers from different academic units. Once the DS had been video recorded, it was transcribed and then analysed based on criteria derived from the analysis framework, which implied the identification of interactivity segments and the predominant actions present in the previously delimited segments, including their configuration and their relation with EIM.

4. Findings

Considering the total amount of data collected, eight segments have been identified. Those segments have initially been called starting, content, instruction, oral presentation, task,

assessment guideline presentation, group work, and closing segment. The temporal evolution and the articulation of the segments are what constitute the structure of the joint activity and allow a panoramic view of the interaction that takes place throughout the instructional process, which can be represented graphically through the interactivity map (Fig. 1).

In the starting segments a rapid review of the contents and activities that have taken place in previous sessions is made and the new contents and/or activities that will be developed are presented. The closing segment responds to different moments of the joint activity and not necessarily to the end of a session. The contents segments correspond to 20.8% of the total of the DS, and they are associated with the management of the delivery of information related to the conceptual foundations of the course.The instruction segment corresponds to 3.4% of the DS and contains directions with respect to the organization of the work to be developed in the following sessions. Similarly, in the task segment, which corresponds to 1.3% of the DS and appears in the first and second sessions, the teachers and the teacher trainer carry out preparatory activities related to the development of the academic task.

The assessment guideline presentation segment corresponds to only 1.5% of the DS and it is the instance in which the teacher trainer hands out the instrument that will be used to evaluate activities developed in the third and fourth sessions. Finally, the group work and oral presentation segments are the longest in the DS and are considered the most important, mainly because it is in these segments that educational aids arise, linked specifically with the assessment situations. Linking the segments and the predominant and non-predominant actions allows for identifying how and when the educational supports are implemented. In this case, those aids are found mainly in the group work and oral presentation segments.

Previous work along this field (Coll and Rochera 2000; Rochera and Naranjo 2007) considers the assessment situations as a set of moments that are not limited only to the assessment instance itself, but also consider aspects such as instances of preparation of the activity that will be evaluated and following the assessment itself, e.g., the instances of correcting, returning and profiting from the results of the assessment. Ultimately, the object of analysis corresponds to the patterns of activity located in the group work and oral presentation segments, which are related to instances in which the teacher trainer, on the one hand, rectifies and comments on the work done by the teachers in the workshops in situ and, on the other hand, gives feedback to the participants in situ and the products that they have developed.

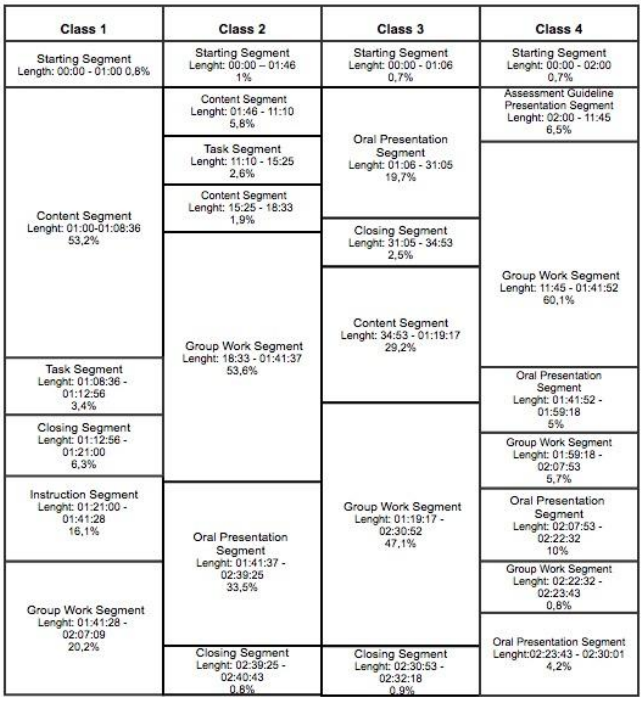

Fig. 1. Interactivity map

It is in the group work and oral presentation segments that these actions, or assessment situations, are more visible as they occur more frequently, in particular towards the end of the DS. In the work group segments, the predominant actions are related to correction instances, which take place mostly after the teachers have finished the tasks assigned for each session. In the following fragment it is shown how the teacher comments the work developed by the teachers (the making of a rubric).

Transcript Class 3 "Non-traditional assessment instruments: The rubric as an authentic assessment instrument of the learning"(second block, group workshop).

Teacher trainer: I see this (rubric), as a student, and I say "I do almost nothing and I still pass".

Teacher: We have the perception that when applying this, regardless of the different scores of the items, we are requiring 60%.

Teacher trainer: I believe that it is less, we pass doing almost nothing.

Teacher: The worst grade that I've given is 4.8.

Teacher trainer: We cannot construct a scale like this. It is incorrect. By definition we cannot construct something dichotomous for something that is plural.

This example corresponds to the rubric construction workshop that takes place between the third and fourth sessions of the DS, supported with instructions projected on the board. In it, the teacher trainer corrects the instrument of each of the work groups.

In the oral presentation segments, the teachers present the results of the work done in the workshops. The oral presentation segments occur at the end of the sessions, where each group chooses a representative who shows the product of the work done. During the presentations of the groups the trainer participates asking questions and giving feedback on the results of the work done by the teachers. An example of this is the following fragment, which shows the comments of the trainer after the presentation of the results of the work done in one of the workshops (preparation of comparison guideline):

Transcript Class 4 "Non-traditional assessment instruments: the rubric as an authentic assessment instrument of the learnings" (first block, continuation of group workshop Class 3).

Teacher trainer: Before going on with the following stage, how do you find the definition of the activity? What aspects stand out? What aspects can be improved?

Teacher: The "what for" is missing, like in last week's definition, it is necessary to know "what I'm doing this for".

Teacher trainer: What's important here is that the definition should be conceptual and operational at the same time. To define what the objective is. In this case, the objective must be defined, it must be mentioned that it is a research project and what it is about. For example, it is stated that the project should have an introduction but it is not explained, there is no quality criterion indicating how that introduction should be.

In this example the teacher trainer provides feedback on the work done by one of the groups. Here, not only something is clarified but also the work done is used as an example to reinforce a concept, in this case the concept of activity that the comparison guideline must contain. In short, the predominant actions that constitute EIM in this DS take the form of correction and feedback of the work done by the teachers as support is given every time the teachers perform assessment tasks throughout the DS.

The feedback referenced here it's related to the concept of continuous assessment. Continuous assessment is a formative process in which teachers and students work together in order to improve learning and collaborative construction of knowledge (Mauri, Ginesta, & Rochera, 2014). According to Shute (2008, 154) formative feedback is defined as "information communicated to the learner that is intended to modify his or her thinking or behaviour for the purpose of improving learning". As pointed out by Shute, the premise here is that good feedback, if delivered correctly, may greatly improve learning outcomes and processes.

5. Discussion

In the analysed DS, EIM are materialized in the group work and oral presentation segments, because the adjustment of the educational support appears with greater regularity and

intensity in those. The former, characterised by actions performed by the teacher trainer that aim to correct the work developed by the group –in situ–, and the latter by actions that provide feedback as a function of the assessment tasks. Both instances can be interpreted in terms of the transfer of control and the joint construction of meanings. They are present in almost all the sessions, but they are particularly more visible at the end of the DS as part of assessment situations. However, neither the transfer of control nor the shared construction of meanings take place linearly or progressively, as corroborated in previous work (Mauri and Barberà 2007).

Work that pays special attention to the assessment situations (Rochera and Naranjo 2007) identifies different moments or episodes that constitute an assessment situation, which allows for the assessment of the actions associated with correction and feedback in a context in which the central content of learning is the assessment. Furthermore, the assessment situations favour offering pedagogical supports needed to promote the process of attributing an essential sense to the learning because it is in these instances that the trainer assesses, corrects and works on these results, thus showing the importance of relating EIM with the assessment situations or the support devices that appear in this DS.

In the same line of thinking it is important to highlight the role played by the feedback. In this specific case, the teachers in training are learning to evaluate and at the same time are being evaluated under the same criteria taught in the course. The premise here is that as long as the teachers are given feedback on their own performance, the will improve their knowledge an also will better their pedagogical practice concerning the relevance of feedback in assessment situations.

However, it should be noted that there is consensus with respect to the need to expand the research toward educational practices as a methodological alternative with the purpose of facilitating the understanding of knowledge construction processes that occur in different educational levels and scenarios. From this standpoint, a relevant contribution is the importance given to the analysis of the activity and the discourse, putting special emphasis on the activity itself. In this context, it should be noted that the methodological elements presented in this study highlight the need for a micro and molar analysis of educational activity in different levels and scenarios.

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An analysis of using flipped learning in Higher Education: 'How flipping difficult can it be?'

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Abstract

This paper aims to provide a discussion of how to implement flipped learning as a teaching method in Higher Education.

A study of using flipped learning was carried out within the context of a module on the undergraduate law degree programme at the University of Sheffield. Prior to this study, flipped learning had not been attempted on any undergraduate law module at the University. Students undertaking the module were asked to complete a survey, and quantitative comments were collated. These results will be presented and analysed in this paper. This paper also draws on academic literature to compare perspectives of incorporating this method of teaching into the HE curriculum.

This paper summarises the reasons for carrying out the study, together with the key findings from this study. The key conclusions of the paper focus primarily on the benefits of incorporating flipped learning into teaching – with the central benefits being deeper learning for students, and increased engagement in the subject matter. The paper also comments on some of the challenges of this teaching method – the central challenges being the need for consistency and clear signposting, together with a large investment of time by staff in implementing such a teaching method.

1. Introduction

The theme of this paper is the incorporation of 'flipped learning' within Higher Education teaching. Flipped learning is often credited to the work of Bergmann and Sams (Bergmann, J; Samms, A. 2012), and can be described as follows:

"In the flipped classroom, instructors prerecord lectures and post them online for students to watch on their own so that class time can be dedicated to student-centred learning activites, like problem based learning and inquiry oriented strategies" (McLaughlin, J et al. 2014)

Bergmann and Sams have often been described as the 'pioneers' of flipped learning, and started the 'Flipped Learning Network' in 2012 to promote the use of flipped learning in Higher Education (Hamdan and McKnight. 2012). The concept of making pre-recorded content is not a new concept, and has been used successfully by many e.g. The Khan Academy. However, Bergmann and Samms and many others have sought to focus on the pedagogical benefits of flipped learning, in particular the importance of "in class time" (Little, C. 2015).

There is relatively little academic literature on the use of flipped learning within the UK, when compared with the large number of studies conducted in the USA. This is particularly true of teaching within Law. However, bodies such as the Higher Education Authority (HEA) are now seeking to publicise and encourage the use of flipped learning within the UK. The study summarized in this paper was undertaken to highlight the use of flipped learning, particularly within the sphere of Law, and to encourage other courses and institutions to follow the flipped learning example.

This paper focuses on the implementation of a flipped learning methodology, within a module entitled 'Commercial law – sale of goods' on the undergraduate LLB law degree programme at the University of Sheffield. The module chosen is an elective final year module, and has approximately 100 students enrolled (out of a total cohort of approximately 250 students). The module is a very popular choice for students on the LLB law degree each year, and has been run successfully for over 10 years. However, prior to this study, flipped learning has not been incorporated at all into the module. Indeed, there is currently no other module on the LLB law degree that incorporates full flipped learning (as defined above). Therefore, an additional aim of this paper is to encourage others within the School of Law to incorporate flipped learning into their teaching.

2. Methods

The 'Commercial law-sale of goods' module offered as an elective module within the LLB law degree, previously consisted of 20x1 hour lectures, and 6x2 hour seminars, over a teaching semester (1 October to 18 December approx.).

To undertake a study into flipped learning, it was decided that the traditional taught lectures be recorded as screencasts (that is, Powerpoint slides with an audio commentary) and embedded within the Virtual Learning Environment ('VLE') available to students. Each module on the LLB law degree programme has a separate area on the VLE, and various content can be uploaded for access by those students enrolled on the particular module. The 20 lecture bookings were kept, but were renamed as 'interactive lectures'. The 6, 2 hour, taught seminars were also maintained.

Prior to the commencement of the module in October 2015, the lecturers on this module scripted and recorded approximately 20 screencasts (using Powerpoint to display and order through the slides, and Articulate software to record the audio commentary).

In the first week of the module, the module convenors held an introductory face-to-face lecture. Given that the cohort had never enrolled on a full flipped learning module before, detailed instructions were given to the students as to how to approach the learning and preparation for the work on the module.

Specifically, the students were told that the pre-recorded screencasts were released on a weekly basis to students, for watching prior to two interactive lecture slots each week. The screencasts covered the essential points previously delivered via a 'traditional' lecture, with the aim that a 1 hour lecture could be summarised within a 15 minute screencast. The screencasts could be then replayed by students as many times as desired. On average, there were between one and three screencasts for the students to watch each week (with the full module taking place over a 12 week period).

In the face-to-face interactive lectures, the lecture started with a short 10 minute summary of what the students had focused on in the pre-recorded screencasts. The students were then given a number of different activities to undertake, with the focus on 'active', problem-based learning (Bergmann and Sams. 2012). These activities included both whole cohort and small group tasks. Following time for consideration of these tasks, the lecturers engaged the students in an open dialogue about the answers to such tasks.

Following the interactive lecture, the students attended separate small group (20 students approx.) seminars, where they worked through different problem-based questions and essay-style questions in smaller groups of 3-4 students. The seminar tutors then engaged the students in an open dialogue, building upon what had been discussed in the interactive lectures and focusing ahead to the assessment for the module.

3. Results and discussion

The students undertaking this module were asked to complete a short survey on the flipped learning that they had received. This survey was embedded within the VLE, and the results were collated. Out of a cohort of 100 students, 38 students completed the survey.

Given that there are a number of different ways that the pre-recorded element of flipped learning can be delivered, the students were asked as to their preference of format. **Figure 1** shows clearly that the students would not have preferred to view the pre-recorded screencasts as a video lecture, and that the screencast format (slides, with audio commentary) was preferable.

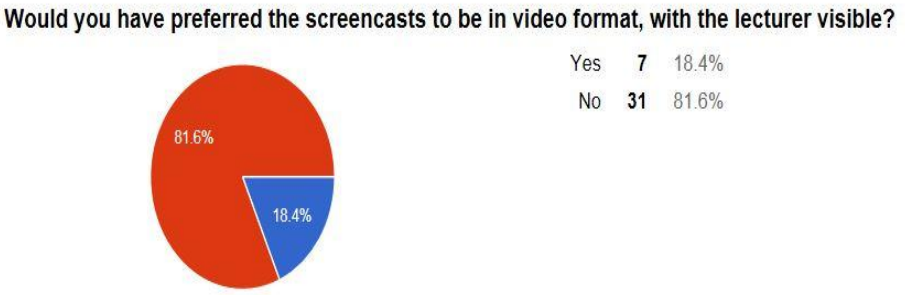

Fig. 1 – feedback on format of screencasts

Figure 2 shows that the majority of the students that answered the survey, felt that they had sufficient time to watch the screencasts and carry out any other preliminary reading prior to the lectures.

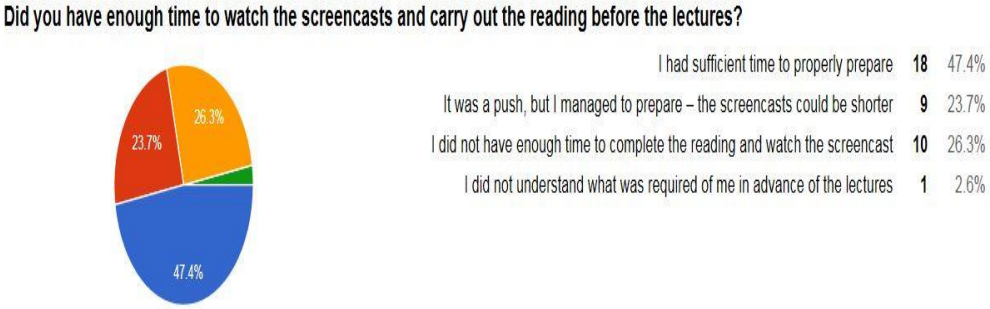

Fig 2. – feedback on sustainability of preparation for interactive lectures

Figure 3 shows that the students felt they were prepared for the interactive lectures, and that they were able to actively take part in the activities in the lectures as a result.

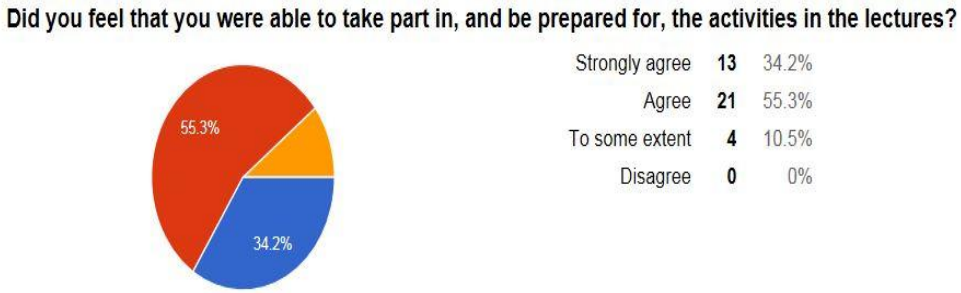

Fig. 3 – feedback on the level of preparation for the interactive lectures

Figure 4 shows that most of the students who answered the survey felt engaged with flipped learning. It is acknowledged that quite a few of the students felt that it took time to get used to the format of the module. This was anticipated when this project was first envisaged, particularly as students had not engaged in any form of flipped learning prior to this module.

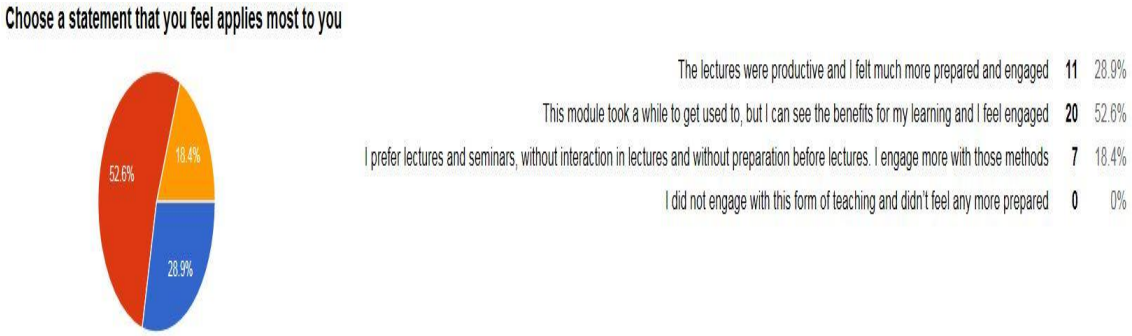

Fig. 4 – feedback on the format of the module

Figure 5 contains two pie-charts, which relate to the screencasts themselves, and how students reacted to their inclusion in the teaching content. The first chart shows that, overwhelmingly, the students found that the screencasts were very helpul in helping them prepare for lectures and seminars. The second chart shows that the vast majority of students who were surveyed found the screencasts interesting, and informative for their learning.

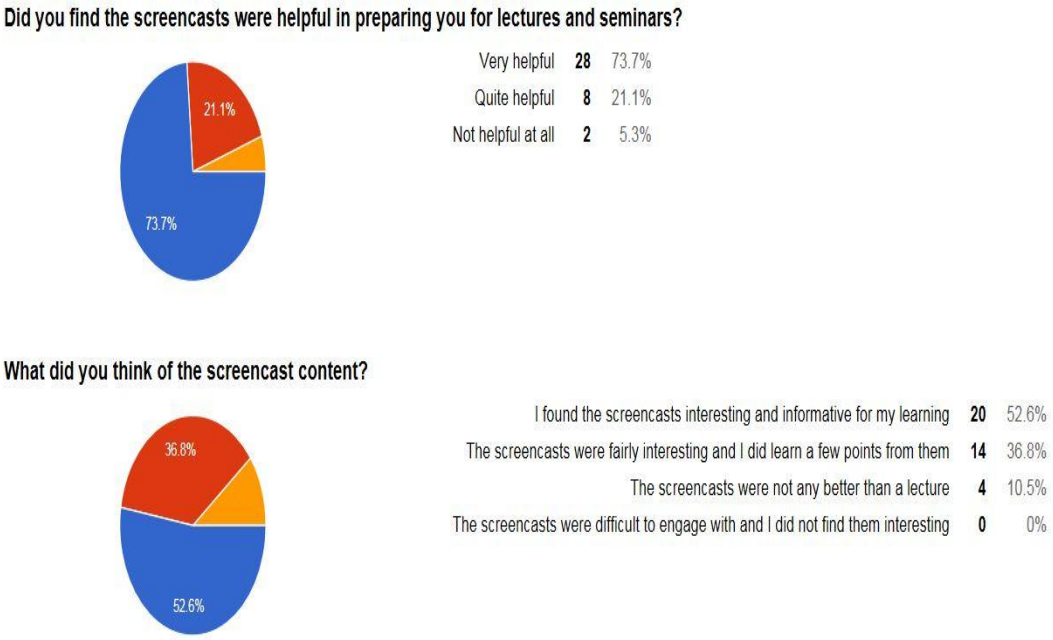

Fig. 5 – feedback on the screencast content

From the results of the survey completed by the students, a few clear conclusions can be drawn. Firstly, it is clear that the students who answered the survey found the screencasts interesting and informative.

The literature in this area sets out that engagement is improved in particular by the fact that the students have the ability to re-listen to the screencasts as many times as desirable (Little, C. 2015). It would be useful to ask the cohort in future years how many times they viewed the screencasts, or what their favourite features of the screencasts were.

It has been recognized that, with any delivery of teaching content, learning needs to be manageable. For instance, with traditional lectures, it has been show that students' attention delicles after the first 10 minutes and students only remember about 20% of the material during an hour of teaching (McLaughlin, J. 2014).

Secondly, it is clear that the students were able to use the screencasts to assist them in their preparation, when they attended lectures and seminars. Again, this reflects what others have commented on in relation to flipped learning. Flipped learning allows for the in-class time to focus on higher order cognitive skills (Little, C. 2015) i.e. it allows students to apply the higher levels of Bloom's Taxonomy (Bloom, 1956), such as the skills of analysis and evaluation, rather than not progressing past comprehension and knowledge. Therefore,

deeper learning is achieved as a result (Orsmond, 2004), and the ability of students to achieve a wider range of learning skills is encouraged (Bergmann and Sams. 2012)

Thirdly, it is clear from the results of the survey that the students felt they had sufficient time to prepare for lectures and seminars. This paper submits that this in itself is linked to engagement – better engagement from the students allows for the students to learn, put their learning into context and 'grow as a learner' (Fox, 1983).

From the survey undertaken, we plan to run the model of flipped learning on this module again in the Autumn 2016 semester. We will survey the students again, with the following additional aims:

(i) A response from all students was not achieved in this study and therefore there may well be students who did not find the method of teaching so favourable. We will try to encourage more engagement in the survey next time.

(ii) On the survey questions, the students were not asked about how they found the interactive lecture content itself, and additionally how this influenced their performance in seminars. A perceived benefit of flipped learning is that it allows for student-led learning, rather than teacher led learning. It would have been useful to try and gauge student opinion on this point, to more fully evaluate an improvement in student learning. Therefore, these questions will be added to the next survey

(iii) Furthermore, the survey does not analyse any final results achieved by the students in their summative assessment, and how these results compared and contrasted with previous years results. It is submitted that this is not the only important factor to consider when making changes to learning and teaching, but it would have been a useful comparator.

The staff teaching on this course also highlighted some challenges with introducing flipped learning in this way. As commented on above, introducing this method involves a large investment of time initially, particularly in the recording of screencasts and re-design of lectures. This is something acknowledged by the 'pioneers' of flipped learning themselves (Bergmann and Sams, 2012).

Also, the students require clear support from the start and a clear setting of student expectations is essential – if students do not see the benefit of this method of learning from the start, or do not understand how to approach such a method of teaching, then the success of flipped learning can be affected. At times, staff did perceive some students to be a bit confused about how much time to spend preparing for interactive lectures, and what benefits this hoped to achieve in respect of their learning. In future years, this could be

more explicitly set out from the start, perhaps referring to factors such as student engagement and deeper learning.

4. Conclusion

This paper concludes that flipped learning can be a very meaningful, fulfilling and successful method of learning and teaching. As has been set out, flipped learning as a concept has been championed by many as a much better pedagogical device than the traditional teacher-led lecture and seminar format.

It has been reflected in the study undertaken and the results received from students undertaking this mode of teaching, that flipped learning can allow for greater preparation for, and engagement in taught sessions, more time for focusing on activities involving deeper learning (such as analysis and evaluation) in class time, and more time to focus on student-centred learning (allowing students to grow as a learner, rather than simply seek to gain comprehension and knowledge without further developlemt).

However, it has also been acknowledged that incorporating flipped learning can be challenging. It requires a lot of time initially to incorporate a fully flipped experience, particularly on a module with a larger cohort of students. In addition, it requires a clear message provided to the students from the start and throughout, about what is expected of them as learners and what benefits can result.

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Visualizing the critique: Strengthening quantitative reasoning skills through design

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Abstract

In the age of "Big Data," information is often quantitative in nature. The ability to analyze information through the sifting of data has been identified as a core competency for success in navigating daily life and participation in the contemporary workforce. This skill, known as Quantitative Reasoning (QR), is characterized by the ability to integrate arithmetic, statistics, visualizations and models for the analysis and interpretation of information. For students intending to pursue careers in graphic design, QR competencies are essential for the design of effective visual displays of information.

This case study provides design educators with an assignment they can use to introduce students to data analytics and visualization strategies. The study describes how, in two sections of an undergraduate Information Design course, the final critique of a mid-term project was replaced with an anonymous survey instead of the traditional delivery of feedback through verbal dialogue. Responses were collated, stripped of identifiers, and distributed to the class with directions to create data visualizations of the critique.

The study reveals the potential of the assignment to strengthen the role of students as active participants in the feedback process, clarify the criteria for assessment, and deliver focused feedback to improve student work.

Keywords: *Quantitative Reasoning; information design; graphic design; pedagogy; data visualization; design critique.*

1. Introduction

> *All (students) should be able to use simple math tools to reason—to understand, interpret, critique, debunk, challenge, explicate, and draw conclusions. In short, college graduates should be able to evaluate the crush of quantitative data modern life throws at all literate citizens.* (Simpson, 1999, p. 2)

This paper presents a case study of a modified critique process that was introduced midway through an Information Design course (Fall 2013 and Spring 2015) taught in an undergraduate graphic design program. For the third and final critique of a midterm project, an anonymous survey replaced the traditional verbal group critique. Data from the surveys were collated into sets for each student project, stripped of identifiers and distributed to the class with instructions to create data visualizations of the survey results. *Visualizing the Critique* is an assignment that design educators can utilize to facilitate student understanding of Quantitative Reasoning (QR) though the collection, analysis, and visualization of data.

1.1. Background

Research has documented a widespread quantitative literacy gap throughout the United States (Kutner, Mark et al., 2007), resulting in leading educational associations and policy-makers[1] identifying QR as a primary learning outcome for 21st century undergraduate education. QR[2] is characterized by the ability to integrate arithmetic, statistics, visualizations and models (formulas, graphs, tables and schematics) in the analysis and interpretation of quantitative information (Mathematics Association of America, 2015).

Quantification, a process that requires conceptualization and reconceptualization in relation to the object (or phenomenon) being quantified, is a leap from the tangible to the abstract and back to the tangible, or from context to determination of equations and back to context (Thompson, 2012). QR is characterized by two attributes applied to the quantification process: first, a comfort level with numbers that enables an individual to cope with the practical demands of life; and second, some appreciation and understanding of information which is presented in mathematical terms (Cockcroft, 1992). Applications may be as mundane as calculating a tip as a percentage of a bill or as sophisticated as the ability to draw conclusions about race and poverty from tables of unemployment rates.

QR has no specific locus in college degree programs and often is mistakenly assumed to fall within the discipline of mathematics. In fact, undergraduate introductory courses in

1 Association of American Colleges & Universities (AAC&U); Lumina Foundation's Degree Qualifications Profile; Western Association of Schools and Colleges (WASC) Senior College and University Commission.

2 Also referred to as Quantitative Literacy or Quantitative Fluency.

mathematics tend to focus on abstractness and specialized language whereas QR, by definition, is a broad set of practical skills (Davidson & McKinney, 2001) and anchored in real-world data within a specific context (Steen, 2009).

Graphic design programs, often presumed to be a safe haven for math-phobic students, may prove to be one pedagogic space for the development and refinement of QR skills at the undergraduate level. Graphic designers, specifically information designers, are charged with the task of giving visual form to data to produce visualizations of statistical data to reveal patterns and relationships that would not be easily ascertained without the aid of visual representation (Meirelles, 2013). Reducing frustration and promoting the understanding of complex information is the ultimate goal of information design. The challenge of translating data to a new visual language, often employing metaphor and semiotics in the process, requires designers to possess a degree of fluency with numeracy.

1.2. Context

Queens College is one of the senior colleges of the City University of New York (CUNY). The college offers a Bachelor of Science degree in Graphic Design, with upwards of 300 declared majors (Queens College, 2015). Information Design, an upper-division design elective offered every third semester, explores the display of information and introduces strategies for designing effective visual communications appropriate for various users, audiences, and platforms. The course integrates lectures and exercises designed specifically to build QR competencies, including: review of mathematical equations for the calculation of fractions and percentages; an overview of statistical literacy; retrieval and analysis of data tables; and graphing and mapping methodologies.

Fourteen students were enrolled in Information Design, Fall 2013 and 16 were enrolled Spring 2015. A diagnostic quiz[3] to gauge student abilities to calculate fractions, percentages and basic graphing techniques was administered on the first day of class. Only two students from the Fall 2013 and five students from Spring 2015 could successfully answer all of the diagnostic quiz questions.

3 Diagnostic Quiz

1. If ¼" =.25", 1/8" = ?
2. If 18 out of 22 students have brown eyes, what is the percentage of brown-eyed students in the class? What is the percentage of non-brown-eyed students?
3. Create a graph of last week's temperatures (F): Mon (!0); Tues (15); Wed (15); Thur (15); Fri (25); Sat (15); Sun (10)
4. Create a graph of last week's range of temperatures (F): Mon (5, 15); Tues (10, 20); Wed (-5,10); Thur (10, 20); Fri (10, 30); Sat (5, 20); Sun (5,15)
5. Create a graph that shows Company ABC's profits (in millions) from 2007-2010.
   2007 (5); 2008 (2.5); 2009 (-2); 2010 (3)
6. Create a graph that compares Company XYX's profits (in millions) with Company ABC's profits from 2007-2010.
   2007 (2.5); 2008 (5); 2009 (1); 2010 (5).

1.3 The Design Critique

The design critique is a widely used assessment tool in design studio classes and arguably the single most consistently employed classroom activity students encounter in an undergraduate design program. Traditionally, the critique consists of project presentations at various stages of completion, and the subsequent verbal feedback is provided through peers, teachers, and invited guest critics. A basic tenet of the critique is that the individual and the group benefit from the process; students demonstrate an understanding of design principles and strategies through their work and through the questions, comments, and ensuing dialogue. The objective of the process is to create a collaborative environment that facilitates the development of design and presentation skills and provides a means to gauge success for a particular project.

Schrand and Eliason's (2012) research indicates that the design critique does not always allow all types of students to participate, and students who are not confident enough to ask questions are left behind. Barrett (2000) and Percy (2004) cite frustration, alienation, and lack of student participation as outcomes of the traditional design critique. Further research yields a list of factors that may impede student learning, including the size (Blair, 2006) and dynamics of the group (Gray, 2013); language and cultural competencies (Lasserre, 2010; Wong 2011); and perceived self-efficacy (Gaffney, 2011).

2. The Assignment: *Visualizing the Critique*

For the third and final critique of a midterm project, the traditional critique was replaced with a nonverbal assessment and developed into a fourth class assignment, *Visualizing the Critique.* Like a traditional critique, the activity began with students pinning their work to the display board for the group to assess. A survey with questions regarding research, originality of topic and solution, and the relative success of each project was distributed for the review of students' projects. Students were encouraged to ask questions to clarify the survey questions, but were instructed to refrain from verbally commenting on the projects or leaving any identifying information on the surveys. After the completion and collection of a set of surveys, the group repeated the process for each midterm project.

The teacher collected and collated the sets of surveys, generating a numbering system to identify the projects to minimize the possibility of identification of individuals with survey responses.

Data sets for the collated surveys were distributed to students the following week with a group discussion on the method of collection, and assessment of the quality of the data and a short lecture on normal (Gaussian) distribution. The next step required students to create a data visualization of the collected data. Upon completion of the assignment, students were privately informed of which data set was associated with each of their midterm projects.

3. Results

Table 1 shows the raw data distributed to students from the Fall 2013 survey exercise. The options for response to the questions were yes (Y), no (N), or no answer (NA). Nine midterm projects were presented and 13 students participated in the survey exercise in Fall 2013. A similar data set was distributed to Spring 2015 students.[4] Class discussions on the quality of the data, possible anomalies and the impact of sample size accompanied the distribution of the survey results.

Table 1. Fall 2013 Information Design Survey Responses.

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**
	Y(N)NA	Y(N)NA	Y(N)NA	Y(N)NA	Y(N)NA	Y(N)NA	Y(N)NA	Y(N)NA	Y(N)NA
P1	3(7)3	5(3)5	10(-)3	9(1)3	1(7)5	2(6)5	4(7)3	6(5)2	2(7)4
P2	9(3)2	6(5)2	10(1)2	7(3)3	3(6)4	6(4)3	3(10) -	9(2)2	4(7)2
P3	6(6)1	3(9)1	10(1)2	9(3) -	3(9)-	- (10)3	6(5)2	10(2)1	4(8)1
P4	11(2)1	7(4)2	13(-) -	11(1)1	2(7)3	6(5)2	8(4)1	12(1) -	4(8)1
P5	6(7) -	- (12)1	10(2)1	4(8)1	2(11) -	9(3)1	- (12)1	4(9) -	3(8)2
P6	8(2)3	6(4)3	10(1)2	9(1)3	3(4)6	5(6)2	7(2)4	9(1)3	6(3)4
P7	6(6)1	2(9)2	10(1)2	9(3) -	3(10) -	1(10)2	6(5)2	10(2)1	4(8)1
P8	13(-) -	11(2) -	12(1) -	12(1) -	6(7) -	5(5)3	7(4)2	13(-) -	12(1) -
P9	13(-) -	12(1) -	13(-) -	13(-) -	6(4)3	10(2)1	11(3) -	10(2)1	10(2)1

P=Project; Q=Question; Y=Yes; (N=No); NA=No Answer

Source: Data collected during an Information Design class (November 2013). Nine students presented midterm projects. Thirteen students completed surveys. Q1. Is the topic original? Q2. Is the project ambitious? Q3. Is the designer interested in the project? Q4. Did the designer research the project? Q5. Did the designer explore multiple solutions? Q6. Is the solution original? Q7. Is the project well designed (consider use of color, typography, hierarchy)? Q8. Does the project capture your interest? Q9. Does the project require you to think?

Figure 1 shows six solutions to the assignment. Student efforts reveal a wide array of solutions and the ability to visualize data through the use of graphs, charts, and diagrams.

4 In this section of Information Design (Spring 2015), 12 students presented midterm projects and 12 students participated in the survey. Two questions were added in the the Spring 2015 survey to distinguish use of color and typography in student projects.

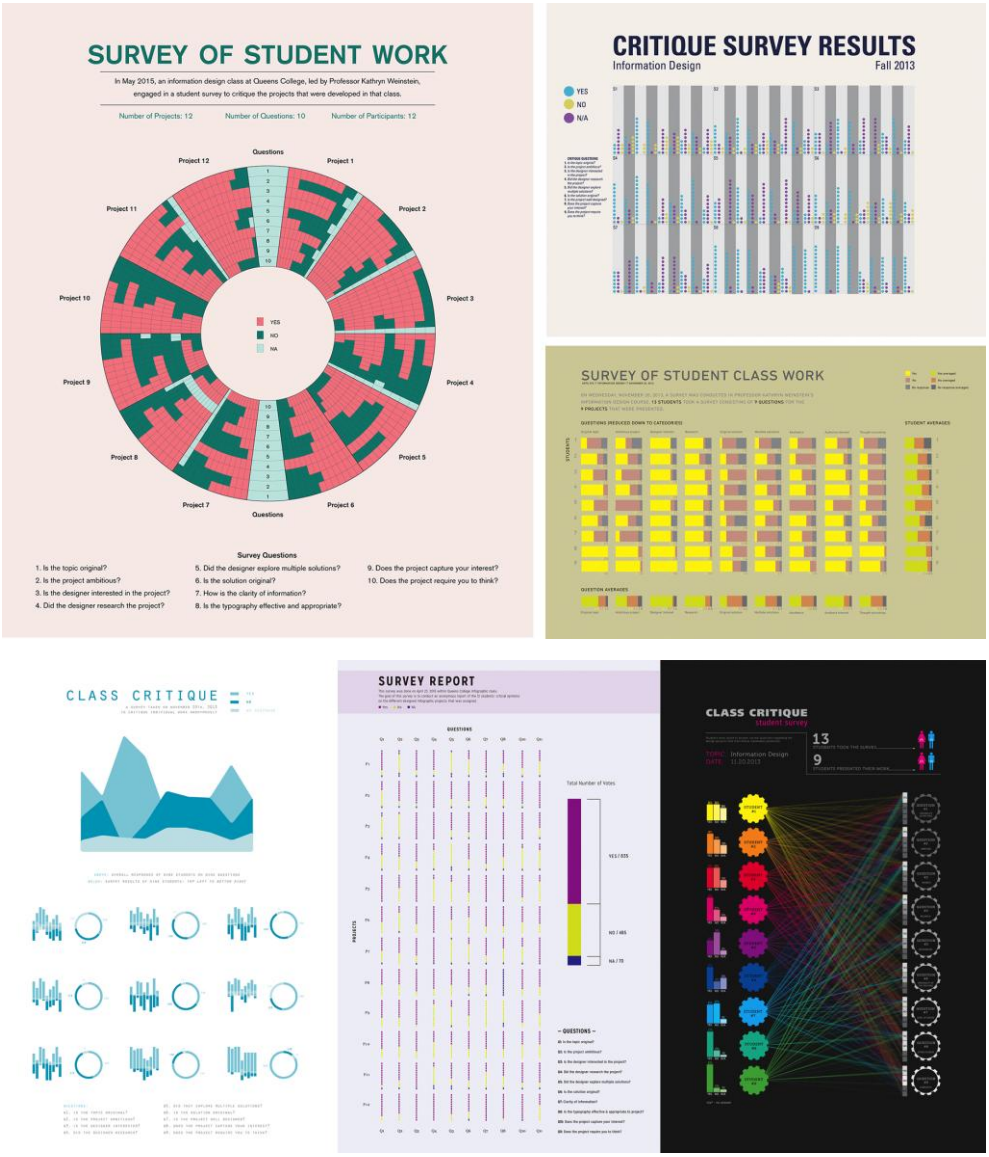

Figure 1. Student responses to visualizing the Critique assignment. Top Row: Samiah Meah, Spring 2016 (left); Madison Chajon, Fall 2013 (top right); Praveena Persuad, Fall 2013 (bottom right). Bottom Row: Serom Lee, Fall 2013 (left), Qiong Lin, Spring 2015 (center); Elena Akulova, Fall 2013 (right).

4. Conclusion

The assignment, *Visualizing the Critique*, introduces students to data collection and analysis in an area in which all students possess a degree of authority: critiquing one another's projects. The assignment provides an opportunity for students to participate in the

collection of data and question the methodology and integrity of the data collected, and then proceed to work with collected data and decide how best to visually represent the information. This process requires students to navigate from the tangible (survey results) to the abstract (determination of equations) and back to a tangible (visual presentation of the data).

The projects created for the assignment demonstrate a wide range of solutions and a variety of lenses through which the data may be assessed. Since the introductory diagnostic quiz of the course nine weeks earlier, students demonstrated an increased 'at homeness with numbers' as evidenced by student ease in the calculation of fractions and percentages; the reading and formatting of tables; and the development of mapping and graphing strategies. The verbal critique of the assignment revealed a shifting of priorities when evaluating work, placing coherence and accuracy over aesthetics. Students were quick to point out flaws in equations or mapping techniques and equally quick to praise effective and innovative approaches to the displays of information. In short, *Visualizing the Critique* provides an assignment that scaffolds skills learned from previous exercises and provides a format for students to demonstrate the refinement of QR skills.

Further, *Visualizing the Critique* provides teachers with a tool to democratize the critique process. In addition to the traditional forms of design critique, the survey provides a venue for students who typically refrain from verbal exchange in a group setting to express their opinions. All opinions are recorded and carry equal weight, fostering a sense of contribution and participation. The student work and the ensuing critiques throughout the remainder of the semester seemed to be energized by the survey experiment, as demonstrated by a greater degree of verbal participation from all students without prompting and a greater range of opinions confidently expressed. Further research is recommended to assess whether surveys as a pedagogic tool generate a bridge for design students who are typically left out of traditional critiques, and whether this newly found engagement is sustained in new classroom environments.

The specificity of the responses to survey questions may provide students with an effective feedback loop that is obscured through the traditional process of verbal critique. Both the act of responding to a consistent set of questions and that of receiving itemized responses of the survey reinforce the criteria of a project and highlight the areas of success or needed improvement per student. For students who have plunged into the sea of design and are at risk of drowning before they learn to swim, the survey may be one of a set of tools that can demystify the process of design and provide a detailed measure of individual progress.

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Electrónica enREDada: An experience with a webinar program

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Abstract

Information and communications technologies (ICTs) are an invaluable tool to facilitate meaningful learning. In this work, a webinar program ('Electrónica enREDada') is presented that complements the teaching-learning process in selected courses of electronics in degree and master studies in Physics. These webinars allow an innovative approach to the study of specialized topics, improving the training of the student and promoting his/her scientific knowledge in the field of electronics by means of specific and informative modules. This learning activity is part of a comprehensive strategy towards the implementation of e-learning activities in all courses taught at the Electronics area. This learning activity consists of two webinar modules: one being of a synchronous nature and specialized contents, and the other one of an asynchronous nature and featuring distributed learning, which is intended not only for students of physics but also of other related degrees.

Keywords: *electronic learning; significant learning, webinar; TIC-based learning.*

1. Introduction

Today's society is immersed in a transformation process with effects at all different levels, and which in particular is shaping scientific and technological aspects. As a consequence, all reflections about the evolution of education need to take into account this context and the critical role that the information and communication technologies (ICTs) will play in higher education (Piramuthu, 2005; Regueras, 2009; Zúñiga, 2012). On the other hand, the shift to a teaching based on competencies requires a drastic change in the conceptions and habits of both students and teachers. Not only are ICTs a powerful tool to facilitate tasks taken on by teachers towards the students' learning autonomy such as guiding and support, but they are also widely used to create spaces to promote a detailed and systematic analysis of selected topics in each discipline (Kirkwood, 2005).

In the last years, many pedagogical innovation actions as well as the update and renovation of teaching resources are being carried out. The most representative of this process is the ongoing incorporation of the majority of courses taught in all high education institutions into software learning management systems such as Blackboard or Moodle. This allows ensuring that the use of ICTs in the courses is important and, therefore, they appear as one of the methodologies used in a number of formative activities.

Web seminar (webinars) programs have a very positive impact on student learning (Verma, 2009; Sypsas, 2015) and, in particular, the creation of a webinar program particularized for the Bachelor's and Master studies in Physics will serve to complement the specific teaching programs of the courses on electronics with experiences to discuss the methods and peculiarities of the scientific work. The webinars are scheduled throughout the academic year to grant students access to professional training programs that are taught by experts with relevant experience in their fields, which would otherwise be out of their reach because of their prohibitive cost and exclusivity. This is particularly relevant in our current economic situation because it provides the students with a realistic view of the career opportunities open in the field of microelectronics while at the same time introducing them to the tools that are used in the industrial sector.

2. Web Seminars Program

This project presents the integration of technological tools into educational practices with the objective of providing support, serving as a tool, expanding training possibilities, and being used only when necessary. Although this pilot experience has been developed specifically for the course Micro and Nano Systems, it is planned to be extended to all the courses of the Electronics area.

The webinar program consists of two modules. The first one, which is synchronous and has a specialized nature, has 4 90-minute sessions that deal with topics related with the design and fabrication of microelectronic integrated circuits. These topics are presented remotely in virtual sessions, making use of the training resources that the consortium *Europractice* (www.europractice-ic.com) offers to its members. In particular, the topics that are presented are:

- Virtuoso Electronic Design Environment, which gives a general view of the computer-aided design (CAD) tools
- Virtuoso Schematics Editor, which introduces the tool to create schematic representations of electronic circuits
- Analog Simulation Techniques in Virtuoso, which analyses the tools to perform the simulation of electronic circuits
- Layout Creation in Virtuoso, which describes the tools to generate the layout of electronic circuits from their schematic representations

The webinars are scheduled for November (Virtuoso Electronic Design Environment), February (Schematic Editor in Virtuoso), March (Analog Simulation Techniques in Virtuoso) and April (Layout Creation in Virtuoso), and they are followed by a one-week period to answer online questionnaires on the main topics covered in each of them.

The learning in the second module is asynchronous and distributed, and it is intended for students of the discipline and other related degrees. The webinars of this module are split into those designated to encourage the knowledge of electronics and its applications, and those constituting a form of mixed learning. The first type of webinars of the second module include videos on the design and fabrication of microelectromechanical systems (MEMS) to give a realistic view of the industrial processes involved. They cover the following aspects:

- Design and simulation of a MEMS
- Stages of the fabrication of an integrated circuit (IC)
- Revision of the presence of microelectronics systems in current processes and instrumentation

In the second type webinars of this module, the students are exposed to the materials outside the classroom sessions, which are used for active learning and, in some cases, for the development of higher skills such as conceptualization, analysis and application of the new information. The scheduled activities include the development of animations to visualize the operation and fabrication of MEMS by the adaptation of Matlab applets (Dimitrijev, 2000; Sánchez-Azqueta, 2014) and their conversion to Java, and the use of CAD tools to replicate the most important steps of the design and simulation process of a

microelectronic system, for which the students have access to academic licenses of the tools.

3. Results

Although "distance teaching" may result in less dialogue between the teacher and the student, it demands more autonomy from the students, which contributes their developing of critical transversal competences such as time management and self-organization.

In this respect, the webinar modules implemented in project improves the learning outcomes because it:

- Facilitates access to new resources of specialized training
- Contributes to a better understanding of physical phenomena by the combination of a conventional treatment with a more visual and intuitive presentation
- Delves into the different stages in the fabrication of microelectronics systems
- Introduces professional computer tools to design and simulate these systems
- Encourages the active participation of the student in the teaching-learning process

One of the methods to evaluate the level of achievement of the objectives of this teaching action is the design of a set of self-evaluation exercises and problem based learning (PBL) activities related to the items dealt with in the webinars. Another one is the realization of a survey to investigate on the students' opinion about the development of the activity, and also on their reflection on their own knowledge of the topics and the influence of the activities. In particular, the students are asked to evaluate if they are able to:

- Describe the principle of operation of the main microelectronic systems
- Enumerate and justify the stages of the fabrication process of these systems
- List their main application fields and analyse their roles
- Recognize and manage in a basic level the main computer tools used to design and simulate microelectronics systems
- Undertake the design of a simple microelectronic system according to given specifications
- Assess whether the scheduled activities have improved their understanding of the matter and their skills and if they have increased their interest in the subject

As shown in Fig. 1, students greatly appreciate the opportunity to use professional computer programs for the design of microsystems; moreover, a vast majority agrees that

the complementary materials have contributed to a better understanding of the course topics, increasing their interest and motivation.

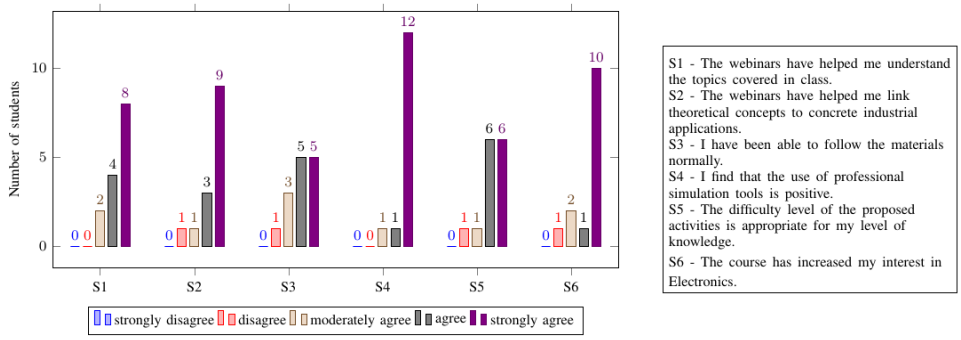

Figure 1. Results of the survey carried out among the students to assess the impact of the activity.

4. Conclusions

In the current framework of degrees adapted to the European Higher Education Area, it is essential to develop a continuous pedagogic innovation strategy, as well as to renew the educational media. This process must be realized in different fields, seeking that the students achieve more autonomy in their learning process. In particular, an adequate strategy is to provide students with tools tailored to achieve a deeper treatment of the most relevant topics of the courses, that are attractive to them to achieve that how they learn be as important as what they learn.

The creation of the webinar program: *Electrónica enREDada* has allowed students acquire specific skills that complement the teaching-learning process in courses of electronics of the Degree and Master studies in Physics. An innovative approach has been given to some specialized topics, improving the training of the students and their scientific knowledge of electronics. In particular, it has favoured the learning of complex physical phenomena while fostering the interest and implication of the students by a visual and dynamic description of the theoretical concepts. It has also allowed students the access specialized training resources in the adequate space and time and it has fostered their active participation in the teaching-learning process.

Regarding the assessment of the teachers, an improvement of the overall results of the course and, above all, a greater implication and motivation of the students is appreciated. Moreover, the incorporation of videos and other materials on the fabrication and operation of the devices has greatly reduced the problems found by the students in what regards the interpretation of the related mathematical expressions.

As an aspect to consider for forthcoming editions of the activity, the students express some difficulties in following the materials in English. The teachers attribute this fact to the sound conditions of the classroom and, above all, to the variety of accents presented by the various instructors of the online materials.

Finally, the strategy proposed in this project is transferable to the majority of the courses of the Degree in Physics and other similar courses in different educational levels in Engineering.

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Enhanced eBooks in the teaching/learning process of electronics

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Abstract

Information and communications technologies (ICTs) are an invaluable tool to facilitate and promote meaningful learning. Numerous higher education institutions have already adopted the use of virtual learning environments, incorporating e-learning along with traditional teaching methodologies as part of a mixed learning. M-learning maintains all the advantages of e-learning while adding the possibility of learning anywhere and anytime. This work presents an enhanced book in Electronics that contains a set of multimedia resources (images, videos, and apps) that have been specifically created to stimulate an adapted and interactive learning. The material presented in this work has been designed to be downloadable to mobile devices (smartphones and tables) running iOS and Android.

Keywords: *enhanced eBook, ICT-based learning, m-learning, ubiquitous learning*

1. Introduction

Our society is immersed in a transformation process that affects not only scientific and technological aspects, but also other scopes of life. All reflections concerning the future evolution of education must take into account this context, where the presence of information and communication technologies (ICTs) will play a major role in higher education. A teaching based on competencies requires a deep change in the conceptions and common practices of students as well as teachers. ICTs are a powerful tool to facilitate, promote and enhance autonomous learning among students; likewise, they ease the tasks of supervision, guidance and support taken on by the teachers throughout the course, as well as their coordination (Buabeng-Andoh, 2015).

Primary and secondary education levels are playing a major role towards digital literacy, incorporating adapted methodologies and enhanced learning environments (digital blackboards and books, Google sites…) to the classroom. A number of higher education and research institutions have committed to strategies focused on OpenWareCourse (OWC) projects, in which all content is free and can be reused, or podcasting to complement teaching. Even research journals start to offer audio slide galleries of their papers.

Many definitions of m-learning and its main features can be found in the literature (Kearney, 2012), as well as surveys on its burst into the current education scene (COL, 2014; SCOPEO, 2011), which coincide in pointing out that the rapid adoption of m-learning strategies comes as a consequence of the wide spread of mobile devices, which allows extending the e-learning paradigm to achieve ubiquitous learning (Pu, 2011). M-learning, however, does not come without challenges, which arise mainly from the fragmentation that exists among mobile devices and media formats, and the fact that mobile learners are constantly changing the context in which they learn.

Today's mobile devices incorporate numerous advanced apps that endow them with features such as always-on connectivity, geo-localization, ability to record and create contents, among many others, which makes them ideal for ubiquitous learning. Several recent surveys on higher education point out that mobile devices will play a pivotal role in new teaching paradigms (COL, 2014; SCOPEO, 2011; Horizon Project, 2012). Nevertheless, only a few m-learning experiences are to be found for the teaching of science (Zydney, 2015), and in particular for higher education (Cheon, 2012; Motiwalla, 2007).

This work is part of the development of a set of activities oriented to improve the teaching of Electronics in the context of a Degree in Physics. In particular, a complementary educational resource, an enhanced eBook (OECD, 2012), has been elaborated to contribute the intrinsic advantages of m-learning as the first step towards a more ambitious project that will encompass the development of a set of specific apps for mobile devices. This innovation activity and its outcomes are intended to become the starting point of an

education research process based on an adequate and systematic assessment of the quality of education.

2. Project

This work is a continuation of a series of education innovation experiences that have resulted in the creation of a virtual learning environment with a specific data-base in the field of Microelectronics. The goal of this work is the design of a digital book, written in an open-code format that includes multimedia resources (video, audio, interconnectivity and advanced browsing) for its use in mobile devices. All the multimedia content included is intended to strengthen knowledge, delve into key concepts and show real-life applications. Different formats are chosen (podcasts, infographics, hyperlinks and interactive activities) so that they have platform compatibility and are size-optimized.

To provide this teaching resource with a character common to different courses in scientific and engineering degrees, the enhanced eBook deals with general concepts involved in several courses related to electronics and circuits. In particular, this first stage of the project has been developed around the main topics of the study of the MOS transistor.

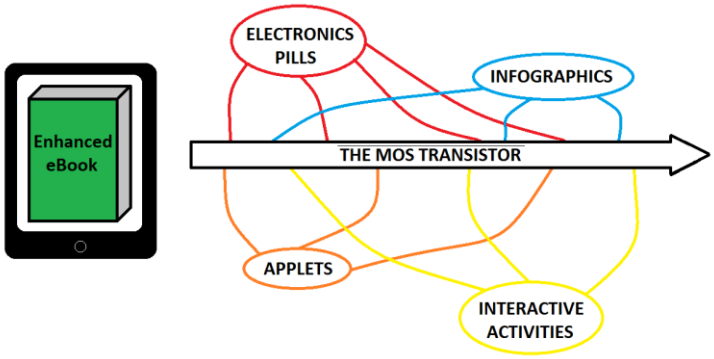

Figure 1. The enhanced eBook and how the enhanced contents appear in the learning process of the student.

The enhanced eBook acts as a conducting thread for the presentation of the topics in the course, and allows the appearance of the enhanced contents when they have their most pedagogical effectivity. This is illustrated in Fig. 1, where the theoretical description of the MOS transistor is given using a classical cumulative approach, but where the various enhanced contents are placed at specific points to illustrate, clarify, or even evaluate the progress of the students.

2.1. Enhanced contents:

The following paragraphs detail some of the resources used to build the enhanced eBook.

Electronics pills. They are a set of tutorials formatted as podcasts. They last for a maximum of five minutes and serve to present contents oriented to going into detail in certain concepts or to stress their links to other courses. They are based in the Digital Learning Object (DLO) model and therefore they must: facilitate the user's learning, be self-contained, and allow a modular integration with ascending hierarchy, this is, allow their integration with other objects to create a more complex one. Electronics pills are widely used as a means to summarise the most relevant concepts of a course and to facilitate the understanding of those aspects of the course that students find the most difficult (Ponce, 2012; Juanes, 2012; Maceiras, 2010).

For example an electronic pill about the MOS transistor is developed explaining its structure (gate, drain, etc.), how it is fabricated in a standard technology process and technical aspects such as its electrostatic properties or the backgate effect.

Infographics. They are a combination of visual materials that provide a graphical display of information. They are mainly used to deliver complex topics by a visual representation that synthesizes or clarifies, making their study more enjoyable (Clarín, 1997). As an educational resource, it is more concise than videos and more narrative than a diagram, allowing a pleasant visualization of information and facilitating the understanding of the most complex concepts. Nevertheless, despite their advantages, infographics are not always the most adequate resource and a careful study of which topics might be delivered using them is required. Also, the creation of infographics is not an easy task, requiring a solid knowledge not only of the concepts that are to be displayed, but also of the specific tools used for their creation.

A number of much elaborated infographics can be found in the Internet (Smithonian, SINC, BBC, La Vanguardia, etc) that deal with topics related to science and technology, but not specific for the study of electronics. For this project, a set of infographics have been created that present the MOS transistor, and its operation and fabrication process, aiming to provide a new form of understanding that does not overlap with the contents of the written materials.

Applets. A set of Matlab interactive applications (Applets) have been adapted from (Dimitrijev, 2000). They integrated areas that constitute the core of one of the topics developed in the enhanced eBook, the MOS transistor. The objective in this case is to facilitate the understanding of the physical phenomena that are involved in the fabrication and operation of electronic devices by a visual description that complements the analytic description that is typically given to students. In particular, the specific realizations are the

following: (1) fabrication of integrated circuits, (2) semiconductor physics and (3) semiconductor devices.

Interactive activities. A set of interactive activities in the form of short questionnaires has been put in place to provide students with a tool to obtain immediate feedback on their learning process that fosters their metacognitive skills (Evans, 2013). The questionnaires contain statements about the concepts presented in the different resources used to enhance the text.

3. Results

To validate the benefits of the enhanced eBook on the learning process, the grades obtained by the students that attended the courses in the previous academic year, when the enhanced eBook was not available, will be compared to the grades obtained by students in the academic year of the implantation of the new tool.

A set of activities has been created to assess the impact of the activity on the learning of students. These activities are characterized by the fact that for their resolution it is advisable to use the resources provided to the students. Among the learning outcomes to be assessed the authors highlight the improvement of the experimental treatment of the theoretical concepts presented in the enhanced eBook, and the results of a test on the topics dealt with in the interactive activities. In particular, three learning outcomes have been analyzed: the characterization of the basic properties of electron transport in semiconductors, the derivation of incremental device models in a small region of operation, and the analysis of the performance of small-signal amplifier configurations.

One of the goals of this innovation activity is that it becomes the starting point of a process of education research. To this end, the procedure to adopt the enhanced eBook throughout all courses in the area will need to be analysed, focusing on learning the main features concerning both the adaptation of the contents and the usability of the enhanced eBooks that the students value the most.

One of the most commonly used techniques to assess and evaluate in the field of technological products and information is based on the user experience (Hassan, 2006). Its formal definition entails several variables: easy of learning (learnability), efficiency, ability to be remembered (memorability), efficacy, and satisfaction. Taking these characteristics as a basis, usability can be measured and assessed, therefore facilitating an improvement in the experience of the final user.

The objective, thus, is to carry out both a longitudinal and a transverse follow-up program. Qualitative as well as quantitative techniques will be put into practice in the process of data

sampling. Because this is the first year that it is being performed, however, it has to be noted that the interpretation of the data might be slanting.

3.1 Student feedback.

Several works propose that students´ motivation and satisfaction are highly related with the success of the e-learning process as it is associated with student achievement (Regueras, 2009). Information about the learning process will be obtained by a survey in which a set of statements about the impact of the proposed activity will be presented to the students, who will be asked to indicate their level of agreement. Among the aspects of interest of the use of the enhanced eBooks that will be investigated in the survey, it will be inquired whether they:

- Are easy to use
- Present relevant information
- Foster the acquisition of knowledge
- Allow a more efficient use of time than traditional class notes

Finally, to assess the usability of the enhanced eBooks, a quantitative survey on the time that every student has on average spent using the different resources, such as browsing through the internet for information using the hyperlinks, watching videos and infographics, taking notes, or solving exercises will be carried out, which will allow a comparison to the amount of time typically spent if a similar resource is not available.

Because this activity is now being developed for the first time, no results are available at time of writing this paper; nevertheless, it is expected that they will be ready for their presentation at the conference.

4. Conclusions

Along with the benefits derived from m-learning (immediate access, interaction, diversity and customization and individualization of learning), and the advantages of enhanced eBooks, in which the text serves as a guide though its various functionalities to facilitate the interaction between the reader and the book itself, a greater autonomy of the student can be achieved, which helps to develop transverse competencies such as time management, and self-organization, fostered by the no-linearity of the reading in this format.

The teachers expect that the application of the methodology proposed in this work will enhance the understanding of the physics behind the operation of semiconductor devices thanks to the introduction of a visual description complementary to the traditional analytical approach, thus contributing a deeper understanding of these processes.

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Context-aware assessment in out-of-classroom activities by means of mobile technologies

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Abstract

This paper proposes a framework for context-aware assessment of out-of-classroom subjects with the support of mobile technologies. The paper discusses: (a) the principles and implications of out-of-classroom activities, e.g. internships, outdoors practicals of topography, of agricultural or marine engineering, virtual university courses, etc.; and (b) context-aware assessment, in which some context elements (location, date and time, environmental circumstances) may be incorporated into the assessment by means of mobile technology. The aim of this framework is to provide the tools that will allow for an enhanced evaluation, by taking into account the context of the activities being carried out. Given the characteristics of the activities, the assessment will be based on submissions prepared by the students, which will automatically incorporate context information that can be relevant for the assessment. The framework will be tested with several groups of students participating in internships and/or international mobility programmes, from different universities (public, private, semi-public).

Keywords: *context-aware assessment, out-of-classroom activities, mobile technologies, internships, international mobility programme.*

1. Introduction

Context-aware assessment of learning activities opens a new range of possibilities for better and more accurate evaluation of students' achievements, by making explicit use of environmental information that is usually not considered in traditional assessment methods.

Out-of-classroom learning also plays an important role in education as a complement to formal learning at school. The constructivist theory describes how new knowledge based on real life experience is constructed and integrated into existing knowledge after a reflective thinking of the activity being carried out. The current proliferation of mobile devices like smartphones or tablets adds new opportunities to enhance not only the student experience in this type of activities, but also the monitoring and assessment of the learning process.

After discussing the fundamentals of out-of-classroom learning and context-aware assessment, this paper presents work in progress around a project whose goal is to define a framework aimed at supporting and facilitating the development of context-aware assessment applications based on mobile technologies specially adapted to out-of-classroom activities.

2. Main principles

2.1. Out-of-classroom activities

The goal of this project is to propose a framework for context-aware assessment of out-of-classroom activities, using mobile technologies.

In this work, out-of-classroom activities are understood as learning activities that make up a regular course, or a fundamental part of it, and that are developed in one or more locations different from the traditional classroom in the academic institution. These activities are carried out more or less continuously over a specific period, as opposed to other types of sporadic activities which can also be carried out away from the school, e.g. occasional outdoor activities for a specific purpose, such as a visit to a botanic park or an exhibition, which are included in a formal subject taught in the classroom (Santos et al., 2014). Examples of out-of-classroom activities are open university courses, internships, practicals of certain disciplines like topography, agricultural or marine engineering, exchange programmes, etc.

Out-of-classroom activities can be carried out indoors or outdoors. For the purposes of collecting context information, as will be seen below, this fact can make a significant difference, but in other respects they can be considered as the same type of activity regardless of the specific location. It is also possible for an out-of-classroom activity to be

performed *en route*, i.e. in an itinerant fashion, and even that part of it is indoors and part outdoors.

2.2. Context-aware assessment

The use of context information for the assessment of learning has been the subject of various studies. In general, a context-based assessment requires careful consideration of situational and contextual factors of the learning processes which, according to Poikela (2004), can be classified as social (assessing and understanding), reflective (assessing and developing), cognitive (remembering and understanding) and operational (doing and acting), in contrast to traditional assessment. This theory, based on constructivist principles, states that the assessment is more productive when it uses expression of the individual, shared and organisational contexts of learning, which in the case of an out-of-classroom environment integrates the action characterised by situation, time and place.

A new field opens up if the context details can be gathered automatically by means of the appropriate devices. In the case of mobile-based learning, more context items can be associated with the activities to be assessed. Hwang et al. (2008) explain the relationship amongst u-learning (learning anywhere and anytime), mobile learning (learning with mobile devices and wireless communication), u-computing in learning (learning with ubiquitous computing technology), and the newly defined "context-aware u-learning", i.e. learning with mobile devices, wireless communications and sensor technologies to better understand the learner behaviour and the timely environmental parameters in the real world, such as the location and behaviour of the learner, as well as specific physical features of the context.

Some studies have been published around context-aware m-learning in specific areas and disciplines (Hwang and Wu, 2014), such as primary and secondary school (Santos et al., 2014), natural sciences, nursing or archaeology. These works focus primarily on the use of mobile devices in the learning process, but their use in the assessment process and the relationship to the assessed activity is not deeply analysed. Back in 2008, Hwang et al. pointed out the potential for additional research in this field.

2.3. Mobile technologies

Mobile devices are more and more popular everyday, and they are reaching all social layers and communities, including also students. A student may very easily have access to a smartphone or a tablet and use it for their learning activities.

A mobile device usually hosts a number of sensors that can provide wide-ranging data; from the general context-aware assessment perspective the most relevant items may be those related to date and time, location, and possibly motion, but for some specific assessment applications other types of context information can also be of interest (such as orientation, speed, acceleration, gravity, proximity to other objects, temperature, pressure, humidity, illumination, magnetic field, signals from various antennas: telephony, Wi-Fi, Bluetooth, NFC, GPS, images from a camera, sounds from a microphone, etc.).

Sensor outcomes may depend on whether the device is outdoors or indoors, especially in the location information. If the device is outdoors and it is equipped with a satellite navigation sensor (typically GPS), it will be able to determine its global location. Otherwise, this information can be obtained more or less accurately through other means such as Wi-Fi, Bluetooth or QR code scanning.

3. Proposed study

Based on the principles presented above, an exploratory study is outlined in order to determine the type and quantities of data that could be collected during out-of-classroom activities. In an effort to obtain data that will allow us to propose a framework that supports the development of context-aware assessment applications for out-of-classroom learning, we have decided to take a user-driven approach by involving a sample of the final users during the design phase. The goal is to define which variables and metrics will be most useful in the design of u-learning activities to be assessed with context information automatically gathered by mobile devices, and in the end propose a framework that can be applied in a diversity of situations and scenarios.

The main questions that are to be approached during the first phase refer to the variables and metrics to be gathered, and also the means by which they will be collected.

As mentioned earlier in this paper, variables such as date, time, location and motion are provided by all smartphones; the question would be, in this case, which other variables could be measured that may be used in terms of assessment for an out-of-classroom activity?

In terms of the technology used, although smartphones probably are the best-known example of mobile technologies, there are other alternatives to be considered. "Nearables" such as Estimote (http://estimote.com/) or Tile (https://www.thetileapp.com/), for example, have more precision than GPS systems and could be used in specific situations. Wearables, such as the iWatch, could also be considered. Other types of sensors, such as RFID, may provide data that is not easy to obtain with a smartphone.

The first phase of the study would involve the design of questionnaires for the three main factors involved in the out-of-classroom activities: the students, the academic tutors and the in-field supervisors. A series of focus-group/brainstorm meetings will follow, in order to compare the results and prioritise the metrics in terms of relevance and impact on the assessment.

During the second phase, a pilot test will be run, in order to verify the feasibility of the data-collection process and the relevance of the data collected.

In the third phase, the data collected and the analysis from the second phase will be used to propose a framework, which will be tested with two groups of students during the fourth phase of the study.

With this framework, the learning activity designer can decide which context information is of interest for the assessment of an out-of-classroom activity.

4. Work to be done

The first phase is underway, and we expect to have finished the design of questionnaires and surveys by February 2016. Phases two and three will be executed during the second quarter of 2016 , in order to finalise a framework proposal by the end of the academic year (September) 2015-2016.

5. Conclusions

While in face-to-face learning the instructor implicitly acquires contextual knowledge about the students and the group, in out-of-classroom activities this context information is not directly available. The framework presented here contributes to a better and more accurate assessment of activities carried out by students out of the standard academic environment, by taking into account new contextual factors that have not been considered up to now.

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The melodic dictation in the traditions of Russian music education

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Abstract

In Russia solfeggio became an academic subject at the time of foundation of Saint-Petersburg and Moscow conservatories. Coming from Western Europe, in Russia solfeggio gained its own traditions of teaching. There were established three main activities – vocal and intonation exercises, hearing analysis and dictation. They were defined by the scientist of the XXth century – professor of Moscow Conservatory I.V. Sposobin.

It is a melodic dictation that became a comprehensive model for the development of prospect musicians' skills. The reason is in the combination of various tasks, such as the ability to hear, realize, memorize and record a relatively complete musical part based on a certain number of replays. Over the years of evolution in the Russian teaching school the dictation obtained logical representation, enabling to teach and perceive music, tonal and atonal. The same dictation significantly differs in the Russian tradition from its French analogue.

The report describes the evolution in the three-level system of music education, comparing it to the traditions of other countries.

Keywords: *solfeggio, a melodic dictation, a comprehensive task, multilevel musical thinking.*

1. Introduction

The melodic dictation as one of the solfeggio course activities has its national traditions in Russia. It was N.A. Rimsky-Korsakov who first spoke about the need to record music episodes from memory. His words referred to teaching solfeggio in two open conservatories: first in Saint-Petersburg, and then in Moscow. The necessity to record music episodes from memory (today it is called a melodic dictation) is primarily related to acquiring the skills of hearing, memorizing and written reproduction of the music text using notes. This skill is especially topical for those studying «free creativity» (today – composition). V.Sposobin, professor of the Moscow Conservatory, defined in the 1930s three major activities of the solfeggio course: sol-fa or vocal-intonation skills, hearing analysis and dictation. While the first activity is the closest to its «source» - solfeggio, originating from Italy as exercises for singing, hearing analysis is the most professional training for musicians' hearing, combining both hearing and understanding the sound vertical (intervals, chords) and requiring the knowledge of musical theory. The least ordinary activity is the melodic dictation. What are the methodological traditions of writing a dictation in Russia?

2. Dictation as a comprehensive activity

While recording a melodic dictation, the writer uses hearing, memory, music material analysis, meter-and-rhythmical skills, music basics, knowledge in the theory of music. The composite format of this complex work requires thorough preparation. It is quite reasonable that dictations are written starting from the first stage of the three-level system of music education and finishing in the first year of higher education. It is to be noted that for some musicians (conductors and music historians), becoming a post-graduate student also involves an examination on Solfeggio as a dictation, since it shows the level of development of the candidate's hearing, memory, music theory and understanding.

At the same time the range of tasks for writing dictations at different stages of education considers manageable complexity of the level. It takes into account the fact that small kids do not have the skills of writing notes, so dictations for 5-7-year-old children are given orally as short (2-4 bars) melodic motifs, which should be sung/played on the instrument/clapped after listening to them once or twice. These are the so called melodic and rhythmical dictations. A melodic dictation requires of children accuracy in reproducing intonation rhythm. Here children show not only their hearing abilities, but also the quality of their music memory.

In the primary music school it is necessary to teach children perceive a dictation as a routine solfeggio class activity. This outer setting means regular memory training. Owing to

the basis of the major/minor key in the Russian system of music education, the topical questions include the specifics of the tonal development in this dictation: which degree the dictation started with, which it finished with, what skips were there in the melody, what melodic idioms were included, what specifics were noticed in the rhythmical groove. Another feature is including the theoretical material studied in class into the dictation. All the above questions enable to train analytical approach to the melody heard.

In the middle music school, teachers normally give a monothematic dictation with the length of 8 bars, which aims to facilitate students' understanding of the simplest structure of the music period of repeating/non-repeating/unified format. The melody heard must be noted down after 6-8 replays, during which they identify the key, metric signature, melodic structure, caesuras, rhythmical and melodic specifics. It is vital to record a dictation.

The classical tradition of writing a dictation means recording it from memory, and not taking of shorthand notes following the performance. The procedure of writing a dictation emphasizes integral perception of the musical piece, including interaction of all its parts. Therefore, artificial division into smaller parts (sequences of notes, rhythmical scale, bars) may be only a temporary technique to find out and solve problems. The integrity of perception is the main difference from the procedure of writing a dictation in France, where a dictation is played in full at the beginning and the end of writing, while in the middle several bars are played 2-3 times in a row. However, the Russian system does not exclude recording the note text by parts, but only provided that the structure of the dictation is clear, and the number of bars is thus evident.

In the music college the task is to teach students write 1/2/3-voice dictations using chromatisms for transitions and modulations to other keys. It is also important to hear the types of correlation between voices in a polyphonic dictation (direct, parallel, indirect, opposite), be knowledgeable about homophonic-harmonic and polyphonic composition, understand the principles of writing chromatic sounds. The issues of the dictation structure (analytical approach) are always topical.

A completely different dictation perception is practiced at higher educational establishments. All the technical memory and hearing training should be left behind. The aim of the conservatory dictation is to record a polyphonic dictation with a changeable number of voices taking into account genre and stylistic features of the music material. It is curious that for the first time prospect undergraduates encounter stylistic dictations and genre performance at the entrance examination, where, pianists, for example, are requested to write down the dictation in Prokofyev's or Rakhmaninov's style as a piano miniature.

Conductors and music historians record 3-voice dictations with expanded tonality and elements of polyphonic imitations.

Naturally, the question is: what material may be used for genre and stylistic dictations. In the educational practice of the first two stages of the three-level system of music education dictations are mainly instructive, since they must «work» for solving specific theoretical difficulties and at the same time they must be structurally complete. Music pieces are often inappropriate here. At higher educational establishments the situation is the opposite: the material often includes fragments of the contemporary works. The aim is to teach and perceive a contemporary miniature, because it has a well-developed music language, using modern notation principles, and gives another horizontal and vertical горизонтали. Undoubtedly, some of the most suitable miniatures here are such pieces as those from "Microcosm" by B. Bartok. However, to achieve genre diversity it is much more interesting to use fragments from chamber and vocal, chorus or symphonic music.

3. Dictation as a result of working on vocal-intonation and hearing skills

A dictation could have failed as the activity if there was no two-fold preparation for solfeggio: vocal-intonation skills and hearing analysis.

Considering memory development, it is to be kept in mind that initially the child's musical memory is developed by signing song-melodies and learning them by heart. At this stage the basics of the analytical approach to a music fragment is made. How many phrases are there in the song? In the text they are usually divided by a caesura. Which of them repeat? What is the difference between them? Does the stop on the unstable degree in the middle of the song sound as complete? Where can we put a «full stop» in the musical development? Obviously, in the end, where we come to the key note. All these questions and answers are to listen and hear the music text attentively and distinctively. It is clear that the material for singing and learning by heart is becoming more and more complex at each step of development. Memory training is in place till the beginning of the higher school solfeggio.

Another important aspect of preparing to write a dictation is hearing analysis. This form of work may include various models for hearing: starting from separately played sounds in/out of a key, associative melodic idioms (auxiliary and transit idioms, leading notes, tetrachords, skips with filling etc.), intervals and chords in/out of a key, harmonic four-voice sequences and separately played altered chords. The skills of this hearing analysis may be useful for the melodic dictation.

4. Issues of the tonal thinking in the melodic dictation

In Russia Kodály Method did not become widely spread, similarly to the system of the absolute «C». The typical feature of the Russian solfeggio is probably its base on the key and tonality, which is the foundation for the future model changes. This sequence makes the Russian system different, for example, from the Danish one, where J. Jersild outlines

various tonalities via numerous options of tetrachords and their further combination. In this respect we are closer to the research done by E. and F. Galofré Mora, where they gradually build up the tonality (based on the example of C major), and then they build the expanded basic triad. It is also similar in terms of the principle of highlighting rhythmical component for activation. In «Solfeggio» Galofré Mora tends to the following integration of the rhythmical and melodic parts (melody and its rhythmical accompaniment).

Since dictations are written in different keys, the freedom of orientation is required. Therefore, preparation in sol-fa is not only to learn music fragments by heart and analyse their structure, but also to actively translating them into different keys. The knowledge of the quint course of parallel keys is advantageous.

The basis on the key and tonality has long been the foundation for students' hearing skills, so at the stage of the higher school solfeggio going beyond tonality or its expansion entails difficulties in writing dictations. The way out may be in the earlier introduction of the contemporary music in the examples for sol-fa. For example, it is suitable to commence the introduction with the modern interpretation of the tonality with music by S. Prokofyev, D. Shostakovich, and R. Shchedrin. It can be used at college solfeggio classes. In this case sample dictations may include «Polyphonic dictations» by N. Kachalina. Another intermediary option of working on tonality expansion is the use of instructive dictations, based on the principle of repeating a tonal phrase or a sentence by sharpening or flattening. This idea was used in the «Polyphonic dictations» by A. Myasoyedov.

5. Innovative methods of working for the melodic dictation in higher education

The specific feature of the melodic dictation in higher education is to go beyond the diatonic key in chromatic. Such a goal seems to be quite a new phenomenon, promoted in solfeggio for the last 30 years. Often, the approach to the tonal perception changes: so-called "tonal limited transposition" replaces the traditional major and minor keys. Knowing the Olivier Messiaen's tonal system involves their active use in practice. In the metro-rhythmic part of dictation changes in melodic interval sizes, which could be unstable, comes to replace the stability bar. The rhythmic simplicity of the beat pattern alters for unusual divisions. Number of voices may change throughout the dictation, that usually due to the characteristics of the genre of musical material. A textured design of the note text, depending on the genre of dictation, becomes a natural requirement.

A dramatically increased complexity quite naturally has caused difficulties in writing dictations for students. Multipolar difficulties involve complex of preparatory work and new forms of dictations.

The need to perceive complex musical material requires more serious forms of memory development. An innovation in the field of musical dictation became a "visual-aural dictation" (N.Kachalina), which goal was to apply visual imagery to the hearing skills development. In particular, students are suggested visually memorizing music, which can then be played on an instrument or be written in musical notation. Needless to say, this form of dictation assumes intensification of internal hearing perceptions.

Another type of activation of the hearing is the so-called "timbre dictations" (T.Litvinova), that involves the musical notation of the piece of music from polyphonic dictation performed by traditional and modern ensembles. The task of such a dictation is hearing in polyphonic texture the timbre line of one instrument.

In an effort to go beyond the diatonic, the training dictations of high artistic performance have been developed by A. Myasoedov. He uses tonal shifts on a short phrase, which can be variably shifted a semitone up or down while maintaining or changing the key. Any chromatic movement allows to fix attention on the here and now playing tonality, generating associative-aural perception of any tonality as such, without regard to the relationships with others.

It would be wrong to say that new forms of work on melodic dictation had affected only solfeggio in high school. A light version timbre exercise can be found in college and music school where interactive melodic diction is cultivating. Multimedia capabilities allow children to practice writing melodic dictation in a playful way by inserting suitable puzzle-bar in the right places with missing parts.

In conclusion, it should be emphasized that the objective of the dictation is never to find drawbacks in music education, as it is frequently seen in test examinations. It is rather the ability to hear the musical material, understand it and literally reproduce it with notes. However, this task can be implemented only under the harmonious interaction between academic subjects, included into the system of music education.

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Pedagogy for Conceptual Thinking in the Digital Age: Enhancing Learning Outcomes with Meaning Equivalence Reusable Learning Objects (MERLO) Formative Assessments

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Abstract

The research presented in this paper is the fruit of an ongoing international collaboration with the goal of enhancing students learning outcomes by implementing and sharing a novel pedagogy for conceptual thinking, and use of an innovative didactical and methodological tool: Meaning Equivalence Reusable Learning Objects (MERLO) that provide student-centered, weekly formative assessments for exploring and discussing conceptual situations in small groups. It was developed, tested, and implemented in Canada at University of Toronto and Ryerson University, as well as in Israel, Italy, Russia, and Australia, in different knowledge domains, including: physics; biology; mathematics; mathematics teacher education; teacher training; developmental psychology; English as a second language; architecture; management; business; project management. Statistical analysis of MERLO data collected since 2002, shows that conceptual thinking enhance learning outcomes and deepens students' comprehension of the conceptual content of learned material. Conceptual thinking is learnable, and provide metrics to document continuous increase in higher-order thinking skills such as critical conceptual thinking, transfer of knowledge, and problem solving. Pedagogy for conceptual thinking is currently implemented with Brightspace (http://www.brightspace.com/), Integrated Learning Platform (ILP) offered by D2L (http://www.d2l.com/) that supports customizable online pedagogy.

Keywords: *pedagogy for conceptual thinking; meaning equivalence; MERLO; formative assessment; enhanced learning outcomes.*

1. Introduction

Traditional pedagogy focus on memory of facts and correct execution of problem solving procedures, and its learning assessments include structured items such as true/false and multiple-choice questions. In contrast, higher-order conceptual thinking skills is now recognized as a cornerstone of effective learning, ways of thinking that explore patterns of equivalence-of-meaning in ideas, relations, and underlying issues: 'understanding facts and ideas in the context of a conceptual framework' (Bransford, Brown, & Cocking. 2004). Meaning equivalence is a construct that denotes commonality of meaning across representations: a polymorphous - one-to-many - transformation of meaning. Learning assessments based on meaning equivalence with unstructured items capture this important aspect of conceptual thinking.

2. What is MERLO?

Meaning Equivalence Reusable Learning Object (MERLO) is a multi-dimensional database that allows the sorting and mapping of important concepts through exemplary target statements of particular conceptual situations, and relevant statements of shared meaning. Each node of MERLO database is an item family, anchored by a target statement that describes a conceptual situation and encodes different features of an important concept; and also include other statements that may – or may not – share equivalence-of-meaning with the target statement. Collectively, these item families encode the conceptual mapping that covers the full content of a course (a particular content area within a discipline).

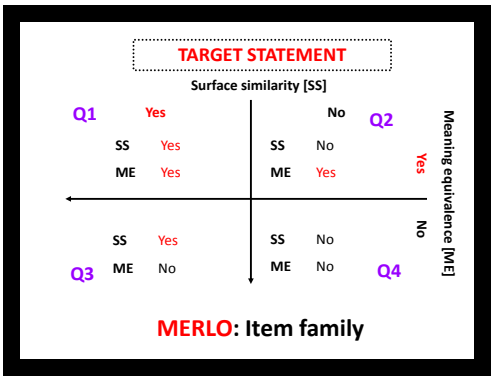

Figure 1: Template for constructing an item-family in MERLO

Statements in the four quadrants of the template, namely, Q1; Q2; Q3; and Q4; are thematically sorted by their relation to the target statement that anchors the particular node

(item family); they are classified by two sorting criteria: *surface similarity* to the target, and *equivalence-of-meaning* with the target.

For example, if the statements contain text in natural language, then by 'surface similarity' we mean same/similar words appearing in the same/similar order as in the target statement; and by 'meaning equivalence' we mean that a majority in a community that shares a sublanguage (Kittredge, 1983) with a controlled vocabulary (e.g., statistics) would likely agree that the meaning of the statement being sorted is equivalent to the meaning of the target statement. A typical MERLO assessment item contains 5 unmarked statements: an unmarked target statement plus four additional (unmarked) statements from quadrants Q2; Q3; and Q4. Our experience has shown that inclusion of statements from quadrant Q1 makes a MERLO item too easy, because it gives away the shared meaning due to the valence-match between surface similarity and meaning equivalence, a strong indicator of shared meaning between a Q1 and the target statement. Therefore, Q1 statements are excluded from MERLO assessment items.

Task instructions for MERLO assessment are: At least two out of these five statements – **but possibly more than two** – share equivalence-of- meaning. (1) Mark all statements – **but only those** – that share equivalence-of-meaning. (2). Write down briefly the reasons for making these decisions (Etkind, Kenett, & Shafrir, 2015).

The learner is first asked to carry out a recognition task in situations where the particular target statement is not marked, namely, features of the concept to be compared are not made explicit. In order to perform this task, a learner needs to begin by decoding and recognizing the meaning of each of the 5 statements in the set. This decoding process is carried out, typically, by analyzing concepts that define the 'meaning' of each statement. Successful analysis of all the statements requires deep understanding of the conceptual content of the specific domain. MERLO item format requires both rule inference and rule application in a similar way to the solution of analogical reasoning items. Once the learner marked those statements that – in her opinion – share equivalence-of-meaning, she formulates and briefly describes in writing the concept/idea/criteria she had in mind when making these decisions.

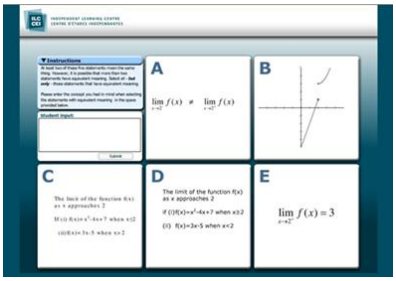

Figure 2: Example of MERLO item (mathematics/functions)

Figure 2 is an example of MERLO assessment item (mathematics/functions); it contains 5 representations that include text, equations, and diagrams; at least 2 two of these representations share equivalence-of-meaning.

Fig. 3 shows mean recognition scores of MERLO assessment in physics grade 11 students; the U-shape pattern, signifying depressed Q2 and Q3 scores, is a typical example of deficient conceptual comprehension. This type of U-shape pattern of mean ***recognition scores*** was observed in all MERLO assessments results for conceptual thinking across all types of learners (secondary; post-secondary; professional learning), in all knowledge domains, including: mathematics; physics; biology; psychology; education; architecture; project management; and business.

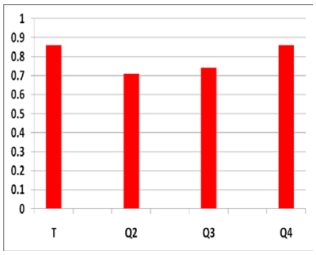

Figure 3: MERLO test results (mean recognition scores; physics/magnetism); Russian Academy of Science (2003).

3. MERLO metrics for diagnostics of misconceptions

The construct 'Boundary of Meaning' **(**BoM) is defined as: Given a community of specialists that share a sublanguage, and a Target Statement that encodes a particular conceptual situation; then BoM is defined as the boundary between two mutually exclusive semantic spaces in the sublanguage:

- a semantic space that contains only representations that do share equivalence- of-meaning with the Target Statement
- a semantic space that contains only representations that do not share equivalence-of-meaning with the Target Statement

What is the meaning of the U pattern of mean recognition scores with **consistently lower Q2 and Q3 scores across different knowledge domains?**

Specific comprehension deficits can be traced as **depressed recognition scores on quadrants Q2 and Q3**, due to the mismatch between the valence of surface similarity and meaning equivalence (Fig. 1). However, the interpretations of Q2 and Q3 scores are very different:

- A ***reduced score on Q2*** indicates that the learner fails to include in the Boundary of Meaning (BoM) of the concept certain statements that share equivalence-of-meaning (but do not share surface similarity) with the target; ***such depressed Q2 score signals an over-restrictive (too exclusive) understanding of the meaning underlying the concept.***
- A ***reduced score on Q3*** indicates that the learner fails to exclude from the Boundary of Meaning (BoM) of the concept certain statements that do not share equivalence of-meaning (but that do share surface similarity) with the target; ***this depressed Q3 score signals an under-restrictive (too inclusive) understanding of the meaning of the concept.***

Production score of MERLO test items is based on the clarity and accuracy of the learner's written description of the conceptual situation described in the item, and the explicit inclusion in that description of lexical labels of relevant and important concepts and relations. Thus, recognition and production scores provides teachers and learners with clear and reliable evidence for diagnosing misconceptions, and provide clues for remediation.

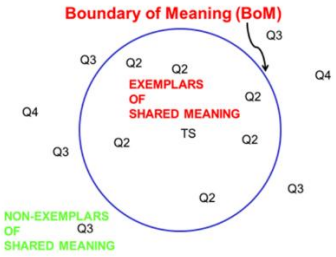

Figure 4: Boundary of Meaning (BoM) of TS include Target and Q2; exclude Q3 and Q4

Figure 4 illustrates a practical way to demarcate BoM for a particular Target Statement in a knowledge domain. Specific conceptual comprehension deficits are traced as depressed (lower) recognition scores on quadrants Q2 and Q3, due to the mismatch between the valence of surface similarity and meaning equivalence in these quadrants (Figure 1).

Pedagogy of conceptual thinking was designed to motivate and engage learners, and encourage cooperation. It includes weekly classroom formative assesments with MERLO items, as well as inclusion of MERLO items as part of mid-term tests and final exams.

MERLO formative assessment provides learners with opportunities to cooperate through discussions in small groups; then make their own decisions and send their individual responses to the instructor's computer via mobile communication devices; followed by class discussion. It takes about 20 minutes, and includes the following 4 steps: **Peer Cooperation and Small Group Discussion** (approx. 3-5 minutes); PowerPoint projection

of a MERLO item; students cooperate in discussing the item in small groups (turn back/sideways to discuss with those seating next to them). **Individual Response** (3 min); each student sends her own individual ***recognition response*** through a personal communication device (smartphone/tablet/clicker), marking at least 2 out of 5 statements (A; B; C; D; E) in the multi-semiotic MERLO item that, in her opinion, share equivalence-of-meaning; then sends her ***production response***, briefly describing the reasons/concept she had in mind when making the above recognition decisions. **Feedback and Class Discussion of Students' *productive response*** (3-5 min); projection of the MERLO item, including several production responses sent by the students, and instructor's description of the MERLO conceptual context; class discussion and comparison of the various individual production responses.

Feedback and Class Discussion of Students' *Recognition Response* (3-5 min); projection of the MERLO item, showing the *correct recognition response* of the MERLO item (i.e., correctly marked/unmarked statements); class discussion and comparison of the various individual recognition responses.

4. Interactive Concept Discovery (InCoD)

Interactive Concept Discovery (InCoD) is a novel semantic search learning tool. It is an intuitive, interactive procedure that allows a learner to search large digital databases (eJournals; eBooks; databases; eArchives), and to discover the building blocks of a concept within a particular context of the knowledge domain, namely, co-occurring subordinate concepts and relations. InCoD construct concept maps that clearly identify not only the conceptual content of important concepts in course material, but also its internal conceptual structure - hierarchical and lateral relations among concepts and their building blocks.

The learner begins by conducting semantic search of *Key Word In Context (KWIC) – concordance;* read/save documents online; annotate and evaluate the degree of relevance of a particular document to the specific conceptual content under consideration; and construct graphical representations of links between concepts. InCoD data reveal the learner's consistency of 'drilling-down' for discovering deeper building blocks of the particular concept, as well as the temporal evolution of outcomes of the learning sequence. This digital record is an authentic, evidence-based demonstration of mastery of knowledge that can be used as a springboard for follow-up class and chat room discussions. It provides a credible record to the individual's learning process and learning outcomes (Shafrir, Etkind, & Treviranus, 2006).

Interactive Concept Discovery (InCoD) makes available to the learner all the different locations of sentences in the digital documents in the course Knowledge Repository (KR),

likely written by different authors with different points-of-views and different examples, that contain a searched concept. Clicking on a found sentence provides access to the document where the sentence appears, so that the learner can examine the context in which the concept is discussed. Following the initial concordance/search, the learner may notice that in several locations/sentences, another concept consistently appears in close proximity to the searched concept. By clicking on the second concept, the learner activates a subsequence search of co-occurrence of both the initial concept and second concept, aimed at discovering consistent co-occurrence with the initial concept.

A Learner Individual Index collects data from each of the learner's activities, including:

- Alphabetic indexing by name of concept
- Document/page
- Ranking (on scale of 1 to 5) in terms of degree of relevance to course content
- Annotations: brief summary of the specific conceptual context, followed by learner's comments, tags, and links

Clicking on a particular entry in the Individual Index provides the date of creation of the entry by the learner, plus complete details of content. A Learner Individual Index is also available to the the instructor; it tracks the learner's progress in mastering the conceptual understanding of the documents in the Knowledge Repository, and the specific learning outcomes accumulated throughout the course.

Concepedia (Conceptual Encyclopedia) is a weekly aggregation of all Individual Indexes of all learners in the class, in the context of the course knowledge domain, and is accessible to the instructor and to all students in the course. It also include learners' commentaries on other learners' annotations. A Concepedia enhances individuals' reputations as cooperators who contribute to the public good, and reflects the cumulative process-learning-curve of the class.

5. Concept Science Evidence-Based MERLO Learning Analytics

Detailed data of learning processes and outcomes are collected, analyzed and available to the learners and to the teachers through learning analytics (Shafrir and Kenett, 2015).

Individual student's data profile shows student's Individual Index of InCoD, and scores of MERLO weekly formative assessments, mid-term tests, and final exams in individual courses. These scores identify specific deficits in conceptual understanding of course content, expressed as lower individual Q2 and Q3 scores, and document corrective interventions with individual learners.

Class data profiles show mean MERLO scores in weekly formative assessments, as well as mid-term tests, and final exams, as well as Concepedias for different courses. This data indicates class specific deficits, expressed as lower mean Q2 and Q3 class scores in conceptual understanding of particular course content, and may prompt the instructor to revisit this content in future lectures or other class activities. These inter-related learning-process data are collected continuously, not just in a particular class, but across all learning and teaching activities throughout the semester and the academic year. Eventually, and subject to strict privacy procedures that protect individual student identity and privacy, the learning analytics is available to the administration of the academic institutions.

6. Conclusions

A recent OECD review provides strong evidence for the important role of formative assessment in enhancing students' learning outcomes (Nusche, 2013, p. 145). This paper is about enhancing learning outcomes and deep understanding of concepts through interactive learning and methods for assessing such understanding. In the digital age, when data is abundant and technology is within reach of everyone, the focus on depth of understanding is gaining importance and urgency. This paper foster learning in the context of modern information technologies. The wide range of application areas where experience in these tools and techniques has been gained, demonstrates their universality and reflects on their large potential in future research and implementation initiatives.

Implementation, testing, and validation, since 2002, of pedagogy for conceptual thinking, lend support to the following conclusions:

- Weekly multi-semiotic MERLO formative assessments enhance peer cooperation, conceptual thinking, and learning outcomes.
- Pedagogy for conceptual thinking motivate and engage students. This is particularly evident - and important - in large undergraduate classes.
- Conceptual thinking is learnable.
- Good vs. poor conceptual thinkers score high (low) on deep comprehension of the content of other courses.
- Pedagogy for conceptual thinking, when implemented as a regular part of the instructional methodology, replicates the above pattern of results.

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Are we assessing correctly our students? Spain versus Finland

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Abstract

The aim of this paper is twofold: first, to analyse the comparison of coursework and final examination between Finland and Spain to test if there are differences in assessment methodologies; second, to study whether there are different factors (such as gender, age, subject, students' motivation, and preferences) that have an impact on the assessment of students from the two countries. The final grades obtained by 117 freshmen enrolled on the Statistics and/or Financial Accounting subjects in Business Administration Degree are analyzed. The most interesting results are that the coursework mark is higher than the final examination in both subjects in both Universities, except for male students enrolled in statistics. Also variables such as gender, type of subject and students´preferences have an impact on academic outcomes.

Keywords: *Assessment; EHEA; coursework; final exam; active learning.*

1. Introduction

In the past few years, university access and participation rates have raised significantly, internationalization and life-long learning have become essential and graduates employability has become an essential concern. The European Higher Education Area (EHEA) has made Higher Education Institutions (HEI) focus on a a more dynamic teaching methodology and a student-centered learning approach, among other changes, leading to an improvement in education. The EHEA has also presented a challenge for lecturers shifting from traditional teaching to active and dynamic methodologies where the students "*are doing something besides passively listening*" (Ryan & Martens 1989, p.20). However, these changes are being difficult to implement as new creative teaching methodologies require higher human resources development, more research in education, new classroom infrastructures, new quality assessment systems and smaller student-teacher ratios, finally, more investment in higher education. Taking into account all of these changes, the teaching experiences of some lecturers evidence the concern about one basic issue in the "creative" process of students' learning: the assessment of this learning. Currently universities publish subjects' syllabus or contents of the subjects adapted to active learning methodologies and schedules adapted to the European Credit Transfer System (ECTS) for all universities belonging to the EHEA to have comprehensive and homogeneous degrees. However, in most of the cases, assessment homogenization has not been achieved yet. Assessment has been defined as 'the process of evidencing and evaluating the extent to which a candidate has met or made progress in learning contents towards the assessment criteria' (Cox et al., 2008, p. 34). As Hand et al. (1996) explains "*assessment is seen as a cost driver*" (p. 105) due to the implication of academic staff in this time-consuming and complex process. At the same time, assessment is valued as a major influence upon the quality of the learning process (Gibbs, 1992). Therefore, nowadays, assessment is a strategic matter for completing the syllabus with the EHEA requirements. Therefore assessment should serve multiple purposes such as providing information about student learning, student progress, teaching quality, and for program and institutional accountability (Fletcher et al., 2012).

With the EHEA environment, assessment criteria has changed to a more holistic system embodying both the student's daily effort and the final examination. Therefore, following active methodologies, the final grade of a subject is the weighted mean between the coursework and the final examination marks. Formal examination refers to closed-book time-constrained written essay, test or exercises, very similar to the traditional unique format of assessment. Coursework refers to alternative assessment of different activities the student must perform including work in group essays, oral presentations, simulations, etc (see Camacho-Miñano et al., 2015). The logical hypothesis is that students with higher grades in coursework will have the highest grades in the final exams because they are studying in a continuous way, they are engaged in their learning and they have done much

more practice, enhancing the real understanding of the subject. However, several empirical studies show the opposite results, that coursework grades are higher than the final exam (see Yorke et al., 1996; Tian, 2007).

Therefore, two universities from Spain and Finland, the Universidad Complutense de Madrid (UCM) and the Jyväskylä University of Applied Science (JAMK), respectively, have experience on cooperation among teachers of Statistics and Accounting. They have exchanged experiences on applying new teaching methodologies. Moreover, as Finland is one of the outstanding countries in European education (Grek, 2009) it could be an example to follow for other continental countries such as Spain, a country with a lower performance in the PISA reports (Calo-Blanco & Villar, 2010).

Bearing these issues in mind, the objective of this paper is twofold: first, to analyse the comparison of coursework and final examination results in two subjects of the Business Administration Degree between Finland and Spain in order to test if there are differences; second, whether there are different factors (such as gender, age, subject, students' motivation and preferences) that have an impact on the assessment among students from the two countries.

The contributions of this paper showed there are differences between Finland and Spain, depending on the students' perception, students' gender and type of course. Moreover, this study highlights implications for managers, teachers and students in order to improve assessment criteria.

2. Sample data and Method

The participants were 117 freshmen enrolled on the Statistics and Financial Accounting subjects in the Business Administration undergraduate degree, taught in English in both universities. They were divided in 61 students enrolled at the Universidad Complutense de Madrid (Madrid, Spain) and 56 students at the JAMK University of Applied Science (Jyvaskyla, Finland) from which 46% of the respondents were male and 40% female.

The research variable analyzed is the final grade obtained by the already mentioned 117 freshmen enrolled on the Statistics and/or Financial Accounting subjects in the Business Administration Degree. Grades range from 0 to 10, where 0 means the worst possible result and 10 the best one. The grades are divided into two intervals: grades in [0, 5) mean failure and grades in [5, 10] mean success, improving as they approach 10. With the EHEA methodology the final exam is not the only component of the final grade. The final exam (FE) consisting in an invigilated closed-book time-constrained examination with only a weight of 60% or 70% depending on the university (UCM or JAMK, respectively). The other part of the final grade, called coursework (CW), is composed of active participation, assignments (exercises, cases, simulations, real-world problems, etc.) and interim class tests

(Heywood, 2000; Camacho-Miñano et al., 2015). Also the students have two opportunities in the year to sit for the final exam and pass the subject, while the coursework component is obtained during the lecturing period.

The students were asked to fill in a questionnaire of 20 items divided in three sections: demographic data (age, gender, nationality and working status), background data (university access exam grade, degree position in university application, previous knowledge of subjects or math score) and some learning strategies (preferred ways of study, preferred type of evaluation, team working preferences).

Out of the 117 enrolled students only 111 participated in the survey where respondent rates were different depending on the question because not all of the students answered all the questions, being higher in JAMK. Missing data was not considered.

The sample is almost homogeneous because most of the questions on the survey give similar values, but there is a great difference in their working status. While the majority of students in JAMK are working (77%) in UCM only a 33%.

3. Results and findings

Analysing the evaluation differences between coursework assessment and final exam assessments it can be seen in the box plot (Figure 1) that for a majority of the students (58%) the coursework mark (CW) is bigger than the final exam mark (FE). However, the difference between coursework and final exam marks (Diff) is higher for JAMK students (mean and median more than cero) with smaller dispersion. A variance analysis confirmed that those differences on the "Diff" variable are statistically significant.

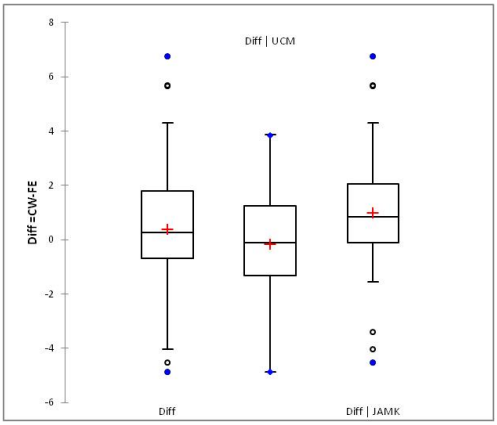

Figure 1. Diff variable box plots

As it can be observed in the Figure 1 the three distributions are quite symmetrical as the mean and the median are very similar with also the whiskers of similar length. The

distribution for JAMK is a little right skewed, as can be seen from the length of the right whisker and from the fact that the mean is higher than the median. It can be also seen in Figure 2 that a majority of points are below the diagonal (CW = FE), meaning the coursework mark (CW) is higher than the Final exam mark (FE). In fact, 58% of the students have higher CW than FE, but percentages are quite different depending on the country: while in Spain only 47% students has higher CW than FE, in Finland the percentage increases to 74%.

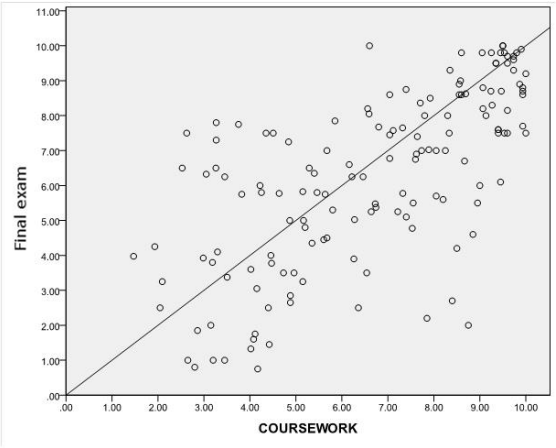

Figure 2. Coursework mark against final examination mark scatterplot

There is a great difference in the values of the difference regarding the universities, as in both the coursework and the final exam marks the values in JAMK are much higher than in UCM, as it can be seen in Figures 3.a and 3.b.

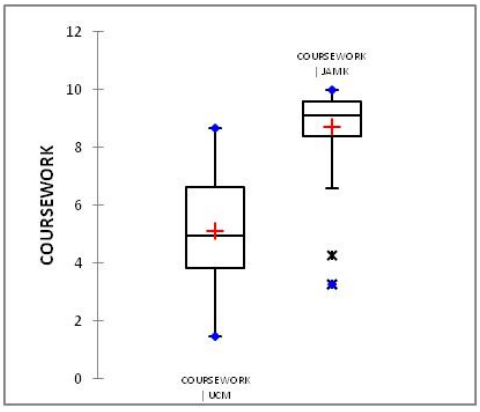

Figure 3a. Coursework box plots by university

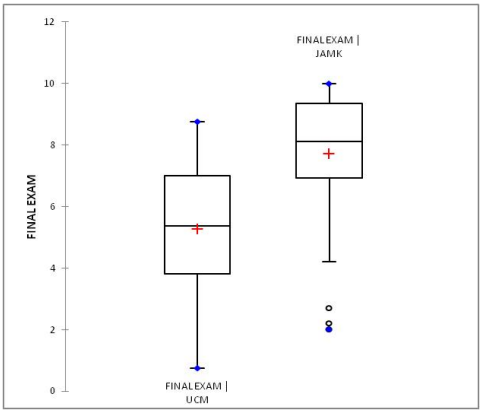

Figure 3b. Final exam box plots by university

Regarding the subjects (Accounting and Statistics), Statistics has, in average, higher values in both the coursework and final exam than in Accounting (mean and median are higher), but the difference is similar (see Figures 4.a, 4.b).

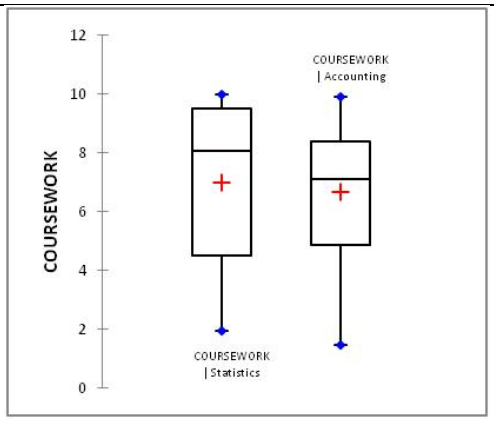

Figure 4a. Coursework box plots by subject

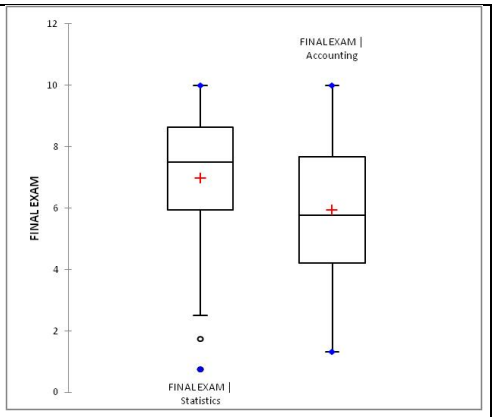

Figure 4b. Final exam box plots by subject

In order to analyse the influence of different students' factors on assessment regression and variance analyses were carried out. The coursework (CW) and the final exams marks (FE), as well as the difference between them (Diff) were used as dependent variables whereas the other 16 variables, three quantitative and twelve qualitative factors, coming from the questionnaire (final grade, number of calls[1], preferred evaluation type, University access examination, Maths grade, gender, motive for electing the degree, degree position in the university application, type of lecturer, study method, learning style and team work preferences) were used as explanatory variables. Only gender, type of subject and students' preferences had influence on the coursework and final exam differences between the analysed groups from Finland and Spain.

4. Discussion and conclusions

Our findings report that, in general, in both universities and for both subjects learning was enhanced by student involvement in the learning process, activities and environment that were most directly related to the learning outcomes (Struyen et al., 2008; Alauddin & Khan, 2010), but coursework marks have resulted higher than the examination ones (Murdan, 2005). Moreover, there are some differences in gender in the same way in line with Woodfield et al. (2005) and Simonite (2003).

[1] Number of calls is the number of times a student has previously sat for the final exam (from cero to four times in our sample).

Secondly, there are differences in Finland and Spain depending on the university's assessment culture, gender and course. Those differences may be due to cultural factors (Baeten et al., 2008). Another explanation could be that Spanish teachers are not assessing in a right way the skills and competences defined to be assessed in each coursework because of less experience in active learning methodologies and because there is still a challenge of assessing key competences across the curriculum (Pepper, 2011).

Finally, a teacher discussion on the manner of assessment should be opened between both universities in order to promote more creativity in the ways to assess learning outcomes. A proposal could be to mix the variety of evaluation methods (portfolios, quizzes, long and short exercises, problem based learning, etc.) in order to balance out non-systematic errors and avoid subjectivity. Another proposal may be to have external evaluators for the final exam.

This study has some limitations such as that the sample size is small and the analyses are focused only in two subjects and only in two countries. Thus, more studies in this line are needed to generalize the present findings. Our future research lines will be to increase the sample with more students, more subjects and more countries in order to contrast the obtained results. Moreover, it could be interesting to analyse the characteristics of students according to clusters or to test different ways of assessment.

5. Acknowledgements

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Business internships and new technologies: a scenario for growth and innovation

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Abstract

Literature on traineeships recognizes beneficial effects on its main agents: students, employers, and higher education institutions. Furthermore, some authors have identified added effects when applying new technologies to the business internship experience, specially referred to improved computer skills and learning outcomes. The Faculty of Business Administration and Management of the Universitat Politècnica de València has had a remarkable increase of internships in recent years. As computer skills are being more demanded by employers in a globalized and technological world, it is expected that virtual placements and ICTs in the internship practice will be a trend in universities in the up-coming years. The management of internships of the two new Double Degrees in the Faculty of Business: Business Administration and Management + Computer Science Engineering, and Business Administration and Management + Telecommunications Engineering, could provide the perfect scenario to put into practice and to explore the possibilities of new technologies applied to internships. The recent change in the Spanish law and in the regulations of universities, such as the Universitat Politècnica de València, allows business internships to take place abroad. This could also provide an opportunity for innovation and growth, by combining internationalization with virtualization of internships.

Keywords: *Internship, Traineeship, Telecommuting, ICTs, Employability, Computer Skills.*

1. Introduction

On the one hand, past research on business traineeships has identified beneficial effects on its three main agents: students, employers, and higher education institutions (Coco, 2000; Divine, Linrud, Miller, & Wilson, 2007; Gault, Redington, & Schlager, 2000; Thiel & Hartley, 1997). A systematic review of the scientific literature about business internships and their impact on their stakeholders by Sanahuja Vélez & Ribes Giner (2015) listed high number of positive effects and stated that they are a win-win situation. Evidence proves the efficiency of business internships done by university students in enhancing their employability (Callanan & Benzing, 2004; Cook, Parker, & Pettijohn, 2004; Divine, et al., 2007; Gault, Leach, & Duey, 2010; Gault, et al., 2000; Knouse & Fontenot, 2008; Knouse, Tanner, & Harris, 1999; Mihail, 2006; Taylor, 1988; Weible & McClure, 2011). Also, the improvement of skills is remarked as another important beneficial effect on students (Beard & Morton, 1999; Chen, 2011; Cook, et al. 2004; Divine et al., 2007; Gault, et al. 2000; Green, Graybeal, & Madison, 2011; Gryski, Johnson, & O'Toole, 1987; Knouse & Fontenot, 2008; Knouse, et al., 1999; Mihail, 2006; Scholz, 2003; Taylor, 1988; Theil & Hartley, 1997).

On the other hand, advances in technology, comprising high speed internet connections and low-cost portable devices, have made the virtual workplace a reality which is expected to grow (Franks & Oliver, 2012). The labor market presents an increasing tendency to telecommuting, remote work or telework. "Telecommuting" is a work agreement in which employees do not travel to a central place of work. "Telework" refers to all types of technology-aided work conducted outside of a centrally sited work space (including work undertaken at home, outside calls, etc.). In the same way, institutions of higher education are beginning to recognize the value of virtual internship as valid experiential learning opportunities to acquire professional skills and competencies (Franks & Oliver, 2012).

The aim of this research was to examine the literature published during the past ten years on the relation of business internships and new technologies. Our objective was also to analyze the current situation at the Universitat Politècnica de València in order to determine if the existing conditions would allow an opportunity for innovation and growth in this field.

2. Method

2.1 Literature search and identification of studies

Using the systematic review on the effects of business internships published by Sanahuja Velez & Ribes Giner (2015), we identified a sample of studies related to the ITCs, published during the past ten years. We examined the selected articles in search of synergies and effects of the ITCs on business internships. We listed these effects using the

approach of Perello & Ribes (2014), which is an adaptation of the Q sorting (Petter, Straub & Rai, 2007).

2.2 Data collection and analysis of the existing conditions

We obtained the numerical data about business internships through the official sources of the Universitat Politècnica de València. We consulted the Spanish legislation which regulates the business internships ("*Real Decreto 592/2014 de 11 de julio, por el que se regulan las prácticas académicas externas de los estudiantes universitarios*"), and the internal regulations of the Universitat Politècnica de València *("Reglamento sobre Prácticas en Empresas e Instituciones de los Estudiantes de la Universitat Politècnica de València",* approved by the Universitat Politècnica de València on the 28th of May of 2015) to picture and analyze the legal framework.

3. Results

3.1. Business internships and their relation with new technologies

The literature review yielded a total of five papers relevant to business internships and ICTs. Two studies were of a quantitative nature and three were qualitative. The findings related to new technologies found were listed and can be found in table 1.

Table 1. Business internships and their relation to new technologies
*(*Qualitative studies in regular characters - *Quantitative studies in italic characters)*

	Findings	**Authors**
1.	Virtual internships increase computer and ITCs skills.	Franks & Oliver (2012); Mihail (2006)
2.	Virtual internships develop independent and critical thinking. Other skills learned or enhanced include: project management, independent work, research skills, virtual presentations, teamwork.	Franks & Oliver (2012)
3.	Virtual internships provide new knowledge and skills through social negotiation with both the faculty internship supervisor and the company supervisor (social learning theory).	Franks & Oliver (2012)

4.	Blogging can enhance knowledge construction, reflection, learning, and communication of emotions.	*Chu & Chan (2010); Chu, Kwan, & Warning (2012)*
5.	Additional learning from social networking: managing a social media site, writing in a digital environment, learn to transfer social media personal skills to professional settings.	McEachern (2011)
6.	Virtual internships enable distance students to obtain industry appropriate experience.	Conroy & Khan (2008); Franks & Oliver (2012)

With the speedy expansion in the number of on-line enrollments in universities, educators have the challenge of warranting that work placement experiences are offered to distant students. Institutions of higher education are beginning to recognize the value of virtual internships as valid experiential learning as well as a good chance to acquire professional skills and competences (Franks & Oliver, 2012). Some institutions are therefore integrating in their programs on-line virtual internships and thus allowing distant students to attain industry-relevant experience (Conroy & Khan, 2008; Franks & Oliver, 2012).

On the one hand, according to previous research, virtual internships offer the same benefits as place-based work placement, but they offer additional benefits as well, such as learning to use modern information and communication technology to perform their work and to cooperate with their site supervisor and co-workers (Franks & Oliver, 2012). Virtual internships increase computer and ITCs skills (Mihail, 2006; Franks & Oliver, 2012) and some other skills are also enhanced through virtual internships, such as working independently and critical thinking (Franks & Oliver, 2010).

On the other hand, blogging has been recommended as a suitable tool for learning during traineeship due to its associated usefulness in collaborative learning, reflection, communication, and social support (Chu, Chan, & Tiwari, 2010). The term "blog" is a shortened form of "web log", which is a web-based diary presented in reverse sequential order that consists of a person's opinions and thoughts published on the web for multiple viewers in a flexible way (Flatley, 2005). Some papers offered evidence to support the use of blogging during internship and computer-based tools for learning and teaching, and that blogs may be an appropriate learning platform that interns should engage in throughout their professional learning (Chu, et al., 2010; Chu, Kwan, & Warning, 2012).

Finally, as social networking becomes progressively more popular as a communication tool for business and organizations, it is also vital that students learn to transfer personal social networking skills to professional situations. A study (McEachern, 2011) proved that this can be achieved through a Facebook Internship, experiencing a social network in the organizational context.

3.2. Business Internships at the Faculty of Business Administration and Management of the Universitat Politècnica de València

The Faculty of Business Administration and Management of the Universitat Politècnica de València in Spain has a consolidated program of business internships. This institution is aware of the positive impact of business internships and therefore dedicates many efforts and resources to the organization, expansion, and improvement of the business internships. The result is that an increasing number of students has been able to undertake a work placement during their studies in this faculty of business during the past years, as table 2 evidences.

Table 2.- Number of Internships at the Faculty of Business Administration and Management of the Universitat Politècnica de València (2008-2015)

Year	No. Internships at the Faculty of Business Administration and Management	No. Employers	No. Internships at the Universitat Politècnica de València
2008	398	139	7,345
2009	419	132	6,179
2010	448	156	6,010
2011	420	181	5,755
2012	559	201	5,816
2013	556	223	6,570
2014	625	280	6,911
2015	634	284	7,856

Source: own elaboration using the official data provided by the Universitat Politècnica de València

In addition to the traditional Bachelor and Master Degrees in the field of business administration and management, the faculty has launched two Double Degrees: Business Administration and Management + Computer Science Engineering, and Business Administration and Management + Telecommunications Engineering. These two double degrees will provide the labor market with graduates strong in business administration and management skills but also with a deep knowledge of the ICTs, and they are expected to be highly demanded.

Furthermore, this faculty offers a modality of learning in a number of courses which is known as “flipped teaching”, in which one of the characteristics is that part of the theoretical hours are instructed through the support of high quality audiovisual materials, instead of presence-based classes.

At this moment the Universidad Politècnica de València is analyzing the situation and is aiming at launching a project in which virtual internships will be possible. We expect to provide empirical data of the first experiences in short as it will be paramount to assess this first experiences from the point of view of the satisfaction of participants and of the learning outcomes.

4. Conclusions

New technologies can enhance the traditional internship programs, in particular computer skills improvement and making the internship experience available to more students and companies, including distance students.

First of all, ICTs could enable the realization of virtual internships or telecommuted internships, which could make possible the internship experience to students and companies with difficulties of compatibility of space and in which on-line work would more efficient and recommended. Therefore there is the possibility of increasing the number of business internships and to expand their beneficial effects to a larger number of students and companies.

Secondly, the use of new technologies applied to business internships improves computer skills of its participants, as some authors have stressed in their researches. Also, the use of computer tools and social networks can enhance the overall learning outcomes of the internship experience.

Higher education institutions and administrations would be astute to stimulate virtual internship programs as a way of multiplying the valuable effects internships have on students in various spheres, especially on employability. This employability heightening is achieved through the ITCs competences that can be acquired, which are highly demanded by the work market.

Moreover, the possibility of undertaking a virtual internship in an international scope, could even add further beneficial effects to the work placement, as international internships have a lot to offer, particularly in terms of foreign languages improvement and intercultural skills enhancement. Virtual internships in a foreign country could also enable working in a different country without having to travel and this could be especially significant in moments or fields with difficulties, when it is problematic to find placements for all students. Also, companies in the foreign markets could benefit from experience, by hiring qualified employees among the Spanish students at a reasonable price.

If higher education institutions are committed to the employability of its university graduates, they should make business internships accessible to the maximum possible number of students and manage effective and adequate internship programs. They should also pay attention to the problems that can make students opt out of the valuable internship

experience and accept the challenge of supporting students finding placements that will contribute positively to their career progress. One way could be, in the opinion of the authors, by being active in promoting virtual traineeships for its students, as well as attracting international virtual traineeships. Given that the Spanish law and that the regulations of the Universitat Politècnica de València allow internships in a foreign company and also bearing in mind the existing situation and conditions of the considered institution, the authors think that there is a space for innovation and growth in this field.

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Normative controversies in the assessment of faculty in Mexican public universities

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Abstract

This paper analyzes recent changes in teacher assessment policies in higher education institutions in Mexico. Procedures for faculty assessment in a typical Mexican state University are analyzed with the purpose of generating insights helpful to construct a fair, pertinent and expedite assessment system.

We review guidelines to assess teachers, specifically those with the purpose of keeping or firing the teacher, even after tenure is achieved. These new regulations are seen as a key policy to improve quality in higher education. However, implications to faculty moral, organization climate and conflict with existing labor laws have not been fully considered.

It is argued that excessive federal and local regulations are, in fact, unable to ponder the complexities of academic life.

We conclude that instead of more complicated regulations, focus on qualitative peer assessment should be considered as means of effective faculty assessment.

Keywords: *Faculty assessment, tenure.*

1. Introduction

Competitive universities around the world foresee faculty assessment as an effective strategy of teaching quality control and they aim basically to provide feedback to the teacher and foster best practices.

In Mexico, assessment of teaching in higher education is carried out since the early 1970s. In recent years, it has become a central policy to promote quality in educational services in every level of the educational system (Arredondo, Perez-Rivera, & Aguirre-Lora, 2006).

A milestone regarding college teaching assessment in Mexico was established in 1991 by the National Council of evaluation (CONAEVA), when a system of recognition of productivity and academic performance was implemented in order to provide financial support to those Mexican academics that voluntarily consented to periodical peer assessment.

This grant/reward system has become a relatively effective strategy for the encouragement of faculty assessment and bonuses derived from positive evaluation constitute a significant portion of the annual income of many college teachers in the public higher education system in Mexico. In some cases, the amount is greater than the base salary itself.

In Mexican universities, the culture of evaluation is emerging; thus, there is still suspicions and ignorance about the rules, regulations and principles that should sustain the assessment procedure. The justice, relevance and usefulness of the assessment of academics is often criticized, mostly by those who do not get positive results. Furthermore, many handbooks, official publications and on line guidelines fail to be clear on how to evaluate specific teaching chores and responsibilities. Actually, the complexities of the academic profession are generally underestimated.

In the words of Rodriguez and Durand (2013), "... the academic profession operates through various functions, particularly around teaching and research, but also college teachers have a role in the dissemination of knowledge and in managerial duties; the picture becomes even more complex, when one considers the differences between diverse knowledge fields and professional domains " (p. 47).

The establishment of assessment systems in Mexican Universities has encounter suspicion and resistance of teachers who set forward various questions regarding criteria used and methodological issues.

Despite great progress in the assessment of academics in Mexican universities, this process is still imperfect and presents several problems. For example, existing descriptions to delineate academic responsibilities are still insufficient and in many cases ambiguous. Only the assessment of productivity, largely based upon publications, is a universally

accepted criterion and it marks the pathway to access the prestigious roster of national researchers in Mexico.

To further complicate this matter, in many of the state public universities, assessment of academics is twofold. As an internal process, Mexican universities carry opposition exams for hiring, tenure, promotion and even permanence. As an external process, they undergo assessment by federal agencies such as *El programa para el mejoramiento docente*, the national teacher implementation program (PRODEP) and the national system of researchers (SNI). Many scholars have argued that assessment is repetitive and that the same evidence should be presented for different similar assessment programs as further analyzed in the following section.

In general, there are three major concerns regarding the evaluation of University Professors. The first, relates to cost-benefit issues. Professors are assessed various times by different authorities which review the same submitted evidence with similar criteria for the different purposes. This makes assessment complicated, repetitive and expensive.

The second concern refers to the absence of evaluation parameters that are accepted by the teachers themselves. This promotes rejection of many institutional assessment procedures and in many instances this process elicit suspicion with regard to the consequences of outcomes.

The third concern relates to the lack of adaptability and specificity of the assessment process that fail to include variations for field of study, contextual factors and regional demands.

2. Case study

This The discussion in this article is based on data derived from a case study carried out in a typical Mexican state University in the South east of the country.

A focus group with faculty from the college of education, all experts in educational assessment and teaching, analyzed and discussed the regulation and norms for faculty assessment, in particular the new internal regulations regarding tenured professors.

In 2012, this institution became one of the first public Mexican universities to implement a "law of permanence", that requires teachers with tenure to be assessed every three years. In spite of the fact that tenured faculty has been hired after winning an opposition exam and survived a trial period or "periodo de estabilidad" of 2 years.

This new regulation provides a one chance to tenured professors to implement recommendations, if the teachers is found not to meet institutional demands, before "the

conducive legal purposes" (article 116, paragraph g, of the rules of the academic staff of the UADY, 2013).

3. Results

As a result of this, a discussion of three major themes emerged from the focus group: the differential teaching roles, current Mexican labor legislation and institutional regulations that underline this process. These topics will be further analyzed in the following sections.

3.1. Roles of a University Professor

Faculty responsibilities in Mexican Universities are delimited by hiring conditions and by differential activities demanded in the various fields of knowledge. For instance, teachers in the health field are expected to spend time in clinical some social sciences faculty seldom leave the campus,

In the university under study, Zapata (1999) demonstrated the existence of differential roles in professors in health sciences, requiring different assessment criteria for each: 1) classroom teacher, 2) instructor of clinical practice, 3) administrative duties 4) laboratory practices, and 5) practicum supervisor. Zapata argued that the criteria to evaluate each one of these roles should be consistent with their differential activities and responsibilities.

These roles are not mutually exclusive, and their performance depends on the type of appointment assigned by the authority, the field of knowledge, institutional demands and even seasonal events. Most scholars exercise all these roles at some point. Faculty assessment should consider the differential roles, and the degree to which they are required in each professor.

3.2 Mexican labor legislation

A major argument against assessing tenured professors rises when the labor Mexican federal law is reviewed in terms of conditions established in the law to fire a worker. It is unlikely that a mere academic assessment may set legal grounds for firing a tenured professor since chapter 47 of this law states that a worker can be fired only when justified cause exists, and posits the following examples: When the worker a) presents false certificates or references, b) shows lack of probity or honesty, acts of violence, feints, injuries etc., c) cause intentionally material damages during the performance of tasks, d) performs immoral acts of harassment etc. These few examples give the reader an idea of the

sort of behaviors that the Federal law considers to be "justified cause" for the workers removal.

Note, that none of the previous examples are similar to the concept of "performance below expected standards of excellence" argued by University authorities. Thus, assessment for permanence of tenured professor may be against federal Mexican labor law.

3.3 University Regulations

New regulations approved 2013 established the possibility to assess tenured professors. Article 53, of the University's´ normative code is translated as follows:

The permanence of the academic staff shall continue provided that it complies with the functions and duties laid down in this regulation for the classification and category that set by his/her appointment.

And, in article 116 it is stated: The permanence of the academic staff will be examined by the Committee of promotion and tenure of each academic unit every three years.

However, in the same regulation, article 54bis it is asserted that assessment of faculty performance is to detect areas of opportunity for strengthening the functions and academic improvement of teachers as fundamental purpose.

This is an oxymoron: either assessment is carried out in a formative fashion to provide feedback to the teacher, or it has legal and labor consequences in a summative fashion. Both approaches cannot co-exist in a same procedure.

4. Conclusions

It is clear that there is confusion regarding when assessment of faculty should be formative, for purposes of improving teaching practices or summative in order to make decisions concerning working conditions. Thus, these two processes should not be mixed since the purposes of each one of them are different and it would be unfair to use them interchangeably.

It is also clear, that regulation of faculty assessment should consider contextual, contractual and legal aspects, which have not been fully explored.

Perhaps, the major concern identified in this study is the excessive regulation from both federal, state and institutional authorities regarding faculty's performance. More basic peer-based assessment procedures that freely and qualitatively assess faculty's productivity and performance have proven in many country effective. Peers are usually from the same

field of knowledge, they are acquainted with institutional and external conditions and they are all involved in departmental planning and the establishment of goals.

Peer assessment conveys a process of reflection, analysis, understanding, and feedback that elicit precise strategies for improvement and professional development.

Teacher assessment is essentially an academic process chartered with clear rules and predictable consequences, especially when it is at stake the permanence of the professor.

In the current state of affairs, it is necessary to continue with a reflective and inclusive consultation process with faculty and authorities alike.

Overregulation of academic activities and excessive legislation are indeed tendencies in the Mexican higher education system that complicate teacher assessment. There is a need to return to the simpler and effective process of peer review.

The academic life should be self-regulated and freedom of action is essential for innovation and quality in teaching, research and publishing.

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Boosting critical thinking in a Project Management course: An active learning experience

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Abstract

The present study reports the experience of a project-based activity in which students are asked to plan an event. It is part of a Project Management course taught at Universitat Internacional de Catalunya, in a Masters' Degree in Business Administration and Production Systems. The activity has been designed in such a way that it is expected to help students develop the acquired technical skills while it requires the use of different quantitative methods and tools to interpret data for decision-making.

The results show that active learning materialized in the form of project-based activities make courses more enjoyable for both instructors and students, and most importantly, contribute to develop students' skills such as teamwork and critical thinking. However, while it is useful for students to gain some exposure to the material through pre-class readings and overview lectures, students do not fully understand and realize about their importance until they actively take part and reflect on the meaning of what they are learning.

Keywords: *Active learning; Rubrics; Critical thinking; Project management*

1. Introduction

Organizations use project-based methods to accomplish tasks. A project is a temporary endeavor undertaken to create a unique product, service or result. It is temporary in that it has a defined beginning and end in time, and therefore a defined scope and resources. Delivering complex projects on time and under budget constraints is a daily challenge.

Education programs and especially those designed for engineering management are now adjusting their teaching methodologies so that students learn how to plan and evaluate a project, competencies that will be required in their professions. In this respect, there are several voices that claim that teaching methods should include active learning methods in which students adopt a leading role (Ayaz & Söylemez, 2015). Project-based activities respond to this typology of teaching methods and are found to lead to better academic results. Particularly, Fruchter (2001) expresses the usefulness of introducing projects in engineering programs, since they help to improve and broaden students' skills. Furthermore, project-based activities engage students in the investigation of authentic problems (Kubiatko & Vaculová, 2011).

In this context, this study reports the experience of a project-based activity in which students are asked to plan an event. The project activity is designed in such a way that it is expected to help students develop the acquired technical skills while it requires the use of different quantitative methods and tools to interpret data for decision-making. This activity is part of a Project Management course taught at Universitat Internacional de Catalunya, in a Masters' Degree in Business Administration and Production Systems.

2. Theoretical underpinnings

With the rapid advancements and requirements of our society, universities have had to adapt their ways of teaching by shifting their focus on preparing students for their future careers. Higher education has to ensure students acquire skills that can be transferred to other fields (Ruizacárate Varela, García-García, González-García, & Casado-Sánchez, 2013). The application of new teaching methodologies based on skill development provides students an invaluable lifelong learning (Kember, 2009). Following this line, in engineering related programs educators have concentrated on providing students with tools that increase the effectiveness of presentations and writings, boost critical thinking, promote the use of new technologies, enhance team working and facilitate the management of projects (Pulko & Parikh, 2003).

The necessity of new teaching practices has changed the traditional lecturing at universities, formerly centered on teaching for "knowing-what", to an active learning methodology, with a focus on teaching for "knowing-why" (Fruchter, 2001). Active learning consists of involving students in the learning process, making them participate in activities that

improve their performance during and after the course, thus bolstering their skills (Bell & Kozlowski, 2008). This student-centered approach makes learners more independent and responsible, but they are also accompanied by the educator in their striving for solutions (Doppelt, 2003). The positive effects of active learning activities, such as higher academic results, motivation to learn, and a deeper understanding of the content, have been proved in a number of studies (Michael, 2006).

In order to implement an active learning methodology there is a wide variety of activities that can be used. Projects are considered some of the most relevant ones (Friedman, 2000). Project-based learning (PBL) activities make students find solutions for real problems, facilitating the acquisition of skills that can be later used in real-life situations, such as teamwork, critical thinking, and communication skills (Macho-Stadler & Elejalde-García, 2013). For a proper consecution of the project, students need to learn how to communicate and organize the tasks to do and how to collaborate with others following a series of specifications. To sum up, PBL results in an experience that boosts not only students' skills but also their autonomy and responsibility (Kubiatko & Vaculová, 2011).

Considering the benefits of the PBL, the activity described here consists in asking students to develop a project plan. While doing so they will be developing several skills: teamwork, as a tool that allows students to obtain better results than working alone (Cortez, Nussbaum, Woywood, & Aravena, 2009; Michael, 2006); and critical thinking, which can serve as a mean to understand concepts needed for the correct consecution of the task.

3. Description of the activity

3.1. Context

Courses on project management provide students with the knowledge, tools and skills to manage projects in an efficient and organized way. The activity described here is part of a course on Project Management taught in the Master's Degree in Business Administration and Production Systems offered at Universitat Internacional de Catalunya. Consistent with the managerial perspective of the course, the course strives to provide a balance between a qualitative and an analytical-oriented approach. Accordingly, the teaching method combines theoretical and practical readings, simulations exercises and case studies, being the "*Organization of an event*" activity the main project in which students will work.

The experience reported in this paper was hold during the first semester of 2015/16 academic year, with a class size of 44 students. Master students that participated in this course came from different countries and had different educational backgrounds, mainly in the areas of business administration and engineering management.

3.2. Description of the activity

The main objective of this activity is to develop a project plan. This assignment is designed to develop student's skills in actual applications requiring the use of different quantitative methods and tools in interpreting data for decision-making.

Students, working in groups of 5 or 6, are asked to plan an event and assess its feasibility in terms of resources, costs, risks and impact. They should imagine that someone has hired them to organize an event (e.g. a conference, an exhibition, a concert, a workshop) where different stakeholders are going to be involved. This event (of their own choice) is scheduled in a two-month period. The project covers the following points: project scope, stakeholder analysis, work breakdown structure, project plan, project and cost scheduling, risk assessment, impact assessment, and general overview.

At the end of the project, each group should deliver the final report and give a 10 minutes oral presentation. The instructions of the project are given one month prior the final delivery. During this month, students will have 3-hours per week to work in the project in class and discuss its progress with the lecturer. The topic of the project (that is, the event to be organized) should be approved by the instructor.

3.3. Assessment

This activity contributes 30% to the final grade of the course on Project Management. The assessment takes into consideration three main aspects: class meetings (25%), content (50%), and the oral presentation (25%).

Class meetings refer to the active participation of students in working in the project in class. Although all group members are expected to discuss regularly about the project, and must have equal participation in completing the group work, their engagement might be different. Accordingly, this score might not be the same for all the members of a group. The final report is limited to 25 pages. A 10-minutes oral presentation is scheduled for the last day of class. Two members of each group would be presenting the work to the whole class. In order to ensure that all students have been involved in preparing the presentation, the lecturer appoints these students the same day of the presentation.

Both the report and the support material to be used during the presentation must be submitted through the online platform of the course one day prior to the oral defense. Failure to submit these documents on time will result in a penalty in the project grade.

In order to boost critical thinking students are given an evaluation sheet (in the form of a rubric) to self-evaluate their own work, in a scale form 1 (poor) to 5 (outstanding). This form should be submitted after the oral presentation is completed. Also, during the presentations, students are required to evaluate their classmates. The instructor also uses the same rubric to assess the projects (see Table 1).

Table 1. Rubric to assess the content and the presentation.

Criteria			Description
Content	Event idea		Original, interesting, well-justified
	Feasibility		Reasonable planning, budget and use of resources
	Information		Proper description on how to organize the event
	Risk assessment		Risk impact, contingency plan, control plan
	Impact assessment		Social and environmental
Presentation	Design	Slides	Creativity, originality, clarity, text font choice, style
		Structure	Logical sequence
	Oral defense	Non-verbal skills	Eye contact, body language, posture
		Verbal skills	Elocution, enthusiasm
		Comprehension	Subject knowledge

Two additional questions are included in the evaluation sheet. First, students should adopt the role of an investor and decide the two projects in which they would invest their money in order to execute the project. Second, students are encouraged to self-reflect and analyse in which degree each team member feels accountable and engaged with the project (how tasks were distributed) and their opinion with respect to the other team members.

4. Results

Figure 1 graphically illustrates the evaluations from classmates (in blue), the members of the group presenting (in red) and the lecturer (in green). From this figure it can be interfered that students tend to be more critical with others' work rather than with their own project. One explanation for this lies in the fact that students are evaluating others' work based on the oral presentations, while when evaluating themselves have the full picture of their work.

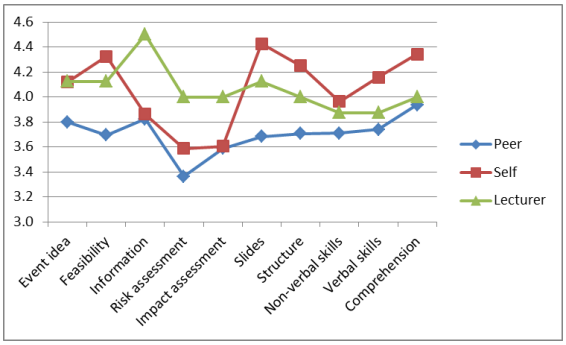

Figure 1. Comparison of the peer-, self- and lecturer's evaluation for each of the criterion.

It is noteworthy to point out that there are three criteria where lecturer's score were higher than self- and peer- evaluations. The rationale behind this may lay in the fact that the assessment of the lecturer was not only based on the information given in the presentation but also based on a careful reading of the full report. Because of the limited time allowed

for presentations, students from other groups might find difficult to evaluate the cost structure, the risk assessment and the impact of the project.

When assessing their own work, results indicate that students are quite confident in terms of their verbal skills, knowledge on the topic as well as in the design of the support material for the presentation. Because during this course on Project Management students have to perform several presentations, results indicate that students have developed communication skills that help them presenting their work naturally in front of other people. This result is very important, as in their daily profession, project managers are constantly asked to lead meetings and negotiate with the different stakeholders involved in a project.

Following the rubric provided in Table 1, Figure 2 groups the items in three main dimensions: Content, Design and Oral defense. Results confirm the previous observations.

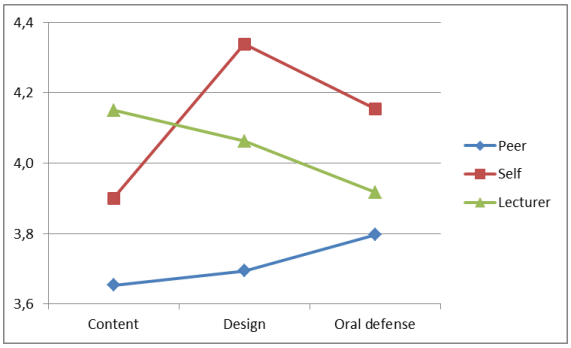

Figure 2. Comparison of the peer-, self- and lecturer's evaluation for main dimensions.

Grades from the items included in the rubric were then transformed into a 0-10 scale. The dimensions of "design" and "oral defense" were equally contributing (50% each) to the "presentation" score. All students were also assigned with a "class meeting" grade which assessed their participation in class. Table 2 summarizes all the records.

Table 2. Rubric to assess the project and the presentation.

Group	Topic	Content [50%]	Presentation [25%]	Class meetings* [25%]
A	Basketball tournament	9.2	8.5	8.5 (0.55)
B	Barcelona tour	6.8	8.0	8.0 (0.00)
C	Bear pong competition	8.0	8.8	10.0 (0.00)
D	Solidarity Racing for breast cancer's cure	8.0	8.3	7.0 (2.19)
E	Food truck meeting	8.0	7.3	8.0 (1.41)
F	University Day	8.4	8.0	9.2 (0.41)
G	"Unplugged day" for Google employees	8.6	8.0	9.0 (0.00)
H	Wine workshop	7.6	6.8	7.6 (1.95)

* Standard deviation in brackets

We also analyzed the correlation between instructor's grades and the self-evaluations performed. Results indicate that there is no correlation (p-value=0.5727).

With respect to the self-reflection questions, students show a high degree of satisfaction with the activity. They positively assess certain aspects such as the design of the activity, working in class and receiving the lecturer's orientation, the choice of two people for the oral presentation without previous advice, and the application of concepts learned in class. Students also appreciate having worked in teams, by organizing and dividing tasks in a balanced and fair way, and achieving a high degree of commitment with the project. They express having contributed to the proper consecution of the activity, acknowledging not only their tasks but also others' work. Most of the students also report having understood the importance and usefulness of activities such as the one described in this paper.

5. Discussion and conclusions

Active learning materialized in the form of project-based activities make courses more enjoyable for both instructors and students, and most importantly, contribute to develop students' skills such as teamwork and critical thinking. However, while it is useful for students to gain some exposure to the material through pre-class readings and overview lectures, students do not fully understand and realize about their importance until they actively take part and reflect on the meaning of what they are learning.

As for the specific experience described in this paper, although the activity has been demonstrated to be of great profit, from direct observation during the session and the feedback obtained from students there is still room for improvement. Particularly, it is possible to envisage some aspects that need to be considered in future editions. First, there is a need to consider the peer-assessment within the project's global mark. Second, it is recommended to introduce the project at the very beginning of the course, and, as the course progresses and the contents are presented in class, start working in the project. Lastly, we will include peer-assessment of the project's report, so that each group will be assigned to another project and would be expected to perform a critical review and elaborate a report with their comments.

Several challenges were also faced. On the one hand, the course enrolled a large number of students which impedes a sole instructor to fully gather all the concerns and feedback during the "class meeting" sessions. On the other hand, the course enrolled both engineering and business administration students which showed that business students needed more help as they were not used to project-based activities.

All in all, and based on our experience, we posit that project-based activities are useful for: (i) embedding all the concepts of the course in a single integrative project; and (ii) developing critical thinking through the students' own work and peer-work. Therefore, we

argue that there is an urgent need to introduce project-based activities at all levels, but particularly in master courses, where students are expected to be challenged with real (or simulated) cases, as they will be in the near future, when entering the marketplace.

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Towards Learning for Employment: A Study of Effect of Different Variables on Employment Readiness of Students Enrolled in Professional Programmes Delhi-NCR, India

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Abstract

Indian Higher Education system has got 70 million students enrolled in different technical and professional courses, which is highest in world. Being the fastest growing economy, India has got global attention also. Despite such strong foundation, the nation lacks a skilled workforce. The expectations of the industry don't match with what they receive as a workforce. There has been a continuous effort in instilling technical, communication, spiritual, leadership skills along with building a high quotient of ethics and professionalism in the students. The problem lies somewhere else, which needs quick attention. The present study attempts to analyze the effect of independent variables assessment of self competence, open to change, networking, professional growth, emotional growth, spiritual growth, realistic expectations, interpersonal skills, conceptual skills, technical skills, leadership skills, attitude towards planet, ethical disposition, flexibility to work and orientation towards money on the dependent variable Employment readiness through Regression analysis. The findings suggest that students need to assess their self competence, develop an achievement orientation attitude and work on technical skills in order to become Employment ready. There are very few studies addressing this issue in Indian context and researchers could find no published empirical work analyzing the effect of all these variables on Employment readiness. This would serve as a strong base for researchers in similar field. This study is beneficial for academicians, policy-makers and academic regulatory bodies.

Keywords: *Employment readiness, Indian higher education, Gen Y employment readiness, Employability of Gen Y.*

1. Introduction

India has emerged out to be a hub of education attracting learners from around the globe. A massive expansion has taken place in Indian Higher Education system as it boasts of enrolling over 70 million students, highest in the world (FICCI, 2013). Despite having a strong institutional base, the emerging economies like India and China lack skilled workforce for MNCs (Multi National Corporations) as well as SMEs (Small & Medium Enterprises) (Budhwar, 2004). Raina (2015) stated a study conducted by McKinsey across nine nations including India and found that only 42% of employers felt that the newly recruits were ready for jobs. According to the India skills report (2014), about 60% population of India is available for working and contributing towards economy but only 25% of them are actually capable of being used by the market. The focus remains on enhancing the hard skills of students ignoring the other aspects which may be significant for taking up a job and sustaining it. The present study attempts to analyze the areas which might be significant for students enrolled in professional courses, to learn skills which makes them Employment ready. This study is beneficial for academicians, policy-makers and academic regulatory bodies.

2. Literature Review

Ward, Riddle & Lloyd (2004) define 'Employment readiness' as "*being able, with little or no outside help, to find, get, and keep an appropriate job as well as to be able to manage transitions to new jobs as needed*" (p.1).They further explain the factors critical to the success for one's work life: a) Employability measures (skill enhancement, job search, job maintenance, career decision making & career management), b) Challenges (systemic, environmental & personal) and c) Facilitators to support challenges (outcome expectancy, self-efficacy, work history & social-support). Every nation differs in the type of skill set so required for making its youth employable. There is a difference of understanding the employment readiness as a construct .Management thinker Shiv Khera in his book "You can Win "focus on readiness for employment being understood in terms of right attitude which is mandatory for professional to be employment ready . Rhonda Byrne in her book "The secret " highlights that whatever we want in life can be achieved by dreaming ,working towards it and achieving it .Readiness for employment and work in the corporate world is also dependent on belief that somethings are destined . These can be seen as dreams or objectives which need to be fulfilled. This philosophy is endorsed again and again by eminent psychologists and social system whose preaching's suggest that one can carve out a place in life and be ready by believing in our dream and work towards competencies so as to get what is destined . So being employment ready also needs to create a dream and make it sure that it is destined to happen.(Jakes,2015) Professionals need to be groomed both emotionally and psychologically to be employment ready .Apart from this need is to find out the effect of individual variables like skill sets , spiritual and professional orientation ,networking ,professional management etc. on the employment readiness of the budding Gen Y work force.

Gen Y budding professionals are dynamic and their workplace expectations range from good remuneration packages to flexible work options. They are tech-savvy and money-

minded but understand the environmental concerns. Hamburg, Velden & Verhagen (2013) describes some skills which are required in 21st century for becoming a part of work force, they are interpersonal skills, innovative skills, professional expertise, academic skills & entrepreneurial skills. Blom & Saeki (2010) conducted a survey to analyze the employability levels of engineering graduates in India and what skills are necessary for them, they concluded that communication skills (verbal & written), professional skills (cognitive skills & aptitude to perform duties) and core skills for employment (general attitudinal & affective skills). In order to make them employable the focus stays on their ethical disposition, developing skills like interpersonal, communication, leadership, professional attitude and perseverance (Junior Achievement Education, 2013). The researchers could find very few studies focusing on all these variables in Indian context and thus, this research will provide a sound foundation for researchers working in similar area. Though a clear understanding and literature is available for importance of types of skills, orientation towards growth ,networking etc. yet its relationship with employment readiness has not been explored .

3. Research Methodology

This research initiative studies the impact of perceptual inferences of students engaged in professional courses as regards a plethora of independent variables (IV's) like self competence, open to change, networking, professional growth, emotional growth, spiritual growth, realistic expectations ,importance of interpersonal skills, conceptual skills, technical skills, leadership skills, attitude towards planet, ethical disposition, flexibility to work and orientation towards money on the dependent variable (DV) Employment readiness. Regression analysis was conducted to observe the effect of various IV's mentioned above on the dependent variable (DV) Employment readiness. The dependent variable of employment readiness was mapped using a 12 item self constructed questionnaire. Requisite reliability and validity measures were adopted. The scale was put to factor analysis which resulted in two distinct and identifiable factors namely attitude towards growth and destiny .The questionnaire was constructed on a five point Likert agreement scale to measure the responses on the decided variables. The questionnaire was subjected to review by experts and their inputs have been incorporated accordingly. Reliability of the same was computed to be Cronbach Alpha (.975). According to Nunnally (1978, p. 245) the instruments used in basic research have reliability of about .70 or better.

Our universe comprises all the institutions imparting professional and technical courses in Delhi-NCR region of India. The sampling was multistage. In the first place it was purposive wherein the researchers drew out a list of management and technical institutions affiliated by AICTE (All India Council for Technical Education). The list was generated through the web link *http://trueguides.blogspot.in/2011/03/list-of-aicte-approved-colleges-in.html.* At second stage sampling was stratified wherein self financing management and technical institutes were selected from the list. Out of it, 2 management and 2 technical institutes were selected for the study. Final year students were administered questionnaires so as to record their perceptual inferences regarding skill set and ethical orientation. A total of 30 students per institute filled the questionnaires. Out of 120 filled questionnaires total of 107 completed questionnaires were taken for the study.

4. Hypotheses

There will be a significant effect of assessment of self competence, openness to change, networking, professional growth, emotional growth, spiritual growth, Attitude towards planet, interpersonal skills, Conceptual skills, Technical skills, leadership skills and ethical disposition on employment readiness of students engaged in professional courses.

5. Results and Discussion

The mean and standard deviations along with measures of skewness and kurtosis for each variable have been calculated . The variables were well within the threshold of skewness and kurtosis. To further investigate the normality of data we conducted Kolmogorov-Smirnov(KS) test of normality. The result showed that all variables are coming from a normal distribution. SPSS was used for the purpose of analysis. Regression was performed to find the significant effect of different independent variables (IVs)on employment readiness of students engaged in professional courses(DV) .Employment readiness was measured in terms of attitude towards growth and destiny. Correlation analysis was done to understand the relationship between perception of Gen Y budding managers as regards their employment readiness (DV)and different other variables(IVs).It was observed that the perception about how ready the Gen Y mangers were for employment with the industry was highly correlated with their assessment of self competence ($r=.801, p<.01$). Studies are there to support that throughout the socialization process the Indian student is exposed to the idea that whatever is destined to be will happen and that we should dare to dream .However it is believed on the other hand that it is pertinent to draw a link of perception about being successful with the ability to prioritize competencies required for fulfilling ones dream (Jakaes,2015) Strong relationship also existed between the aforesaid variable and assessment of Gen Y managers regarding their importance of the activities and training for the concept professional growth($r=.776, p<.01$)and spiritual growth ($r=.508, p<.01$).However low correlations were recorded for the relationship between the DV and importance of interpersonal skills ($r=.293, p<.01$)though it was highly correlated with the importance the respondents attached to conceptual ($r=.715, p<.01$)and technical skills($r=.769, p<.01$). Moderate relationship was observed between the DV and the other IVs like importance of ethical disposition, importance of sensitivity training towards building realistic expectations from corporate ,Attitude towards the planet and importance of understanding of networking.In other words destiny can be self constructed by enhancing self competence and skills . The belief that one is the engineer of his own destiny is a strong cultural input that a child gets from birth .Ironically however the system, education and family places greater impetus to harnessing social skills rather than technical. There are special lectures for interpersonal skill development wherein the importance of technical skills is diluted in most of the technical and professional curriculums. (Choudhury, 2014). To further investigate the effect of IVs on the DV through a stepwise regression analysis was done .The perception of Gen Y mangers regarding their assessment of self competence (ASC), importance of the activities and training for the concept professional growth(TFPG)and technical skills (TS)was calculated. The result is shown in table 1.1. Stepwise regression was used to determine the significance of each variable. This procedure has been used in previous studies (Hatten, Schendel & Cooper, 1978;Eisenhardt & Schoonhoven, 1990). The model is significant which explains 64%of variability of employment readiness. According to the regression model the effect of assessment of self competence (ASC), importance of the activities and training for the concept professional growth(TFPG)(B=.31)and technical skills (TS)(B=.24)is positive, though the most

significant contributor is assessment of self competence (ASC)wherein one unit improvement in Assesment of self competence results in 0.345 increase in employment readiness.(B=.345)**.** Other IVs like to check for the existence of multicollinearity. Variance inflation factors (VIF) have been calculated and are observed to be well within the acceptable range hence, multicollinearity does not influence the results. Therefore, it can be concluded that the model is a good predictor of employment readiness of Gen Y budding managers.

Table 1. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.801[a]	0.641	0.638	0.40539	0.641	187.694	1	105	0
2	.831[b]	0.691	0.685	0.37804	0.05	16.745	1	104	0
3	.841[c]	0.707	0.699	0.36968	0.016	5.757	1	103	0.018

a. Predictors: (Constant), assesmentofselfcompetence

b. Predictors: (Constant), assesmentofselfcompetence, professionalgrowth

c. Predictors: (Constant), assesmentofselfcompetence, professionalgrowth, Technicalskills

d. Dependent Variable: employmentreadiness

Table 2. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.406	0.268		1.513	0.133		
	assesmentofselfcompetence	0.893	0.065	0.801	13.7	0	1	1
2	(Constant)	0.173	0.256		0.675	0.501		
	assesmentofselfcompetence	0.557	0.102	0.5	5.465	0	0.355	2.818
	professionalgrowth	0.38	0.093	0.374	4.092	0	0.355	2.818
3	(Constant)	0.229	0.252		0.908	0.366		
	assesmentofselfcompetence	0.384	0.123	0.345	3.123	0.002	0.233	4.291
	professionalgrowth	0.321	0.094	0.317	3.418	0.001	0.331	3.022

	Technicalskills	0.22	0.092	0.241	2.399	0.018	0.281	3.558
a. Dependent Variable: employmentreadiness								

6. Conclusions and Implications

There is no denying to the fact that there exists a skill gap between what industry expects of students and what they have to offer. Around 80% of engineering graduates are unemployable (Times of India, 2016). Millions of students graduate ever year but more than 50 % of them are not employable. The academia and institutes imparting higher professional education feel that the skills that make a student employable are problem solving attitude, team-player, leadership capabilities, adaptive to changes, basic technical knowledge, communication skills and creativity (Panse, n.d.). The institutes are focusing all effort in harnessing these skills and thereby preparing the Gen Y workforce to be smart workers wherein the importance of technical knowledge, right attitude and self confidence and competence is relegated a back seat. However as per the students who are in the process of learning towards development into an employable workforce are having a different perspective. The research findings indicate that importance of clear assessment of self competence is the key. It has emerged out to be the most important factor in determining the Gen Y employment readiness. More so the budding professionals link their dreams and destiny along with growth orientation in terms of prioritizing what they require for fulfilling their dreams and know clearly that it is dependent on their attitude towards self , growth attitude and technical skill proficiency which however is not catered to by the system of higher professional education in its current form. Talking of skill development, prime minister of India Mr. Narendra Modi stated that employment creation and skill development are the main priorities of Indian Govt. so that this gap is acknowledged. Further, mentioning the percentage of available skilled workforce in India, he pointed out that less than 4 % of its population is skilled as compared to South Korea (96%), Japan (80%), China (47%) and Germany (74%) (Nanda, 2015).It is the need of the hour to develop a positive attitude towards oneself & the way they are also learnt ,are very important (Schein, 1967). Gen Y feels that the right impetus should be given to imparting on the job technical knowledge to make them more job ready for a dynamic industry. Though the curriculum followed is age old and doesn't fit the expectations of recruiters anymore. The technical knowledge is not as per industry standards, which is a cause of worry for our budding professionals. There is an immediate need of revising the curriculum and teaching methods (Choudhury, 2014). Employability skills can be taught at institutional or job level as they are teachable (Robinson, 2000). Learning hard and soft skills will make them street-smart. However, the superficial knowledge in their respective domains leads to low motivation and low self-assessment and thereby leading to inability to visualize their dreams, believe in themselves and develop a growth orientation so as to be employable. Sensitivity training must be imparted to students in order to inculcate sound professionalism and positive attitude in them thereby helping them to carve their own destinies. Due to right orientation given by some premiere institutes, their students are winning the race with lucrative packages. Whereas, students from other institutes are lagging behind because they think they are not competent enough to grab a dream job or remuneration equivalent to those from premiere institutes . There is an urgent need to bridge this increasing gap of learning requirements by all stake holders like institutions,

regulatory bodies, administrators, parents and policy makers. Our research can be instrumental in giving insights to institutions to rework on their learning modules and their processes of implementation so as to draw a vivid and objective path towards learning for employment.

7. Limitations of the Study and Areas of Further Research

No work is accomplished without precincts, because margins open the way for further growth. Size of sample was a constraint and major limitation of the study. Comparisons may also be done between 2tier, 3 tier cities and metropolitan cities as this research is limited only to Delhi NCR.

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Implementation of International Master's Programmes in Engineering Education in Germany

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Abstract

This paper introduces the framework conditions of the internationalization process of the higher education system in Germany and gives an overview of the implementation of international Master's programmes in engineering education and the characteristics of student migrants in this field of studies. Developments on the macro-level clearly indicate political interest to attract more international students for German universities and the technical disciplines in Germany are already very successful in this endeavour. With a special focus on higher education reforms in engineering, this paper is based on an investigation directed at the meso-level, the motivations and strategies at the level of university and faculties for establishing such international study programmes. The results of a qualitative study will be presented that was conducted at the engineering faculties of the Ruhr-Universität in Bochum between December 2014 and August 2015. With the overall aim of investigating in how far the decisions made on university and faculty levels are related to the general political endeavors to attract international talent, the different stakeholders' interests and implementation strategies such as language policy were considered.

Keywords: *Internationalization; Higher Education Reforms; Student Migration; International Master Degree Courses.*

1. Introduction

Facing a predicted shortage of highly qualified workers due to demographic change and the loss of human capital through emigration (SVR 2011), Germany and fellow industrialized nations have long since recognized the potential of international students who might be recruited as highly qualified talent in the areas of science and technology (Chaloff & Lemaitre 2009; Bhandari et al. 2011).

In Germany, the structural changes that took place in its higher education system during the last 20 years nowadays appear to work rather effectively in attracting such international talent. After the General Agreement on Trade in Services (GATS) in 1995 had liberalized the sector of tertiary education along with the global exchange of services in general, the amendment to the Framework Act for Higher Education in 1998 finally opened the possibility for fundamental changes to the system of study courses and degrees at German universities. With the overall goal of attracting more international students, those now began to gradually implement the two-stage model of Bachelor's and Master's degrees, thus replacing the one-stage system with Diploma and Magister degrees (Schnitzer 1999).

The substantial reformation process of the German higher education system allowed for the implementation of international degree courses. While in the old system recognition of study periods and degrees from foreign universities had been difficult, the overall goal was now to attract more highly-qualified, international talent by facilitating the access to German study programmes. To achieve this, new degree courses were designed according to their clientele's needs, especially with regard to language requirements and organizational support (KMK 1997). Supported by the German government and the German Academic Exchange Service (DAAD) with special funding programmes, German higher education institutions were particularly eager to implement such internationally-oriented study courses on the Master's level.

In this process of implementing new degree courses at German universities, the engineering disciplines were among the first to develop internationally-oriented offers. As student numbers in this field were still comparatively low, the attraction of international talent was seen as a welcome opportunity (Rotter 2005). About 15 years in the process of implementing the two-phase study model and international degree programs in the German higher education system, the database of the DAAD today lists no less than 800 international Master degree courses and 140 international Bachelor's programmes (DAAD 2015). Defining the subject criterion "engineering", this database reveals 245 international Master degree courses.

Germany belongs to the countries that draw the highest amount of all student migration (exchange and degree mobility) in engineering education. (Macready & Tucker 2011). Of all disciplines chosen by international students in Germany, engineering belongs to the

most popular ones with a percentage of 25% (Apolinarsky et al. 2013). In comparison, only 19.8 % of all German students are enrolled in technical study courses. With regard to the distribution among study phases, the largest share of international students who study engineering in Germany is actually enrolled in Master degree courses. In contrast to this, foreign students of the humanities have the largest share in bachelor's degree courses and students of natural sciences in the PhD phase (ibid.).

There are several noteworthy characteristics of student migrants in German engineering disciplines, one of them being their national background: By far the largest shares of international engineering students in Germany (with 40% each) are of East-Asian or Asian nationality (ibid.). In general, a high amount of foreign students in the technical subjects in Germany is from countries with low to upper middle per capita income and only 17% from high-income countries. The largest share of international students from countries with high per capita income (36%) is enrolled in the humanities, especially languages and cultural studies, in Germany. The comparison of technical and cultural disciplines also indicates a gender-specific distribution: While the cultural and philological studies are clearly dominated by female students (36% from developing countries, 44% from industrialized countries), the engineering disciplines are preferred by male international students in Germany (36% of all foreign students from developing countries, 27% from industrialized nations) (Schnitzer 1999).

The following sections of this paper describe the results of a case study that aimed at investigating the meso-level of academic migration in engineering: The level of engineering faculties and decision-makers at universities who decide on ways to implement new study programs and who find themselves in *between* political decisions on the German higher education system (macro-level) and the student migrants themselves (micro-level). This paper presents work in progress, with the outlook of investigating the student's perspective in the near future.

2. Case Study: International Master Degree Courses in Engineering at the Ruhr Universität Bochum

2.1 Object of Investigation and Research Design

The Ruhr Universität Bochum (RUB) is located in the area of the Ruhr in Germany and home to 5,600 employees and more than 41,000 students at 20 faculties. Over 7,000 students study at its three engineering faculties. The RUB was one of the first universities in Germany to implement the two-stage model of Bachelor's and Master's degrees. The international study course Computational Engineering at RUB for example was one of the first to be funded by the programme "internationally oriented courses" by the German Academic Exchange Service, the DAAD (Rotter 2005, S. 172). Today, there are seven

international Master's programmes in Engineering and Natural Sciences at the Ruhr Universität Bochum and an extension of this offer is planned as part of the university's internationalization strategy. Some of the international degree courses received additional funding by a rectorate programme called "Master 2.0" in 2011, designed to support the implementation of study programmes that are interdisciplinary and strongly research-oriented, as well as international. This investigation was directed at three international Master degree courses in the RUB's engineering disciplines: *Computational Engineering*, *Lasers and Photonics*, as well as *Materials Science and Simulations*.

Based on a thorough study of secondary literature on internationalization of the German higher education system and specifics of academic migration in engineering education, guidelines for a qualitative study with semi-structured interviews were developed. The interviews (a total of 6, with 1-2 persons and about 90 minutes each) were conducted between December 2014 and August 2015 with study coordinators and persons in charge of these three international Master degree courses at RUB, as well as the person responsible for international Master's programmes at the university. In order to retrace the decisions made on these institutional levels regarding the programmes' implementation, the key questions were directed at the overall goals driving the different stakeholders as well as the programmes' language policy. Furthermore, interview partners were asked for an assessment of the actual application situation and the composition of student body.

2.2 Stakeholders' Motivations and Implementation Processes

The three international Master degree courses in the focus of this research are anchored in the three engineering faculties of the Ruhr-Universität: While Computational Engineering (Comp. Eng.) is located at the Faculty of Civil and Environmental Engineering, the organization of Lasers and Photonics (LAP) is a cooperative project of the Faculty of Electrical Engineering and Information Technology and the Faculty of Mechanical Engineering (supported in teaching and projects also by other faculties such as Physics, Astronomy, Chemistry and Biochemistry). Materials Science and Simulation (MSS) belongs to the Interdisciplinary Centre for Advanced Materials Simulation (ICAMS), which was established as a research centre in public-private partnership between the Federal State of North Rhine-Westphalia and industry partners. The implementation of an international Master degree course was included in the framework agreement of this institute. While Comp. Eng. already started off in 2000 and was partly funded by the DAAD as mentioned above, both LAP and MSS received their first students in 2011.

On the level of the university rectorate, international Master degree courses were (and still are) called for as part of the overall internationalization strategy and are partly supported financially (as was the case for LAP and MSS through the funding of "Master 2.0"), mainly with funds for organizational support. Yet, the interviews with rectorate and faculty

representatives showed that the main initiative for a programme's implementation had to come from the respective institutes, engineering faculties and/or chair(s) involved on the content-related side. The main reason for implementing these international degree courses on the engineering faculties' (and partly employers') side was the acquisition of suitably qualified doctoral candidates. According to them, it is getting increasingly difficult to recruit enough candidates from German engineering (or natural science) students at the bottleneck of certain highly-specified, interdisciplinary research areas.

2.3 Language Requirements

Internationality is defined similarly by these three programmes: They are open to international as well as German students and their course offer is taught entirely in English. This language prioritization presents a sharp contrast to the regular degree courses at the RUB engineering faculties, whose course offer is (still) mostly taught in German. As the study programmes are taught in English, foreign applicants do not need to provide any proof of German language skills for their application. They need however to certify a sufficient knowledge of the English language via test results from TOEFL (e.g. with a minimum score of 550 in the paper-based test), IELTS or similar. From the viewpoint of the chairs and faculties responsible for the implementation of the Master degree courses, it is essential to offer international students the possibility to study completely in English in order to receive a sufficient amount of qualified applications to select from. According to their estimation, application numbers (which currently amount to several hundreds) would be significantly lower if the programmes were offered in German or German/English.

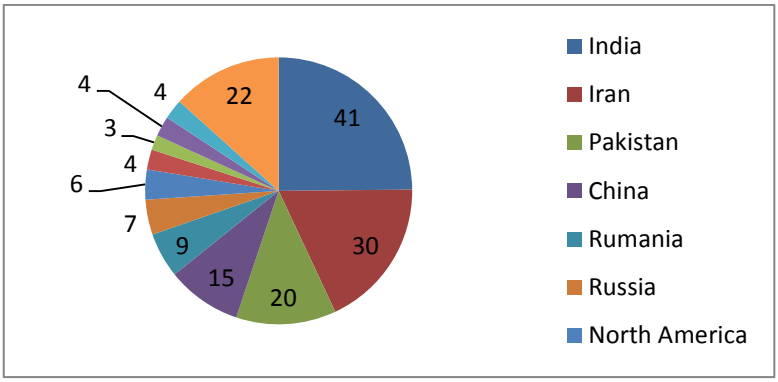
However, the interviews also showed that the coordinators of the Master's programmes put a strong emphasis on the importance of German language skills for the German labour market and regularly advice international students to take German classes during their studies. They are aware that while good English skills suffice to do PhD research at their chairs and faculties, employers (especially of small and medium-sized companies) in Germany still require at least a solid basic knowledge of German. Moreover, as the coordinators of Computational Engineering put forward, they are starting to demand German skills also from students applying for research positions, as these language skills are still important for teaching positions at the Engineering Faculties whose regular curriculum is mostly in German.

2.4 Composition of Student Body and Challenges to be Faced

The composition of student body is similar in all three programmes: By far the largest share of students is male and from Asia and East-Asia. Top among the list of countries of origin are India, Iran, Pakistan and China, followed by Russia and Eastern European countries. A smaller number of students come from North America or Western Europe to study in

Germany. Although all Master degree courses are open to international and German students alike, there are only a few German students enrolled in all three programmes.

Table 1. Distribution of Nationalities among Students. (Total number of students in all three Master degree courses, winter term 2013/14).



Source: Own depiction, Data Warehouse Ruhr-Universität Bochum (2014)

Regarding the distribution among nationalities, all three programmes would wish for more diversity and try to promote it through their selection processes. However, the total application numbers from Indian, Iranian or Chinese students are so high (with several hundred Indian applicants each year for Comp. Eng. for example), that even a weighting in favor of underrepresented countries cannot provide an even distribution.

A major challenge the study coordinators are facing during the application process (apart from the high numbers of application documents that have to be dealt with) is evaluating the qualifications international students earned at their home universities. For although Bachelor and Master are globally known and accepted degrees by now, highly interdisciplinary requirements of these Master's programmes make it hard to judge whether first study phases at a foreign university provides the applicant with a sufficient basic knowledge in the different fields. Fortunately, this evaluation becomes easier with increasing numbers of applicants who come from the same home institutions over the years, often after having learnt about the German study offers from professors or fellow students at home.

Once selected, the study coordinators assess their students a generally high motivation and eagerness for their studies. On the other hand, they note that only a small number of students come to Germany with prior knowledge of the German language. Thus, while most of them intend to learn German when in Germany, this endeavor turns out to be more difficult for most of them than they might have expected. The combined situations that only few fellow students in these international programmes are German and that there are

usually large groups of one nationality lead to a lack in opportunities of German-speaking interaction. Moreover, the work load of studies (which most international students try to fulfil within the regular time because they cannot afford to prolong their studies in Germany) does not allow for many extracurricular courses and activities. All three programmes are therefore trying to encourage student's initiatives such as language tandems or free time activities that bring them closer together not only as a group within their study programme (which already seems to work very well), but also with German engineering students. However, the organization and support of such international Master's is already a very time and cost intensive project for the chairs and faculties, so capacities are rather limited.

3. Conclusions and Potential for Further Research

The three international Master's programmes in the engineering sciences at the Ruhr Universität Bochum belong to the large share of international degree courses in Germany that are open to international as well as German students, while being taught entirely in English. The composition of their student body corresponds to the general specifics of international engineering students in Germany. With regard to the stakeholders involved in the implementation of such international study programmes and their motivations, it can be said that while university rectorate and even external employers are in some cases involved in planning processes and funding, the organizational responsibility lies mostly with decentralized organizational units such as the ICAMS institute and the three engineering faculties. Decisions to offer the programmes in English only were in all cases made in order to attract high numbers of qualified international students, partly to win suitable doctoral candidates for the research of the chairs and institutes involved. However, learning German is being recognized as a central asset by programme coordinators and they try to promote this among students. A rather homogeneous distribution of national backgrounds and lacking interaction with German-speaking students present the largest challenges for these international Master degree courses, together with difficulties in the assessment of qualifications from foreign universities in the application process.

Complementary to this investigation on the meso level of internationalization processes in higher engineering education, the motivations and decisions of international students who come to Germany to study in international Master's programmes might be the object of future research. It would be interesting to analyze whether student's intentions to work in the host country after graduating from their studies affect their selection of destination country and whether experiences (such as language acquisition) during their studies make them change their plans. Considering the student's viewpoint on international Master degree courses in this way would help to clarify whether – and how – stakeholder's goals of attracting highly qualified talent can be achieved through the implementation of such programmes.

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Academic and Student Perceptions on the Integration of HIV and AIDS education in an Electrical Engineering Curriculum at a South African University of Technology

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Abstract
South Africa has the largest number of people living with HIV and AIDS in the world. A concerted effort is needed to address this epidemic, lest a socio-economic crisis may cripple the country. Education may be the most powerful weapon in this regard, with universities playing a critical role in addressing this concern. In 2015, a funding program was initiated by Universities South Africa to facilitate this integration. Subsequently, the Department of Electrical, Electronic and Computer Engineering at a South African University of Technology set out to re-design their curricula to include vital aspects relating to HIV and AIDS. A responsive driven curriculum design was adopted whereby the perceptions and expectations of facilitators and students in this department towards HIV and AIDS education were sought. An online open-ended questionnaire was used to gather both qualitative and quantitative results. This paper presents the initial findings of this study. A key recommendation of this study is to develop a digital online module addressing advanced HIV and AIDS education with special focus on its application in the workplace.

Keywords: *tertiary education; feedback; online module; perspectives*

1. Introduction

HIV and AIDS is currently one of the main causes of death in various countries of the world. Sub-Sahara Africa is the worst affected region where it accounted for 74% of mortalities due to AIDS related causes in 2013 (UNAIDS, 2014). Whiteside (Whiteside, 2002) states that the estimation peak, or decline of the true death toll, cannot be established until the full waveform of the epidemic has been seen, which might take as long as 20 years. It is also stated that unless there is a concerted effort to address the socio-economic impact of this disease, in particular HIV and AIDS-related poverty, things will get much worse over the coming years and decades.

Although South Africa (SA) does not have the largest percentage of infection, it has the largest number of people living with the disease in the world, being estimated at approximately 5.51 million people (Africa, 2014). HIV and AIDS school education in SA falls under the life orientation curriculum. It starts with basic information at primary school level and is further integrated into secondary school curricula (DoE, 2011), where education focuses primarily on introducing learners to the various diseases and how they may be contracted, highlighting their basic human rights, and helping learners to grasp how they can maintain a relatively healthy lifestyle.

Recently, Universities SA mandated all universities in the country to step up their efforts in responding to this epidemic (HEAIDS, 2010), in a drive to provide on-going and relevant education regarding this disease. However, reports indicate that higher educational institutions in SA are not integrating HIV and AIDS education into their curricula with enough vigour (De Lange, Van Laren, & Tanga, 2014; Tanga, De Lange, & Van Laren, 2014). Reason seem to be a perception that students have learnt everything there is to know about the epidemic during their school education (Wilmot & Wood, 2012). Similar research conducted by Higher Education AIDS (HEAIDS) concluded that universities in SA did not see it reasonable to integrate HIV and AIDS education into their curricula (HEAIDS, 2010).

The following research questions therefore arise: “Are facilitators at a University of Technology in SA favourable towards including HIV and AIDS education in their curricula?” “What type of HIV and AIDS education do students at this university require?” “How may this integration of HIV and AIDS into the engineering curriculum be achieved?” The answer might lie in the declaration that education is the single most powerful weapon against HIV transmission (Sukati, Vilakati, & Esampally, 2010). Providing this on-going and relevant education may well be achieved by making use of appropriate educational technologies in higher education.

The Department of Electrical, Electronic and Computer Engineering at the Central University of Technology (CUT) in SA set out to re-design their curricula to include HIV and AIDS education by adopting a responsive driven approach. The first step in this

approach involved obtaining the perceptions and expectations of facilitators and students towards HIV and AIDS education. The purpose of this paper is to present these results and subsequent recommendations. Kosslyn and Rosenberg's (Kosslyn & Rosenberg, 2001) notion of perception states that one's perception, being either positive or negative, influences one's behaviour which in turn affects beliefs. The importance of student perceptions was discussed as early as 1949 with Tyler who stated that student's views should be seriously considered because they are the receivers of the curriculum (Tyler, 2013). Pinar (Pinar, 2012) stated that a student driven curriculum produces desirable results because of its responsive nature. The paper will firstly discuss a number of current HIV and AIDS educational programmes, followed by the research methodology. Results are presented in corresponding topics so that correlations can be drawn. Conclusions are discussed with possible considerations and proposals for future content development.

2. HIV and AIDS in higher education

In 2010, HEAIDS published the findings of a Rapid Assessment Survey as sent to Deputy Vice Chancellors (DVC) and Deans at all Higher Education Institutions (HEI's) of SA (HEAIDS, 2010). DVCs were asked to describe their priority activities with regard to HIV and AIDS education in their institutions. The results of this survey revealed that there is no generic approach for HIV and AIDS education in Universities of Technologies, as well as for traditional universities in SA. Furthermore, those who did indicate a priority activity did so for different faculties. Priorities were are also vague with many focusing primarily on creating awareness of the disease, with no indication of activities in Engineering. 5 of the17 universities did not even indicate priority activities regarding HIV and AIDS education. Noteworthy is the priority activities for the University of KwaZulu-Natal that aims to provide support for students and staff to be tested and to obtain treatment.

One can state that currently in SA, no generic approach exists for HIV and AIDS education in higher education. It is of concern that the last report on this issue was only documented in 2010. Newer strategies and activities must have been implemented since then to ensure the successful education of students regarding this epidemic. On a more positive note, Universities SA did initiate a funding program in 2015 to further facilitate more and intensive HIV and AIDS educational programmes for higher education in SA. The funding program includes a section on content development which becomes the focus of this paper in terms of determining what specific content electrical engineering students are interested in for such an educational programme.

3. Methodology

A descriptive survey study is used to gather both qualitative and quantitative data. Descriptive studies can provide information about the naturally occurring health status, behavior, attitudes or other characteristics of a particular group, without changing or manipulating any variables. This type of study is ideal to use as it seeks to understand specific people's views (Yin, 2013). Fraenkel and Wallen (Fraenkel, Wallen, & Hyun, 1993) contend that qualitative and quantitative approaches are not diametrically opposed, but, can complement one another. A qualitative approach was preferred because it enabled participants to freely express their views, while providing rich textual data about a particular phenomenon (Creswell, 2002). A quantitative approach was used to analyse a series of closed ended questionnaires which were drawn from the literature.

Pragmatism was used as a research paradigm for this study, as it is an ideal paradigm for a mixed methods approach (Creswell, 2002). In the mixed methods research community, pragmatism is defined as a deconstructive paradigm that debunks concepts such as truth and reality and focuses instead on what works as the truth regarding the research questions under investigation (McCoy, 2015).

The target population was restricted to all facilitators in the Department of Electrical, Electronic and Computer Engineering at CUT. This negates the need for a sampling technique. However, only students enrolled for Logic Design III, Electrical Engineering II and Digital Signal Processing IV were asked to complete the questionnaire, which forms the data collection instrument. The reason for this was to first pilot the questionnaire in an attempt to resolve any concerns, ambiguity, misinterpretations, difficulties, errors and questions of validity.

Two questionnaires were developed, one for facilitators and one for students. Ethical clearance was requested and received for both questionnaires. Facilitator's and students questionnaire's was loaded onto e-Thuto (learning management system). Of the 22 facilitators in the Department, only 9 voluntarily completed the questionnaire resulting in a response rate of 45%. 17 were males with 3 females, of which 11 were black, 1 was coloured and 8 whites. The student's could access there questionnaire during November 2015. However, only 74 of the 100 attempted the questionnaire, of which 36 successfully completed it. This resulted in a response rate of 36%. The completed questionnaires were received from 28 black students, 4 coloured students and 4 white students. They comprised 24 male and 12 female students with the majority between the ages of 21 and 25 years of age (23 students). Reasons as to why 38 students did not successfully complete the online questionnaire were also sought in an effort to improve the survey. Results of this process are not presented in this paper.

The questionnaires were designed to consist of five specific sections. The first section measured participant perceptions on integrating HIV and AIDS education into higher education. The second section targeted student prior knowledge of HIV and AIDS education in order to verify what content was covered at school level. The third section focused on HIV and AIDS educational content specifically aimed for the workplace. The fourth section sought to obtain perceptions of electrical engineering students with regard to what other specific content they would prefer to see in the HIV and AIDS educational programme. The fifth section obtained participant responses with regard to preferred modes of delivery of the educational programme.

4. Results and discussion

As stated, the purpose of this paper is to obtain facilitator and student perceptions on the integration of HIV and AIDS education into an electrical engineering curricula. These results could lead to an effective responsive curriculum design.

4.1. Perceptions on HIV and AIDS education

It is important to determine perceptions on HIV and AIDS education.

Results show that 50% of the facilitators felt that students have been taught enough about HIV and AIDS in primary and secondary school, and hence it should not be integrated into the university curriculum. Contrary to this, only 10.7% of the students felt they have enough knowledge where 67.9% of the students stated that they would like to learn more about this disease in order to protect themselves.

Only 37.5% of the facilitators felt that HIV and AIDS is a problem affecting everyone and that every facilitator should teach students about this disease wherever possible. One can conclude that 67.9% of the students want to learn more in order to make a success of their future career, but only 37.5% of the facilitators would have a positive attitude towards such an educational programme. So, great care should be taken when designing and implementing an HIV and AIDS educational programme for higher education, as all facilitators need to buy into the concept if it is to be successful.

4.2. HIV and AIDS education prior knowledge

On average, 85% of student responses to questions on HIV and AIDS education as taught in primary and secondary school were correct. 50% of facilitators indicated their confidence in the HIV and AIDS educational programme provided in primary and secondary school by

stating that it was sufficient to equip students with the necessary knowledge. These facilitators therefore felt that there is no need to integrate another HIV and AIDS educational programme into the university curriculum. However, students want to learn more, which leads to questions about what content for the workplace and content in general would students want to know.

4.3. What students want to learn about HIV and AIDS education

It is important to determine what other type of content would be desired by electrical engineering students in a new HIV and AIDS educational program at university level.

15.8 percent of the students indicated that they would welcome more general knowledge on the subject, thereby suggesting more awareness is required. 26% of the students indicated that voluntary counseling and testing for HIV and AIDS should be included in the program. Workplace related concerns for HIV and AIDS infected people were further requested by 21.1% of the students. This equates well with the previous subsection in this regard. However, the most requested information in this regard relates to various treatment options and complications of these treatments (31.6% requested this). Some of the student comments included "How are people with HIV and AIDS treated at the work environment", "How does it correlate with CD4 count and how are ARVs used", "What are the different laboratory tests that are performed" and "How can I treat and care for someone having it". These comments suggest that some students are really concerned about how this disease is diagnosed and treated. Thoughts from the facilitators, with regard to content, were concentrated on preparing students on how to act and behave when faced with a situation of working with an HIV positive colleague.

4.4. Perceptions of mode of delivery

A responsive curriculum design would seek participant feedback on different modes of delivery of the required content. Two main proposals surfaced from the facilitator and student questionnaires. Firstly, 75% of the students indicated that they would prefer the introduction of a compulsory module which should be taught by an HIV and AIDS specialist. This module should feature across all levels of education, which each subsequent level building on previous knowledge. One student stated "I personally think there should be a subject such as Life Skills (it's just an example) where all these topics can be addressed, even if it is once every month for all faculties. Every session can be focused on a different topic concerning the challenges we are facing in this regard". 3 facilitators commented as follows "HIV and AIDS should be taught to students in generic modules such as Life Skills, not in engineering education", "Our students barely have time to learn

about HIV and AIDS. They struggle with our engineering subjects in such a short period of time" and "The syllabus is already full and time is limited, so at this stage there is no way that I can bring this into my syllabus." These comments suggest, that while students want a separate module dedicated to HIV and AIDS education, there seems to be no place for it in the already packed engineering curriculum. This gives support to the second proposal, being a digital approach.

19% of students indicated that the content for the HIV and AIDS educational programme may be shared using e-Thuto, social media, mobile phones and the Internet. Facilitators further indicated that "Digital literacy is important". Study guides and pamphlets may also be incorporated into this digital approach. This would afford students the opportunity to review the information at their own time and leisure. It would also provide those students who really want to learn more with the needed information to make an informed decision when working with someone infected with HIV and AIDS.

5. Conclusion

The purpose of this paper was to present facilitator and student perceptions of integrating HIV and AIDS education into an electrical engineering curriculum. A responsive curriculum design is thus envisioned. Responses from facilitators indicated that such an educational programme is a waste of time, as students already know enough about this topic as they were taught about it during primary and secondary education. On the other hand, students felt they do not know enough about this topic, especially with regard to HIV and AIDS in the electrical engineering workplace. What chemicals and electronic equipment would be problematic to handle by infected personnel? What treatment (both emotionally and physically) should be provided to someone in the workplace that has been infected? Answers to these and other questions may be provided by considering a digital approach. Institutional learning management systems may be used to disseminate this specific information to those students who want to learn more. This will negate the need for a specialised module to be incorporated into a fully packed electrical engineering curriculum.

Although this descriptive survey study was only limited to 9 facilitators and 36 students, it provided sufficient reason to investigate an HIV and AIDS educational program centered on workplace content. It has also been possible to address the concerns identified in the online questionnaire, thereby making it now possible to release the questionnaire to a greater pool of students. Results of the refining process of the questionnaire and future responses are planned for another paper. The initial results of this study may now already be used, in collaboration with an occupational health specialist (specialising in HIV and AIDS) to develop a relevant HIV and AIDS educational program for CUT. Using such educational programs in an effective way may just be the most powerful weapon that

currently exists to continue the fight against HIV and AIDS, which still remains one of the leading causes of death in Sub-Sahara Africa.

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Results of the implementation of a virtual microscope in a course of histology

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Abstract

The course of Anatomy and Histology is studied in the first year of Dentistry at the University Cardenal Herrera CEU (Alfara del Patriarca, Spain). Its practices consist on choose freely six different tissue samples and draw their most representative features. These practices were made by optical microscopy until 2014, and in 2015 was introduced the virtual microscope exclusively. The aim of the study is to test whether this new teaching method has improved the quality of exercise and the understanding shown by students. First, the best exercises of both years were chosen, and from them some drawings from the same tissue were compared. Some tissues which samples for optical microscope were hard to obtain, were drawn for the very first time thanks to the virtual microscope. Also, with the virtual microscopy the drawings contained more details and definition. The understanding of the structures improved, shown by a more functional, detailed and defined vision of the tissues. The labels of the virtual microscope helped to the self-study and avoided the loss of unnoticed structures. In conclusion, replacement of optical microscope by the virtual microscope is a teaching improvement and facilitates student learning.

Keywords: *Virtual; Optical; Microscope; Teaching; Histology; Improvement*

1. Introduction

Virtual slides are digital reproductions of optical microscope slides that can be viewed by a software that can emulate a traditional microscope (Dee, Lehman, Consoer, Leaven, & Cohen, 2003). These slides can be explored in a web browser that closely simulates examination of real glass slides with an optical microscope (Kumar et al., 2004). The technology for production of virtual slides was developed in 1985; but was in the late 1990s when desktop computers had enough processing speed to expand virtual microscopy and use this technology for education. As a result, by 2000, the use of the optical microscopy in medical education had decreased for allow the entry of virtual microscope in the faculties (Dee, 2009). In 2001 Bacus patented a system for fast scan of microscope samples and turn them into virtual slides (Bacus & Bacus, 2001). In 2009, about 50% of pathology courses in United States already have or expect to implement virtual microscopy (Dee, 2009). The virtual microscope has advantages and disadvantages respect to the optical microscope. However, the student preferences for one or other microscope change widely (Scoville & Buskirk, 2007).

One of the main advantages is the saving cost: the optical microscopes and glass slides are expensive and require maintenance and reparations (Dee, 2009). The virtual microscope only needs a computer or tablet with a web browser (Rehatschek & Hye, 2011). Also, the single-use microscope laboratory can be converted into a multiuse computer laboratory (Dee, 2009). Other advantages cited are that the virtual microscope is easy to learn, and students and professors adapt very quickly to the use of the virtual microscope (Kumar et al., 2004). Respect to the higher resolution, the slides provides excellent image quality (Kumar et al., 2004) in part thanks to the improvement of the streaming (Afework et al., 1998) Virtual slides are always focused and with an adequate level of light adjustment (Harris et al., 2001). Also the exploration of the sample is much better in the virtual microscope: virtual slides enhance the ability of the students to grasp and explore morphological features better than optical microscope (Dee et al., 2003). They are able to magnify, scroll and take pictures of images of their samples for use them for their notes or presentations (Goldberg & Dintzis, 2007).

The use of labels in the virtual microscope allows students to find tumours o growths (Afework et al., 1998). The students can write their own notes in the slide, which helps them to understand deeper the sample (Goldberg & Dintzis, 2007). Other advantage is the standardization of the content, because all students are exposed to the same samples. The virtual microscope avoids the problem of maintaining a satisfactory assortment of glass slides, which are easy to break (Goldberg & Dintzis, 2007). In addition, the virtual microscope allows the group study being able to point with a finger to features on virtual slides, allowing interaction tutor-student or between students (Randell et al., 2012) and allowing to focus on the links between histology, physiology, and pathology (Goldberg &

Dintzis, 2007). It has been studied that the use of virtual microscope reduce the learning time: students learn more quickly (Harris et al., 2001) and the time required for a concrete lesson can be reduced to a half (Heidger et al., 2002). The average marks of the practical exams also increase (Goldberg & Dintzis, 2007). Other of the advantages is that the virtual microscope is always available: students can review the samples at any time, not only when the microscopy laboratory is open(Goldberg & Dintzis, 2007) This is useful especially preceding practical examinations (Harris et al., 2001). Also, the students can use additional features of the new media, such to share the findings of the slide to the community or in social networks (Rehatschek & Hye, 2011). Also professors can take advantage of the accessibility, efficiency, and pedagogic versatility of the computer and the Internet (Dee, 2009). In the future is expected the introduction of the virtual microscope using a Powerwall, a high-resolution array of 28 computer screens (Treanor et al., 2009).

However, the virtual microscope also has some disadvantages. To digitalize a collection of slides for the first time is expensive and requires investment (Goldberg & Dintzis, 2007). It is a problem to store and process the extremely large quantity of data required for a collection of virtual slides (Çatalyürek et al., 2003). A single slide consists of 5 to 30 focal planes, with about 7GB each one, which means a total of 35-210GB per slide (Ferreira et al., 1997). The speed can also be an obstacle: depending on the speed of the Internet connection, there can be a large latency in processing these data when changing zoom or browsing the sample (Ferreira et al., 1997), especially in periods of high peak demand (Kumar et al., 2004). Other problems are related to the public use: Nowadays, only few virtual microscopes for public use can be found on the web, perhaps due to a lack of solutions at reasonable cost (Glatz-Krieger, Glatz, & Mihatsch, 2003). In the future it is need to work in the development of a public domain set of virtual slides (Harris et al., 2001). For ending, there is the problem of the oblivion of the optical microscope. Students must have the chance to learn techniques of traditional microscopy, maintaining some of them in the laboratories (Goldberg & Dintzis, 2007).

2. Objectives

The course of Anatomy and Histology is studied in the first year of Dentistry at the University Cardenal Herrera CEU (Alfara del Patriarca, Spain). The practices were made by optical microscopy until 2014. In them, following an explanation by the teacher, students must choose freely six samples and draw their most representative features. In 2015, for the first time, the practice was made using only the virtual microscope *histologyguide.org* created by professors Robert L. Sorenson PhD y T. Clark Brelje PhD. The aim of the study is to test whether this new teaching method has improved the quality of exercise and the understanding shown by students.

3. Material and methods

The first step is to choose the best exercises performed by students of the Anatomy and Histology course in 2014 and 2015. The second step is to choose from these exercises, some drawings for compare them and observe the main changes between both microscopes and obtain conclusions.

4. Results

First, it is very notorious that in 2015 the students chose tissues that were not drawn up until now, because normally they are very difficult to obtain or the samples are fragile. Thus, as shown in *Figure 1*, students chose brand new samples such compact bone or eye thanks to their availability in virtual microscope. It is also very evident that the student drew both tissues with a high level of detail.

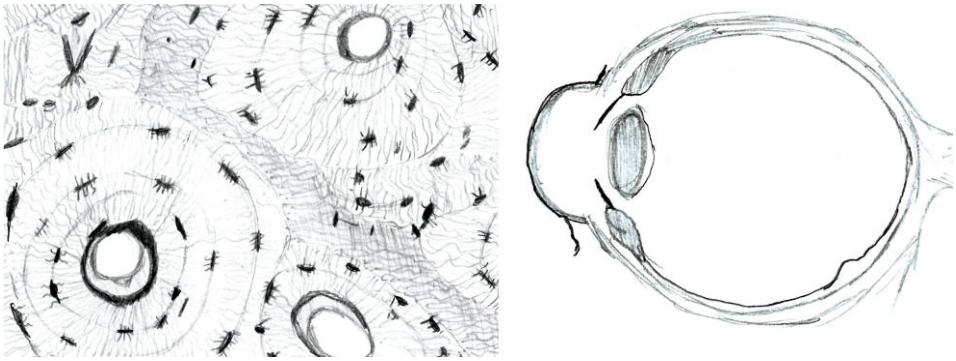

Figure 1. Compact bone on the left, and eye on the right, both with virtual microscope 2015.

In *Figure 2* it is compared the renal cortex drawn using an optical microscope and a virtual one. It shows how the student using an optical microscope drew the characteristic rounded contour, a classic detail that is lost in the virtual microscope. Because the optical microscope used in the practice cannot achieve more than 50x magnification, the Bowman's capsule is not appreciated in detail, so the student interpreted it as a glomerulus with random nuclei inside. The level of detail that shows the virtual microscope is much higher, appreciating all the contours of the cells and their nuclei. In this way, students could see more clearly the structure of the renal cortex.

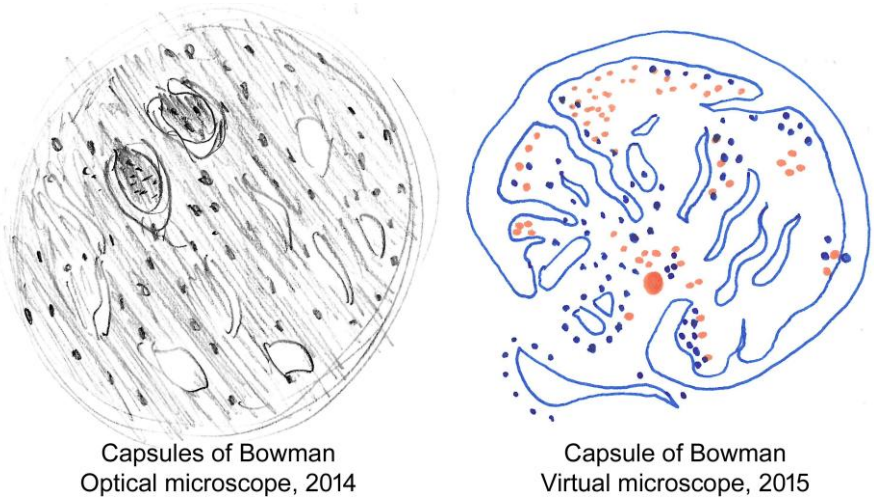

Figure 2. Comparison of two drawings of the renal cortex.

In *Figure 3* a sample of skeletal muscle is shown. Watching through the optical microscope, the muscle fibers intersect and the student has the impression that they form a tangle, putting the focus in the striations and rounded nuclei. Using the virtual microscope, the student drew every fibre separately and also realized that the nuclei are elongated and not round.

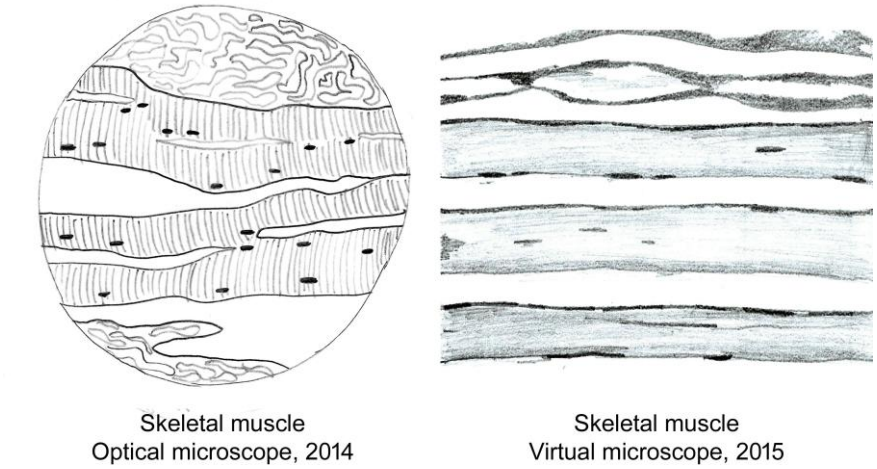

Figure 3. Comparison of two drawings of skeletal muscle.

In *Figure 4*, a sample of intestinal microvilli are observed. This sample is hard to prepare because it is very difficult to make a longitudinal section of the villi. In fact, in the picture of the left the villi are cut axially, making it difficult for the student to understand the villi as fingerings from the mucosa. In the professional virtual slide, the cut is perfectly longitudinal, and the student can draw the structure of the villi with great precision and understanding its whole structure.

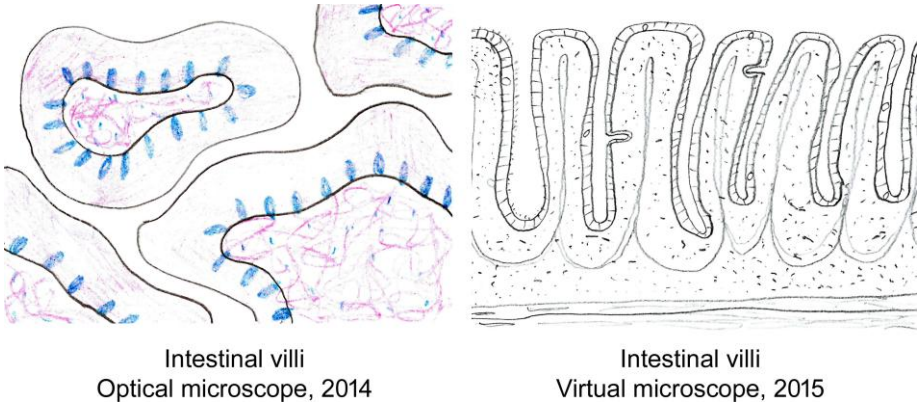

Figure 4. Comparison of two drawings of the small intestine.

The *Figure 5* is a sample of tongue. Due to the absence of labels, the student who used the optical microscope focused on the oral mucosa, drawing the stratified squamous non-keratinized epithelium that was the most striking thing of the sample due to its intense red colour. However, the student who used the virtual microscope, aided by labels, noticed the huge number of structures that are in the tongue, drawing many papillae and numerous serous glands. Despite this self-study, the teacher should continuously check the development of the exercise and resolve doubts.

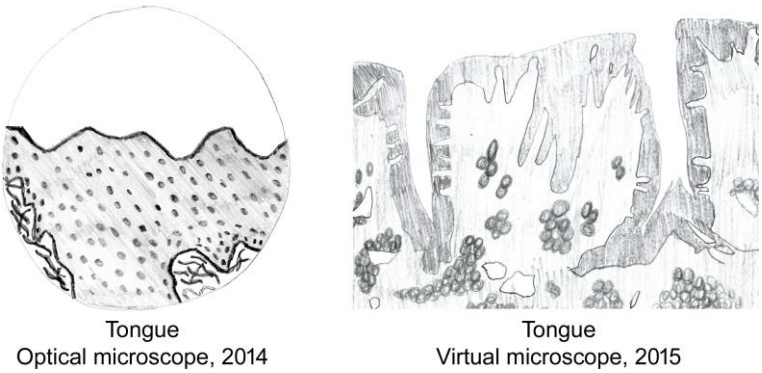

Figure 5. Comparison of two drawings of the tongue.

5. Conclusions

The replacement of the optical microscope by the virtual microscope in the courses of histology not only implies an improvement in costs, also results in a better understanding of the samples by the students, helps them to have a more functional, detailed and defined vision of the tissues. Thanks to the labels they can learn by themselves the main landmarks of the sample and not to miss unnoticed structures. It also allows the learning of organs and tissues which samples are difficult to prepare for the optical microscopy.

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Organization of the Ph-doctoral studies on the chemical specialties

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Abstract

Problem of globalization of the educational process and integration into the international educational space is one of the most urgent problems for the Kazakh universities. In this regard, generalization of experience in training of PhD students is of particular interest, since training of PhD students is different in different countries. The example of the organization of educational process and scientific research in the PhD studies of chemical specialties at Faculty of Chemistry and Chemical Technology Al-Farabi Kazakh National University shows the peculiarities of the organization and defense of dissertations in Kazakhstan universities.

It is shown that the training of specialists - doctoral students at Kazakhstan universities is carried out on the basis of theoretical and practical tests. At the same time currently the state of theoretical training and practical research is 1:1,5 however there is a tendency of decrease of the theoretical training.

Conditions for preparation and defense of PhD-dissertations are described. The main requirements for the defense are marked: fulfillment of theoretical training and practical research in amount of 75 credits, the publication of results in journals with non-zero impact factor and approbation of the results in international scientific conferences.

Keywords*: modules; credits; Ph-doctoral students; curriculum; dissertation.*

1. Introduction

One of the most important modern trends of economic development is internationalization and with respect to higher education is expressed in student and teacher mobility, internationalization of curricula and programs, establishment of regional and international university networks, export of educational services and related problems of the quality of education and international accreditation [1,2]. Since 2010, Kazakhstan became the 47th country that along with European countries began to carry out studies at universities by the principles of Bologna process. This assumes, first of all, the transition to 3-level model of training; academic mobility of students and teachers; the transition to a system of quality assessment of education through accreditation and academic ranking of universities [1-3].
The transition to a three-stage education in higher education institutions of Kazakhstan is a fait accompli. By the results of 2015 in the QS rankings of universities Al-Farabi Kazakh National University takes 275th place. Since 2005, National Universities of Kazakhstan began training in Ph-doctoral studies. The purpose of this article is an analysis of organization of classes, research and defense of the thesis for Ph-doctoral universities in the chemical specialties of Kazakhstan.

2. Main part

The distinctive feature of organization of classes in the Ph-doctoral studies at the universities of Kazakhstan is the presence of theoretical training and the implementation of research into practice. Therefore, Kazakh National University pays great attention to the preparation of curricula, including theoretical training, as well as research work. Let us consider this on an example of the curriculum of specialty "Chemistry" in Al-Farabi Kazakh National University.
Ph-doctoral students training on specialty "Chemistry" goes in two directions: "Basic Chemistry" and "Applied Chemistry" (Table 1).

Table 1. Content of curriculum of specialty "Chemistry"

№	Main blocks	Name od modules	Number of credits
1	Fundamental disciplines	Compulsory state modules	3
		Compulsory professional modules	15
2	Specialization disciplines	Modules of individual educational paths	18
		paths 1	
		paths 2	
		paths 3	
		paths 4	
3	Additional types of training	Professional practice	6
		Research work and final thesis	28
		Thesis preparation and defense	5
Total			75

Taught component of curriculum includes "Fundamental disciplines" and "Disciplines of specialization". Fundamental disciplines consists of 18 credits, 3 of them are taken by "Compulsory state module" and 15 credits are assigned for "Compulsory professional module".

Discipline of Compulsory state module "Theory and problems of physical chemistry" is studied in both directions: in the "Fundamental chemistry" and "Applied chemistry".

Compulsory professional module includes subjects on modern aspects of radiation and polymer chemistry, colloid, analytical and biological chemistry, problems of catalysis and petrochemistry, chemical physics, etc.

PhD students study specialization disciplines by 4 individual trajectories. At this block PhD students study 6 disciplines, each one of them includes 3 credits, total 18 credits.

Block "Additional types of training" includes parts "Professional practice" (6 credits), "Research work and preparation of dissertation" (28 credits) and "Final dissertation" (5 credits).

Altogether curriculum of PhD specialty "Chemistry" includes 75 credits, 36 credits takes theoretical learning. However, it is necessary to specify the ratio of Kazakhstan credits to ECTS credits (Table 2). Given the fact that the ratio of Kazakhstan credits to ECTS credits is 1:1.5 [1], it is possible to approve, that the total number of credits mastered while studying at PhD Doctoral studies is $(75 \cdot 1.5) = 112.5$.

Table 2. The ratio between Kazakhstan credits and ECTS credits

1 credit	45 hour= 15 hour cur.+15 hour IWS+15 hour IWSL
1 ECTS credit	25-30 hour = 12,5-15 hour cur.+12,5-15 hour extracur.

The second feature of organization of classes in doctoral studies - every year decrease of the period of theoretical training. If earlier doctoral students passed theoretical training during the first 2 years, now that period is 1.5 years. From 2016-2017 academic year, the ratio of theoretical and practical training will be changed in the direction of increasing of

the share of practical work. Moreover, the period of theoretical training will be 1 year (2 semesters of 15 weeks).
It is necessary to note, that not all countries include theoretical instruction into the doctoral program. For example, in the UK universities there are optional courses for PhD students, which are recommended to visit at the doctor's degree. These courses are devoted for the organization and planning of scientific research, exploration of new computer programs, etc. The main time PhD students use for scientific research. A similar provision in the training of scientific personnel is observed in Russian universities. Young scientists pass exams there on the specialty and one foreign language (mostly english), which gives them access to defense of the thesis in the presence of relevant publications [4].
At the same time in Hungary universities according to the curriculum of PhD some time is allocated for theoretical instruction. As in Kazakhstan universities, in Hungary universities PhD studies take 3 years or 6 semesters, during which students learn 180 credits. Among them 100 credits are engaged in the thesis preparation and 80 credits devoted to the theoretical courses, preparation of publications, patents and teaching practice. In this case, only the special courses, such as, Spectroscopy, Structure Investigated Methods are studied and no basic courses. PhD students select the elective courses depending on the dissertation topic. As in Kazakhstan universities, PhD students in Hungary are also involved in teaching activities.

Regarding the organization of defense of the thesis there are 3 Dissertation Councils on Faculty of Chemistry and Chemical Technology, where the defense of dissertations is held in the following directions of chemistry [5]:
1. Chemistry; Ecology (chemical and technical sciences);
2. Chemical technology of inorganic substances, chemical technology of organic substances;
3. Nanomaterials and Nanotechnology.

Each year about 10 people defend dissertations in the Dissertation Council on specialties "Chemistry" and "Ecology" (Table. 3). They are PhD graduates of Al-Farabi Kazakh National University and other universities in Kazakhstan.

Table 3. Number of defended dissertations at the Faculty of Chemistry and Chemical Technology of Al-Farabi Kazakh National University

Specialization	2011 year	2012 year	2013 year	2014 year	2015 year
Chemistry	7	7	7	3	7
Ecology	-	-	1	5	5
Chemical technology of inorganic substances	-	-	2	4	5
Chemical technology of organic substances	-	-	1	4	3
Nanomaterials and nanotechnology	-	-	-	6	8

Dissertations are devoted to actual problems of catalysis, analytical and colloid chemistry, electrochemistry, preparation of new catalysts, creation of polymer materials for medicine, flocculants for wastewater treatment, development of methods for soil remediation, methods of analysis for radiation safety of population, development of assessment methods

of soil contamination, evaluation of human impact on the environment of oil and industrial regions of Kazakhstan.

The requirement for admission to the defense of PhD students is mastering of the curriculum, implementation of the research timetable and publication of the results in journals from the List of periodicals recommended by the Ministry of Education of Kazakhstan, and in journals which have impact factor and included in the database of Thomson Reuters and Scopus. Furthermore, PhD students must approve research results at international conferences.

One of the factors of integration into the international educational space of training process of doctoral students is the fact that one of the consultants of PhD student is a foreign scientist with an experience in the field of studies of this PhD student in whose laboratory the doctoral student carries out research for a minimum of 4 months. For that, he must have an appropriate level of English. It should be noted that in the preparation of curricula authors study the curricula of the leading European universities and take over their experience. Based on the analysis of KazNU and other countries we can conclude that in the PhD program of al-Farabi Kazakh National University it is necessary to reduce the share of theoretical education for a corresponding increase of the labor input, spent on the implementation of the research work. Further work on the improvement of PhD students training will be aimed at the globalization of curricula and the training of specialists capable of working anywhere in the world.

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Inclusive University Classrooms: the importance of faculty training

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Abstract

The presence of students with disabilities in the universities is increasing. Faculty needs to be trained in order to attend these students and with the objective to offer and inclusice education. The aim of this paper is to identify, describe and explain the barriers and aids that students with disabilities experience in university classroom. Forty four students with disabilities participated in the research. A biographical narrative methodology was used. The university-life histories of the students were complied by making use of in-depth interviews, lifelines and photographs. Results indicate the important of faculty training in matters concerning disabilities and new technologies, informing to the faculty of the presence of students with disabilities in their classroom, the existence of a specific service to support the faculty and the important of improving a positive attitude toward the disability. These results are dicussed in line with other studies. Recommendations are maded according to inclusive education and offering keys to universities to provide training plans leading to inclusive education and learning.

Keywords: *students with disabilities; high education; faculty training; inclusive education.*

1. Introduction

In 1998, the UNESCO World Declaration on Higher Education, based on the Universal Declaration of Human Rights (WHO, 1948), forged a new vision of higher education, which underscores the right of every person to an education and equal rights of access to higher studies for all. Fuerthemore, the Convention on the Rights of Persons with Disabilities (UN, 2006) stated that persons with disabilities must be ensured access to higher education, professional training, adult education and life-long learning.

In Spain, Organic Law 4/2007 on universities had already referred to the inclusion of persons with disabilities at universities. It also included the obligation for university environments to be accessible, and inclusion of the *principles of universal accessibility and respect for all* in plans of study.

The number of university students with disabilities is increasing (Debram & Salzberg, 2005). In this sense, universities should be inclusive and respond to the needs of the entire student body. Ferni and Henning (2006) explain that participation in educational environments is restricted by inaccessible curricula, negative attitudes of faculty and physical barriers. The social model of disability (Oliver, 1990) poses the need for restructuring these environments in such a way that the entire student body can participate and learn in them.

Many studies have been developed and highlighted that students with disabilities have to cope with continuing barriers, whether in the macro-institutional environment (inaccessible buildings and virtual environments, unending administrative bureaucracy, unapplied regulations, etc.) or in the micro-institutional classroom environment (negative attitudes and uniformed faculty members, strict, non-inclusive curricula, absence of adjustments, etc.) (Moriña, López, & Molina, 2014). In this sense, students with an invisible disability, many often prefer not to reveal their disability because they are perceived negatively by others (Riddell & Weedon, 2014). This is worrying because although in some cases, faculty members have helped the student and shown a positive attitude, many faculty has not been sufficiently sensitive or has shown a complete lack of training in how to attend these students in the classroom (Moswela & Mukhopahdyay, 2011). This is important, and some of the key factors to success of students with disabilities include knowing the professors, and professors' attitudes or willingness to adapt curricula (Leyser, Greenberger, Sharoni, & Vogel, 2011). Hadjikakou and Hartas (2008), mention that most faculty members have neither training nor previous experience in the subject of disability. In this sense, it is necessary to train and inform faculty members in matters referring to disability.

The main objective of this paper is to identity, describe and explain barriers and aids related to faculty that students with disabilities experience in classroom.

2. Method

This study pertain to a wider research funded by the Spanish Ministry of Economy and Competiveness entitled, "University barriers and aids identified by students with disabilities." This four-year study (2011-2014) was carried out by a multi-disciplinary research team of professors from different areas and branches of knowledge (Education, Economics, Health and Experimental Sciences).

The research is based on a biographical-narrative methodology. Through it, it was attempted to make students with disabilities heard. It has been previously concluded that this type of methodology emphasizes the importance of people talking about themselves, without repressing their subjectivity. Therefore, as a methodology for research, it is most suitable for listening to the voices of groups such as students who could be suffering from discrimination. Specifically, the research was designed in two stages. After their informed consent had been acquired, 44 students participated in the first. Several different discussion groups were held (at least one in each of the five fields of knowledge[1]) and individual interviews (oral and written). In the second, in-depth life histories were constructed for 16 of the participants. Some of the instruments used for collecting data employed in these histories were the in-depth interview, photographs and lifeline. As the life histories were characterized by their polyphony, it was indispensable to include the voices of other persons in the university trajectories of the main characters.

This paper concentrates on the recommendations that university students with disabilities made for faculty training. Data were collected during three years. The range of age was between 19 to 59 years, being the mean 30.5 years old. Of these, 22 were men and 22 women. Twenty five percent of them were in the first year of their degree studies, 16% in the second, 25% in the third, 14% in the fourth and 9% in the fifth. The remaining, approximately 11%, were studying for a master's degree. Finally, using the university's terminology, 38% of the students participating in the study had physical disabilities, 15% psychological disabilities, 36% sensorial disabilities and 11% had difficulties associated with some organic problem (asthma, degenerative diseases, etc.).

Data analysis was done from a double perspective. On one hand, for each history, what is called a narrative analysis as proposed by Goodley, Lawthom, Clough and Moore (2004) was done. On the other, a structural analysis (Riessman, 2008) was done for comparative analysis of all the information collected with all the techniques and people participating, using a system of categories and codes, as proposed by Miles and Huberman (1994) with the MaxQDA10 data analysis program.

[1] The fields of knowledge included are: Health Sciences, Experimental Sciences, Social Sciences and Law, Engineering and Technology, and Humanities.

3. Results

All participants identified faculty training in matters concerning disabilities as a necessary and unavoidable improvement, which the university must make. In fact, they recommended that the faculty be trained in the specific content referring to disability and the needs arising from it. In this respect, a basic demand that arose was that the faculty be informed of the different types of disability, since depending on which it is, the response may be different:

"RSP10[2]: *I think the most effective thing for training would be for them to have knowledge of the needs that each type of disability has, and how they can respond to it, like how to adapt notes to braille, Right?"*

These students suggested too that it is necessary to make the faculty aware of the presence of students with disabilities in the classroom who must be given an appropriate, quality response. It is about making faculty members aware of the subject so they show a closer and more proactive attitude toward disability.

There should also be a service supporting the faculty in this matter, which could assist them whenever they found a student with a disability and did not know how to respond to him[3].

"RCS4: *But who supports the professor? …it would be good if there were orientation specialists in higher education …technical and educational adaptation, different clearer, concise teaching techniques …"*

Participants believed that professors received insufficient support from the university on how to respond to diversity. They commented, for example, on how faculty members often had to face students with disabilities in the classroom for the first time, but the information they received from the institution was minimal, and did not specify how to respond to the special needs of the students.

Several barriers related to the faculty were among the main obstacles identified by the participants in the study. Specifically, with regard to training, it was emphasized that the faculty is neither informed nor trained.

Other students emphasized that the problem was the absence of a positive attitude toward the disability. They suggested that it is complicated for the faculty to be trained to attend to

[2] To protect the confidentiality of the participants in the study, abbreviations are used to identify them. Thus, RSC refers to Health Sciences, RSE to Social Sciences and Law, RSP to Social Sciences (Education), RTE to Engineering and Technology and Experimental Sciences and RH to Humanities. Each of these abbreviations is accompanied by a number that identifies the participant.

[3] The only service which the University currently has for this purpose is the Disabled Student Services Office. Only one person with a degree in psychology works there, for a population which in academic year 2014/2015 was as many as 600 students. Therefore, the authors of this article believe that the question is not that the service does not exist, but that due to the large number of students it has to serve, the functions it performs are others.

diversity because to do it, first they have to empathize with these students, and sometimes that is not the case.

The new technologies and how they can contribute to inclusion of students in the university was another of the points the students who participated in the study recommended to faculty.

In addition to insisting on making use of the new technologies in general, students with visual disabilities also made concrete proposals, like promoting the use of digital blackboards, or locating monitors on each desk so students could view the information the professor is projecting more easily. However, the barriers in this section appeared when faculty members decided not to use the technological tools they already had available to them, whether due to lack of interest or training in their use.

"RSP5: *For a person who is blind, technology is always extremely important, because if it were not for today's technology... So of course, I think there is ignorance about the circumstances of each person with disability, but also about technology. Professors should be trained in this the same way they are trained in their field or subject."*

The students also indicated that the university's virtual teaching platform was a huge help to them.

"RCS8: *Virtual teaching platforms are very good and can be very useful to the student. However, this is another matter that should be reviewed, because there are professors who do not take this type of technological tool seriously."*

4. Conclusion and Discussion

The students with disabilities who participated in this study recommended that faculty have to be infomed and trained in matters concerning disability. Therefore, faculty members must be made aware and have an opportunity for training to understand the advantages of inclusion. As Hurst (2006) says, training in disability should be obligatory for the entire staff. Such a training proposal should be based on the principles associated with effective learning for everyone and its sessions should be participatory. Thus it would be recommendable for universities to have a training plan so that its faculty can be adequately trained in dealing with these students.

Some universities have already accepted the challenge and have designed awareness training programs to prepare faculty members for this purpose (eg. Debran & Salzberg, 2005; Guasch, 2010;Teachability, 2002). Some of these materials are more specific and concentrate on how to respond to the students depending on the type of disability, while others are broader, including matters referring to inclusive higher education (inclusive

classroom methodology, curriculum adaptation, etc.). Zhang et al. (2010) recommend that to facilitate participation by faculty members, training should be online and go at their own pace.

Some content that seems to be indispensable in the design of faculty training for responding to the educational needs of students with disabilities, is the universal learning design (Watchorn, Larkin, Ang, & Hitch, 2013). Applying a universal design to learning means guaranteeing equal access to teaching and learning, and as Pliner and Johnson (2004) suggest, conceiving of training from this perspective leads to benefiting not only students with disabilities, but also the rest of the students.

Finally, it is fundamental to consider the use of the new technologies inside and outside of the classroom to favor inclusion of students with disabilities (Pearson & Koppi, 2006). As Seale (2006) explains, in many institutions, e-learning has become an essential tool of learning for many students. Several studies have already reported that the lack of faculty training could become a methodological obstacle and a significant educational barrier for students. Along this line, successful use of methods with specific tools for accessibility of students with disabilities, as some studies argue, not only depends on their technical nature, but also on teaching factors.

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Strategies for Scientists in Higher Education

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Abstract

Scientists have had a role in higher education since the very first institutes of higher education. While this role has evolved considerably in the last century, the period that has seen the most significant changes has been the last four decades. The rapid expansion of the higher education sector and the massification of education through the commitment of the state to free education has seen the role of scientists in higher education in Ireland swell to incorporate new responsibilities and expectations. In this paper a brief history of the role of scientists in higher education and the recent changes to that role are presented. Although these changes are focused on the role of Irish scientists, similar changes can be identified across Europe. A new strategy for supporting scientists in higher education is proposed — a research-informed masters programme in science education that provides the necessary skills and experience for early career scientists in higher education to cope with the demands of their positions.

Keywords: *Science Education; Irish Science; Course Development.*

1. The Early Role of Scientists in Higher Education

Scientists and institutes of higher education have been inextricably linked since the very first institutes of higher education. While the term "scientist" has only existed since it was coined by William Whewell in the nineteenth century (Yeo, 2003), science has existed in education in some form since the rise of natural philosophy in the sixth century in ancient Greece. It initially entailed investigation into the "natural world that concentrated on questions of material causation" (Lindberg, 1992). These early scientists found their natural home in the Platonic Academy and eventually in mediaeval universities. Pedersen (1997) points out that "in medieval terms, the schools and universities... at that time [were] the only real workshops of science and learning". In Ireland, the first university was the University of Dublin, Trinity College, founded in 1592 by Queen Elizabeth, and together with Oxford, Cambridge, St Andrews, Glasgow, Aberdeen, and Edinburgh made up the seven ancient universities of Britain and Ireland. The first gathering of scientists in higher education in Ireland came in 1683 when a group of natural philosophers founded the Dublin Philosophical Society at Trinity College (Wilde & Lloyd, 1844). These scientists began a relationship between science and higher education that would culminate in eighteenth and nineteenth century Ireland producing some of the most distinguished scientists of the time, such as mathematician William Rowan Hamilton (1805-1865), geologist/physicist John Joly (1857-1933) and physicist George Francis Fitzgerald (1851-1901). Around the same time, the Leviathan telescope at Birr Castle was established as the largest telescope in the world from 1845-1917 (Yearley, 1995). This period in Irish science is one of the most significant: "the years between 1780 and 1880 can only be hailed as a golden age for Irish science... Ireland's leading figures in science were men enjoying the highest of international scientific reputations" (Davies, 1985). The nineteenth century brought challenges for scientists in higher education in Ireland. The ongoing political and religious tensions eventually saw the establishment of new universities. The Catholic Church, with its power over Irish education growing through its primary and post-primary school influence, demanded institutes of higher education that were not deemed a threat to the faith, as it "would not allow the education of Catholic students in overtly secular institutions as this could lead to the erosion of Catholic faith and morals, due largely to their exposure to the works of suspect philosophers, historians and scientists" (O'Riordan, 1897).

2. Recent Challenges & Developments

Across Europe in the twentieth century scientists found more opportunities in higher education thanks to the rapid expansion of the sector. Ireland benefited from significant investment from the state that facilitated a period of growth and expansion: "the Irish state made a long-term commitment to investment in education from the 1960s, largely absent in

the first generation of independent statehood, which was sustained over the following two generations" (Loxley, Seery, & Walsh, 2014). After this expansion of higher education, the next meaningful development to the role of scientists in higher education was the influence of the European Union and the injection of research funding. This was mirrored by commitment from the Irish state to research and innovation which helped drive the economic boom in the 1990s. The Programme for Research in Third-Level Institutions funded €1.2 billion for basic research from 1998 onwards. In the early 2000s, the global financial crisis brought on a recession which caused a sea-change in Irish state investment and huge cuts to basic research. Although foreign investment saw total spending on research and development grow during this time (See Figure 1, from Butler (2015)), the lack of research funding for crucial areas such as astrophysics, particle physics and mathematics presented a challenge to scientists, especially early-career researchers in institutes of higher education.

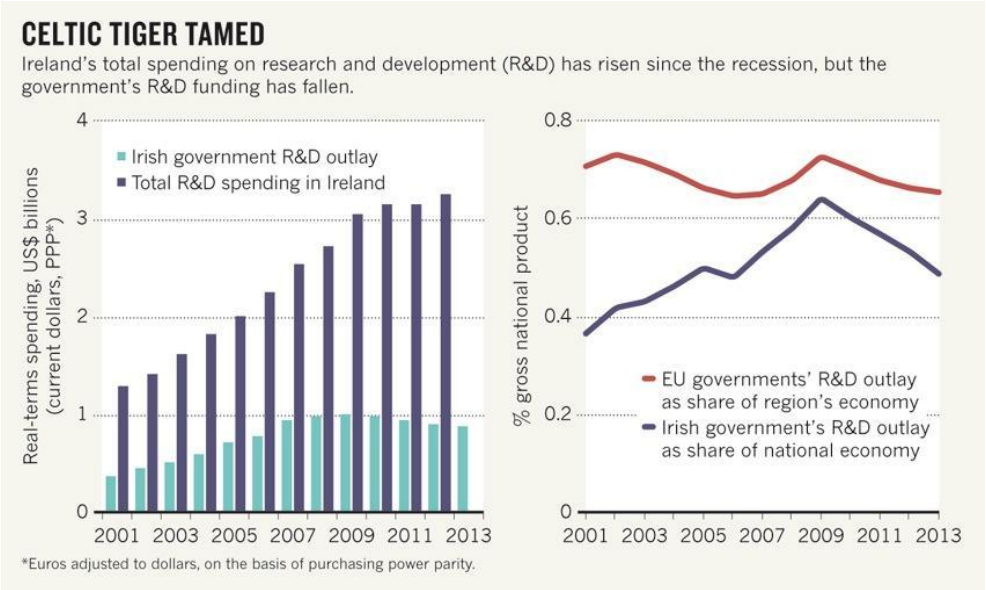

Figure 1. Source: Butler (2015). Original data: OECD/World Bank.

3. A New Strategy

To get a sense of how these developments have impacted on early-career researchers, a research project is underway to collate the myriad challenges that currently face scientists during the early stages of their working lives. Work on this project is in its infancy, but already it is clear that as a consequence of the dearth of funding for basic research, growing demands are being placed on Irish scientists to perform more core duties in increasingly competitive environments. Gathering input from Irish scientists across institutes of higher education has shown that these duties now include: securing research funding, publishing frequently and diversely, disseminating research, informing policymakers, seeking out commercialisation opportunities, teaching, tutoring, mentoring, supervising, assessing students, developing new courses, understanding and utilising social media and mass media, embracing public engagement and involving the public in decision-making processes. Many of these duties can be traced back to the objectives of the European Commision and the tenets of "responsible research and innovation" (Owen, Macnaghten, & Stilgoe, 2012). In a bid to ensure scientists are more equipped to carry out some of these duties and succeed in their discipline, a new research-informed masters course has been developed at Trinity College Dublin that provides education and skills to cope with these new challenges. The course takes the form of an M.Ed in Science Education and is designed around four core modules: "Science in Society", "Communicating Science", "Learning Theories" and "Frontier Research and Current Debates" with the overarching aim being to give participants a critical understanding of the role of science in society. While incorporating traditional components of science pedagogy and curriculum, it also draws upon growing fields of science education, including informal learning and public engagement (Roche, 2015). There is an emphasis on developing skills that are becoming crucial to scientists in higher education in Ireland such as an understanding of science governance, publishing, funding, policy and ethics in order to enhance career opportunities. It will also actively engage in, and be informed by, science education research. A key component of the M.Ed is the partnership with Science Gallery Dublin — a world-leading public engagement space that will bring expertise and practical experience to the course for all the scientists. Figure 2 shows an example of the type of public engagement experience that Science Gallery Dublin can bring to an M.Ed in order to support scientists in higher education.

Figure 2. The image on the left is from an exhibition called "RISK LAB" which invited members of the public to consider the underlying probabilities associated with risk-taking behaviour, such as gambling. The participants shown are visitors to the exhibition that are engaging in a game of poker while wearing biosensors that are displaying their physiological responses to the stresses of taking risks. The image on the right is from an exhibition called "FAT" which explored the relationship and stigma surrounding fat and diet. The mediators in these images are Science Gallery employees in the mold of traditional "explainers" with the crucial difference that they do not solely explain the exhibit in the traditional "deficit model" of science communication (Trench, 2008) but instead engage in conversations and facilitate a discussion around the topics emerging from the exhibition. Source: Science Gallery Dublin, Trinity College.

4. Conclusion

Trinity College Dublin embraces novel strategies for coping with challenges in higher education, such as recently offering a postgraduate certificate in 21st Century Teaching & Learning in association with Google Ireland (Roche, 2014) in order to address the need for stronger computer science skills among post-primary teachers. The M.Ed in Science Education is the latest effort to help cope with challenges to science in Ireland, in particular to support scientists in higher education struggling to meet the demands imposed upon them due to a lack of national funding in basic research. The M.Ed in Science Education is a strategy we feel will not only empower scientists to adapt to their changing role in higher education but also ensure that they are central to any future developments in scientific policy.

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The use of internal audits as a tool to analyze skills and competences

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Abstract

The degrees of the faculty of Chemistry of the University of Barcelona have implemented a quality management system (QMS) (Real Decreto 1393/2007; Real Decreto 861/2010). One of the common subjects taught in formative period of the students is Quality and Prevention. The competences that the students must acquire are knowing the QMS and the basis of certification and accreditation. They must also have skills to plan and propose actions to ensure quality and to prepare documentation of a quality management system, among others. The aim of the work is the execution of internal audits carried out by students to analyze the degree of skills and competences obtained by the auditors throughout the course Quality and Prevention.

Keywords: *Audit; skill; competences, laboratories.*

1. Introduction

The degrees of the faculty of Chemistry of the University of Barcelona have implemented a quality management system (QMS) (Real Decreto 1393/2007 and Real Decreto 861/2010). One of the common subjects taught in formative period of the students is Quality and Prevention. The competences that the students must acquire are knowing the QMS and the basis of certification and accreditation (Companyó and Rios, 2002). They must also have skills to plan and propose actions to ensure quality and to prepare documentation of a quality management system, among others.

The audit may be a useful tool not only for the acquisition of skills and abilities but also for evaluating the students. The training for developing the capabilities of auditors can include experimental programs. Auditing is a structured process that involves the application of analytical skills but during the audit they should also receive guidance on the professional approach to ethics, fundamental principles and the consequences of unethical behavior.

The audit process involves the understanding of the entity to be audited, the internal processes and the related controls, to perform analytical procedures and to report the conclusions. According to the standard ISO 19011 (ISO 19011), they have to verify the observance of effective controls.

2. Methodology

The methodology is based on three basic pillars: training students, conducting audits and monitoring and evaluating the process (Fernandez et al., 2015). First a training session is carried out with the students auditors where they receive the basic features of the audit and information about the tasks, together with the relevant documentation. This documentation includes the audit questionnaire, the manual of auditors, audit procedures and form audit report. The audit questionnaire will help auditors to identify potential interviewers and to make sure that auditors and observers are familiar with all relevant procedures.

For his performance as auditors, students are supervised by a member of a teaching innovation group (TIG) which developes, at the same time, the double duty of training and observing the work of students.

After the audit, the students prepared a report that it is evaluated by teachers of the subject of Quality and Prevention. A representative sample of these reports is then revised by members of TIG. The students must be able to draw conclusions about their work and the laboratories audited. Finally, through a series of surveys (Companyó et al., 2008) of students working as auditors, audited students and teachers, it is assessed the level of satisfaction with the work done.

A total of 102 students have been selected, over the two academic years in which this project has been developed. After a brief training, these students have acted as auditors in 49 audits, Table 1, involving the participation of 99 students and 49 teachers as partners in laboratories audited. During the audit, the students were able to work with generic skills and ethics, speaking and writing ability, the ability to dialogue, leadership, analysis and interpretation of data, management quality, respectful labor the environment, safety, etc.

Table 1. Audits conducted during the years 2013-14 and 2014-15

Variable	2013/2014	2014/2015
Number of students auditors	44	58
Number of students audited	40	59
Number of teachers involved	20	29
Number of audits	20	29
Number of laboratories audited	18	20
Number of surveys about auditors	18	27
Number of surveys to audited students	40	60
Number of teachers surveyed	18	28

It was established that each audit process was conducted by two students, several groups of two students were therefore formed. Audits were carried out in laboratories during the scheduled morning and afternoon laboratory sessions. Prior to the audit, with the advice of a member of the TIG, the audit was also planned with the teachers of the involved laboratories.

During the audit, students were supervised by a teacher of the subject, who, as previously mentioned, developed a dual task of training and observation of the work carried out by students during the audit.

The students prepared the final report which included the following sections: i) general data of the audited laboratories, ii) results of the observations with regard to the system of quality management, environment and security, strengths and weaknesses of the system, nonconformities and iii) establishment opportunities for improvement.

Finally a number of surveys adressed to all participants of the audit were conducted to analyze, by means of specific questions, all the aspects related to the preparation and implementation of the audit.

3. Results and Discussion

Auditing is a process that involves the use of analytical skills and judgement fulfilling technical standards. To adquire the required skills, the auditors must have prior knowledge and experience training. The skills that the students of the Quality and Prevention include to plan and propose actions to ensure quality according to the different management systems and to develop documentation of a quality management system. They must take the culture of quality and risk prevention and be aware of the need of the organization and work planning.

Audits can improve the scientific and technical competences of students, focusing on basic and applied aspects for a scientist or engineer, respectively, and also skills related to work as a team as the students have to interact with their corresponding partner in the audit.

The results of the audits are related to:

- All documentation related indicators.
- The improvement in the generic skills of students.
- The introduction of the students in the knowledge of quality management systems.
- Identifying any deficiencies in experimental subjects related to both the laboratories and the organizational aspects and, therefore, having a better understanding of the functioning of laboratories and to propose practical measures to their improvement.

The achievement of skills can be done through the training sessions and corresponding personal interaction when developing audits.

Students are not only limited to indicate the response that they consider most appropriate, according to the audit questionnare, in accordance with the responses of the partners, but point to a series of observations (objective evidence) that are valuable for the implementation of the report. These evidences are valuables for a futher analysis of the audited laboratory.

The survey of students, who have participated as auditors, about the degree of satisfaction with the new learning mode is shown in Figure 1. They have to answer 18 questions, 4 questions are concerning aspects before the audit, 8 questions about the audit process and the last 6 ones concerning the end results of the audit. Some example of the questions are:

4.- The available documentation helped you to prepare the audit?

8.- Was easy communication with teachers?

13.- How easy was preparing the report?

In general, the satisfaction of the students involved in the audit is quite good, with an average value just below 4, for both years. Question 11 and 13 are related to lidership in the audit and the ease in preparing the report.

Better results are found when analyzing the survey of the audited teachers, Figure 2. The questions with lower qualification, 2 and 8, are related with the statement of the objectives of the audit and the request for evidence to corroborate assertions. Some examples of the questions are:

3.- Was communication fluid?

5.- The questions were understood?

10.- Did auditors show enough knowledge?

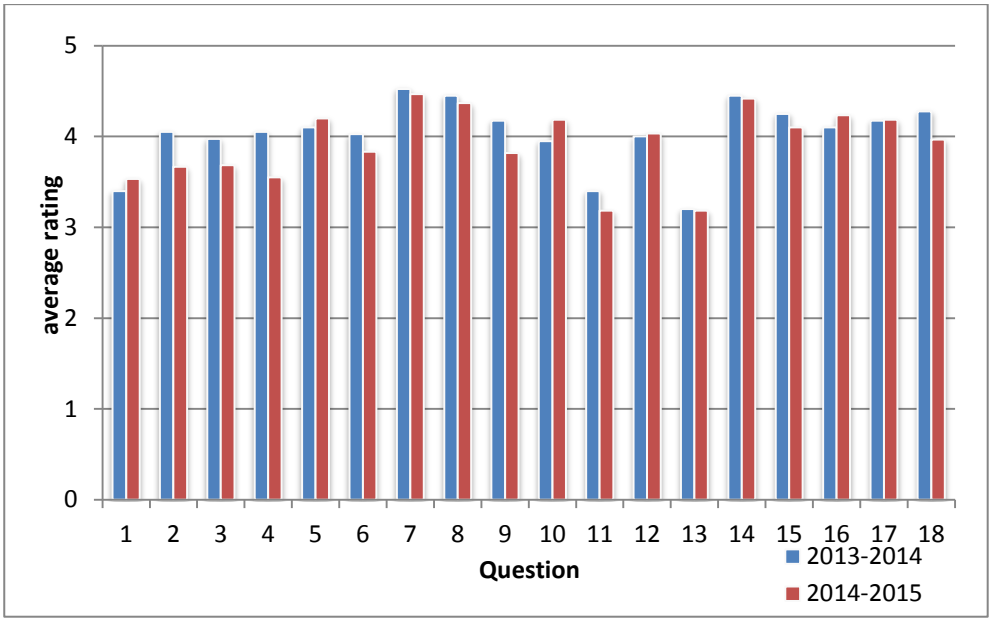

Figure 1.Satisfaction survey of auditors.

From the analysis of reports of the audit, it can be stated that students have improved the skills related to the analysis and interpretation of data, the ability of oral and written expression, the capacity for dialogue and leadership and the ability to find and integrate new knowledge and attitudes. Furthermore, the reports show that they have been able to integrate the dynamics of management systems of quality, safety and environment training.

Students have shown understanding of the work of others adapting and understanding different situations always with a critical look at an established system.

Importantly, the reports submitted by students have the rigor and quality enough to constitute a useful tool for the assessment and implementation of corrective actions in the teaching laboratories of the Faculty of Chemistry, allowing continuous improvement practice and performance of laboratories teaching.

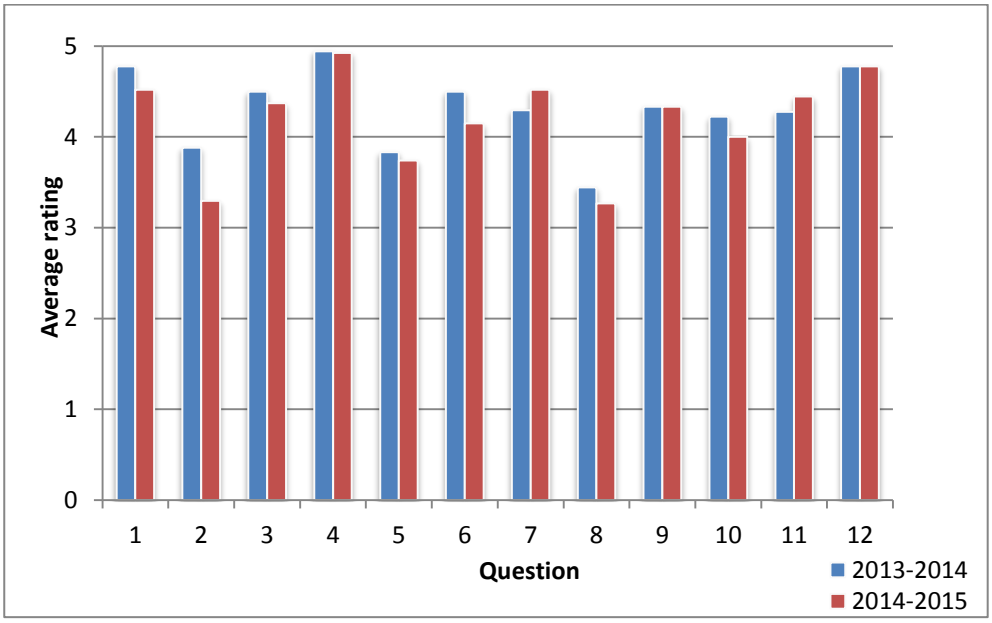

Figure 2.Satisfaction survey of audited teachers.

Conducting audits has forced the direct interaction between the auditor (student) and the auditee (teacher and trainee) which enables working capacity of understanding and communication of the work done by others.Surveys have shown a good level of involvement among people involved in audits and allowed to evaluate the usefulness of the same for students in their acquisition of skills.

At the same time, analysis of the results has led to a precise knowledge of the state of the laboratories of the Faculty of Chemistry.

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Student engagement with statistical design of experiments by active learning projects

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Abstract

This paper illustrates the use of design of experiments in an active learning environment in a new Master course in Quality and Environmental Engineering at a higher education institution in Portugal. The study took place in the unit of Advanced Techniques for Quality. The aim of this work is to explain how in an active learning environment the students worked on projects designed to use fractional factorial designs in order to improve a system including the impact that the approach had on students. Twelve master students took part of the classroom projects. Three groups of students worked on projects, created and developed by them contributing to increase their commitment and enthusiasm. In a classroom session the students made a presentation and the results were discussed. Each group also produced a video with the planning and execution of the fractional factorial designs which was helpful to start the debate. The active learning approach required that the students developed their own projects and decide when and how to do the experiments. Taking the responsibility of their activities was very enriching forcing the students to think about the things they did and questioning some of their own decisions.

Keywords: *Active learning; design of experiments; quality engineering; student-centred learning; factorial design.*

1. Introduction

Students' engagement with what they are studying is a key to high quality learning. According to Park (2003) students that actively participate in the learning process tend to understand more, learn more, remember more and enjoy more than those who passively receive the information provided by the teacher. An engaging learning environment have been proved to have strong association with learning outcomes (Schaufeli *et al.*, 2002, Sakurai *et al.*, 2016). The traditional teaching style of lecturers is in several cases verbally orientated, and the students are usually passive except for note-taking. This leads to inattentive and discouraged students losing interest in attending lectures (Prince, 2004). This type of teaching has been changing over the years to make way for active processes in which learners are active sense makers who seek to build coherent and organized knowledge (Mayer, 2004).

The teacher challenge is to stimulate the students to actively engage in the learning process and be able to develop their ideas and be creative, think more critically and also become better prepared to solve problems. The adoption of an active learning approach requires that the teacher adopt a student-centred approach (Wright, 2011) where the teaching and learning emphasize the student activity and responsibility in learning. Some characteristics of these student-centred teaching methods are: (1) the activity and independence of the student, (2) the coaching role of the teacher, and (3) knowledge which is regarded as a tool instead of an aim (Baeten *et al.*, 2010).

The new generation of students that were born in the 1990´s have different learning styles and different characteristics e.g. their preference for experiential learning, their digital literacy, the need for interactivity. These are some of the subjects that need to be introduced in the classroom (Skiba & Barton, 2006). The different learning styles and different expectations of this new generation of students requires that focus is placed in student-centred approach learning. Accordingly, several teaching methods were developed that indeed emphasized the effectiveness of active learning (Prince, 2004).

Both general higher education literature and statistics education literature highlight the importance of active learning and student engagement. In statistics the learning comes through doing and practice. Many students studying statistics are not doing so out of choice and are not necessarily convinced of its usefulness and they may see it as an imposition, not an interesting learning experience to be applied in their profession. (Bidgood *et al.*, 2010). The introduction of a project chosen by the students engage them in higher order thinking tasks as planification, analysis, synthesis and evaluation. This strategy to promote active learning is defined as an instructional activity involving students doing things and thinking about the things that they are doing. The objective of this paper is to illustrate the use of design of experiments in an active learning environment in a new Master course in Quality

and Environmental Engineering. In the project the students design experiments evaluate experimental data, and develop the ability to work together in small groups. Studies and reports by the engineering accreditation, ABET suggest that achieving these objectives can help the students in their future engineering profession.

2. Curricular unit Description

Advanced Techniques for Quality is a curricular unit of the Master course in Quality and Environmental Engineering at ISEL a Higher Education Engineering School from the Polytechnic Institute of Lisbon. The first edition of the Master course as well as the first edition of the Advanced Techniques for Quality took place in the winter semester of 2015-2016. The curricular unit was taught twice a week with sessions of 90 minutes each over fifteen weeks covering a semester. The unit covers topics related to product and process design and improvement. The objective is to introduce the experimental design and the types of problems in which designed experiments are useful specially its contribution to the design of more reliable products with greater performance and easier to manufacture. The techniques discussed are of great use in the design and optimization of products and processes. They are used in many industries and are essential for engineers because its correct use is a key factor for better quality and productivity leading to more competitive organizations. The students should acquire skills to demonstrate knowledge of the techniques to evaluate and optimize parameters, namely applying such tools in process/product optimization or in the development of new products and processes. Students should also demonstrate critical and analytical skills by using these techniques. The assessment of the unit includes two short tests during the semester to allow students to demonstrate what they know and if they are achieving the desired learning outcomes. The tests weight a total of 20% of the final grade and the main objective is to allow the teacher to monitor students´ learning along the semester in order to adapt the teaching strategies to the class. Another assessment technique is a summative test that contributes with 40% to the final grade and occur at the end of the instructional unit and measures the extent to which the students have achieved the desired learning outcomes. The project also weights 40% of the final grade and is very important because give the students the opportunity to go deeper with the material to set the knowledge they have acquired and also be creative and engaged with the learning process. The project is a group activity and so allows the students to develop the ability to work as a team and also give the students who do not test well the opportunity to demonstrate their skills and acquired knowledge. The project was created as an evaluation activity in order to be engaging and enjoyable for the students. It was our objective to create an evaluative process that would fully engage learners and at the same time could provide us the feedback that we wanted and that we would be able to use. The main objective of the summative test is to have a standardized component of the evaluation

process so that it will be easier to monitor over time. The introduction of the project, which is a student-centred changing element, let us get feedback from a new perspective with projects chosen and developed by the students.

3. Design of experiments project

Central to Advanced Techniques for Quality curricular unit is the students´ design of experiments project. The project with an experimental design focus engages students in experimental design methodology. After the development of the project the students should be able to: (1) explain how designed experiments can be used to improve product design and improve process performance, (2) estimate main effects and interactions of factors, (3) understand the factorial and fractional factorial design concept, (4) know how to use the 2^k and 2^{k-p} system of factorial and fractional factorial designs, (5) know how to use the analysis of variance (ANOVA) to analyse data from factorial designs, (6) know how residuals are used for model adequacy checking for factorial designs and (7) know how to construct and interpret contour plots and response surface plots.

The students will consider a designed experiment as a test or series of tests in which purposeful changes are made to the input variables of a process so that they may observe and identify corresponding changes in the output response. To use this approach, it is necessary that the students involved in the experiment have a clear idea in advance of the objective of the experiment, exactly what factors are to be studied, how the experiment is to be conducted, and at least a qualitative understanding of how the data will be analysed. Montgomery (2013) gives an outline of the recommended procedure.

3.1. Project development

After the first seven weeks of classes the students start the project. A total of twelve students were grouped in teams of four elements with a total of three groups. The students were asked to pick a subject of their interest and propose the topic, plan the experiments, perform the experiments and analyse the results. Antony and Capon (1998) in their article present a "paper helicopter experiment" which can be easily understood by the students providing a stimulus for the students to think about their own project. The article was delivered to each group of students at the beginning of their work and served as a trigger to the project development. The objective is that students design the experiments to perform without receiving instructions on how to perform the experiments, instead the students have to design the experiments themselves to achieve the specific goals. Each group of students developed each own project and after fourteen weeks since the beginning of the semester they present the project in a session. The discussion of the findings is made with the

teachers and peers in a session where they have to present the work developed and explain all the steps of the work. The procedure for designing the experiment is presented in fig. 1.

The students also present the step by step procedure in a video which makes easier the discussion and debate with the professors and colleagues. The production of a video was a requirement that the students should also accomplish. The objective of the teachers with this requirement was to get students energized and engaged in the hands on learning process. The video is also an instructional medium that the students would use to explain the project to peers and to the teachers allowing to a better understanding of the project.

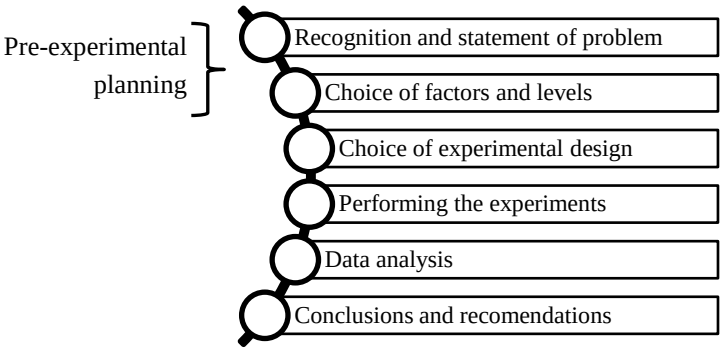

Figure 1. Procedure for designing an experiment.

3.2. Performing the experimental design

The students developed their projects in seven weeks. At first the students develop all ideas about the problem and about the specific objectives of the experiment and came with the idea of the project. Then they choose the factors to be varied in the experiment, the ranges over which these factors will be varied, and the specific levels at which runs will be made. In selecting the response variable, the students took into consideration that the variable provides useful information about the problem under study. In the choice of the design the students took in consideration the number of replicates, the selection of a suitable run order for the experimental trials, and the randomization restrictions involved. The students were actively engaged in the learning process and each group developed their own ideas and creative thoughts about the project to develop. Each team's project is identified in fig. 2. Although in some cases students may have prior expectations regarding the results of the experiments, they are not supposed to make predictions before running the experiments. Only after performing and analysing the experiment the students were able to fit a regression model to the data and use the model to obtain the predicted values at any point in the region of experimentation.

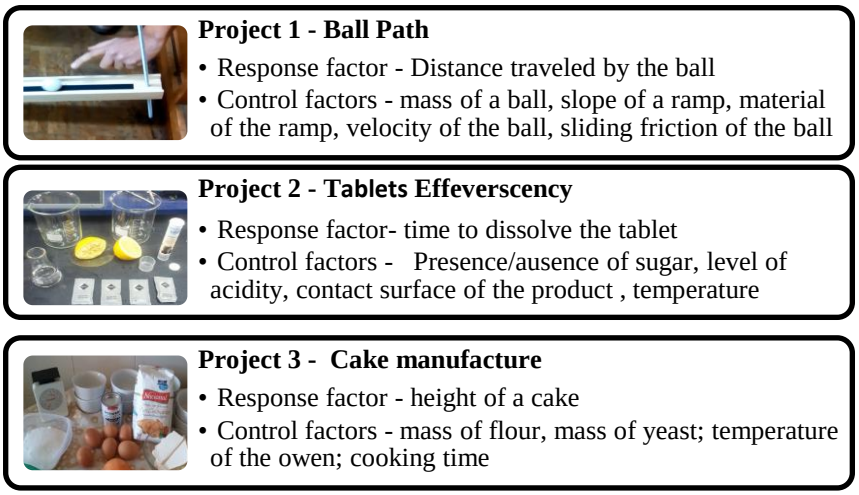

Figure 2.Projects developed by the students.

4. Students' perceptions about the usefulness of the project

In one session of 90 minutes the total of twelve students, grouped in teams of four, reflected about the usefulness of the project. In the session the teachers used a verbal open ended questions focusing on the students perception about the usefulness of the project. The teachers used face to face conversation with the teams, unstructured, apparently informal with some pre-determined questions for later in depth analysis. The goal of the project was to help students learn to design experiments and learn how to interpret data and mainly to actively engage students with statistical design of experiments. Some questions were used to guide the conversation:

- What do you think about choosing the topic and develop your own project?
- What do you think about the usefulness of the project to help you to better understand design of experiments methodology?
- Which were the most important things you learned from the project?
- What do you think of the project as an evaluation tool?
- Do you think the project should be kept with this format for the next year?

Qualitative research was used in order to explore the ways in which students think and feel about the project. Rather than producing statistically representative data the exploratory research performed facilitates the identification of general trends regarding students' perceptions.

When questioned about the requirement to choose the topic and develop the project all the students referred that at the beginning they thought it would be difficult without instructions

but soon became engaged and motivated with their own ideas. When questioned about the usefulness of the project all the students were able to identify the goal and they felt that the work was very useful in order to better understand the steps of design of experiments methodology. The students were asked to describe important things that they learned from the project. All the students found important to figure out things independently without the help of the teacher. They also considered very enriching the fact that it was their responsibility to devise a procedure for the investigation and describe their own design. The identification of the independent and dependent variables in the experiment was also very challenging. The students also found very motivating have to decide about the range of variation of each variable and discuss with colleagues how the range could affect the results of the experiment. One group also referred the usefulness of the graphical methods in the interpretation of the results. All the students referred the difficulty that they faced not particularly in choosing the factors to be varied in the experiment but mostly the ranges over which these factors would be varied, and the specific levels at which the runs would be made. Students mentioned that they did not realized, until they made the project, how important it was having some previous knowledge of the process in order to better select the work levels of the factors. The students found the project enjoyable as an evaluation activity and found important to have a group activity in order to enhance their ability to work as a team. All the students found important that the project should be maintained for the next edition of the course. They also referred that the teachers could introduce the projects developed this year to the next year students because this could work as a trigger to new project ideas.

5. Conclusions

We found that students improved on the ability to design an experiment, to devise a procedure to make the experiment, and to analyse the data using appropriate tools. We also found that the students proved to be able in a simple way to communicate the details of the experiment, as well as the difficulties they faced. From the teachers perspective the communication is one of the key roles of the engineer. The quality engineer must be able to explain the results of a complex analysis to a customer with little knowledge on the subject. Teachers must take this into account when devising an assessment strategy for a curricular unit. Another important thing was the enthusiasm of the students when presenting their work and video of their project. Some students brought inclusively samples of their experiments (e.g. cake samples). It was very interesting to note that despite the concepts were previously taught in classes using a combination of techniques (e.g. lectures followed by a practice, case studies, computed guided sessions) the students were much more involved with the project and motivated to put in practice the statistical tools. We think that the “statistical design of experiments thinking” is very important. Although we are in the

age of computers where they can not only perform all the calculations but also suggest appropriate methods of analysis and in some cases write an automatic report allowing for statistical thinking is much more challenging than assessing the ability to perform routine calculations. The introduction of a student-centred teaching practice with the inclusion of the project allowed the promotion of student´s qualities such as intrinsic motivation that stimulate more engaged and deeper learning. The results of the qualitative research of the project were very promising in order to repeat the project approach in the second edition of the master course. It would also be interesting to compare the results of the next year with the results obtained in this first edition of the course as well as with similar courses of different schools.

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Student support to enhance student living and learning at a South African University

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Abstract

Quantitative measures show that the higher education system in South Africa remains inefficient and this reality poses significant challenges to all universities. The Faculty of Humanities at the Tshwane University of Technology has added a Student Support Programme to the existing institutional student support structures. In this article, the author reflects on the experiences of student supporters who were appointed in 2014 and 2015 for the enhancement of students' living and learning to improve success in the Faculty of Humanities. The findings indicated that this programme has indeed improved the academic performance and personal circumstances of hundreds of students. The under-preparedness of students entering South African higher education institutions was highlighted as a major obstacle in academic performances. The majority of students who are supported by this programme experience intense personal and social challenges that are by and large brought about by and as the result of severe financial needs. The student supporters were adamant in their departing statement that much more had to be done over and beyond the general and existing approach and support structures at the Tshwane University of Technology to support these students.

Keywords: *Student support; Student living; Student learning.*

1. Introduction

According to the National Development Plan (NDP), university success rates in South Africa are relatively low compared to similarly developed countries (NPC, 2011). The problems of low participation, retention and graduation rates are a huge challenge and raise significant concerns about the productivity of the system and the high costs to government and institutions (DOE, 2001; DHET, 2011; CHE, 2013; NPC, 2011; Lewin & Mawoyo, 2014). A cohort study conducted by the Council of Higher Education (CHE) shows that only 50% of students entering higher education will ever graduate (CHE, 2013).

Tshwane University of Technology (TUT), with 57 000 students is the largest residential university in South Africa. The Faculty of Humanities with 13 000 students is one of seven faculties and is situated in Soshanguve, a black township in the Pretoria area of the Gauteng Province. Although higher education in South Africa has become more accesible over the past two decades, it is still unaffordable for the majority of historically disadvantaged students from poor financial backgrounds. Many of our the students come from households of unemployed parents. The HIV/AIDS pandemic in South Africa caused the death of many parents and these orphans depend on the assistance of relatives, community members or the state to be able to enter into higher education. Students who managed to get support from sponsors are mostly accommodated in the hostels on campus but many students are obliged to seek alternative accommodation in the surrounding area and this is not always without risk. When the majority of the students registered with the faculty have to live and learn under such difficult circumstances, the average success rate of 78% over the past 3 years is aceptable but the graduation rate of 21% and dropout rate of 28% from the 2011 cohort, is a matter of concern. Steps aimed at supporting and guiding our students towards academic success were desperately needed.

For these reasons the Faculty of Humanities has decided to add a Student Support Programme to the existing institutional support structures such as subject tutors, mentors and professional councellors to address and contribute in enhancing the quality of living and learning of students. In this article, the author reflects on the experiences of the student supporters appointed in this programme over the past two years in order to indicate the effectiveness of this intervention with specific reference to academic and non-academic factors.

2. Literature review

Student success is complex and multi-dimensional. Lewin and Mawoyo (2014) identify two interrelated factors that impact on student success, namely academic and non-academic factors. Academic factors can be student-related or staff-related. For the purpose of this

article the author used this classification with her own interpretation. Student-related factors include aspects such as students' preparedness for tertiary study and their attitude and approach to further study. Staff-related academic factors, which for the purpose of this article will not be attended to, include staff members' approach to pedagogy, their attitudes and skills and their ability to handle pressures related to time and workload. Non-academic factors refer to students' personal, social and financial challenges, their living conditions and socio-cultural and systemic factors.

In 2014, the Directorate of Quality Promotion (DQP) at TUT conducted a survey on the First Year Initial Experience (FYIE). Findings from the FYIE report (TUT, 2015), specifically from the approximately 700 respondents of the Faculty of Humanities, assisted to strategise this intervention with the aim of enhancing student success.

3. Student Support Programme

To be selected as facilitators for the Student Support Programme offered by the faculty, senior students should not only be academic achievers. They should have shown leadership skills, have good communication skills and should be able to manage their own academic programmes as such that their workload as student supporters does not negatively impact on their academic performance.

In 2014 eight senior student facilitators were appointed and each was assigned to a specific academic department in the faculty for 19 hours per week. This number increased to ten student supporters in 2015. They worked closely with head of departments, subject lecturers, subject tutors and student supporters as well as with TUT's division of Student Development and Support (SDS). Regular feedback sessions with the Dean were honoured and they had to submit written semester reports about the progress of each student at risk.

Student supporters are available for students who are not performing well academically or who experience challenges with regard to non-academic issues that have an impact on their success. The tasks of student supporters can be summarised as follows:

- At the beginning of the year they identify students who are academically at risk, based on the final results of the previous year or students who have not performed satisfactory during the first test series of the year.
- Student supporters arrange personal meetings with students. The student supporter introduces himself/herself to the student and explain the purpose of the intervention.
- After the initial consultation, a student is categorised as a high or low risk student and a student file is opened.

- The student at risk is then referred to the subject tutors, mentors or professional counsellors.
- The student supporter stays in contact with the recommended support structure and requests regular reports on the student's progress.
- The student supporter monitors the student's progress after each assessment cycle and considers transfer the student to the higher or lower risk category.
- The student supporter constantly identifies and contacts new underperforming students based on test results.

4. Research question and methodology

To determine the value of the support programme, the following research question needs to be answered: How effective is the Student Support Programme to enhance students' living and learning at a South African University?

A qualitative research approach was followed because it provided the means to investigate the complex ways people interact in their everyday lives which enabled the researcher to increase her understanding of people's experiences and perspectives (Stringer, 2004). The participants comprised second, third and fourth year students appointed as student supporters.

Apart from regular feedback sessions with the student supporters during their term of service/appointment, semi-structured interviews (Leedy & Ormrod, 2005; Mertler, 2009) were also conducted with each participant towards the end of their term. Document analysis as another data collection instrument was utilised. Analysing the semester reports ensured that the researcher didn't miss the truth of the examined phenomenon, namely student success (Lynch, 2010).

5. Findings

Since 2014, a total number of 863 students at risk have been supported and/or guided by student supporters. The findings are discussed under themes which represent academic and non-academic factors that impact on student success in higher education.

5.1 Academic factors that impact on student success

The following student-related academic factors are discussed: Under-preparedness of students and their attitudes and approach to their studies.

Under-preparedness of students

The majority of schools from which the Faculty's students come, do not adequately prepare learners for tertiary education. Inadequacies in the secondary school system (the details of which are not relevant for purposes of this article) are seen as a major stumbling block for student success. A student supporter stated that *"The huge gap between school and university needs to be closed so that struggling students can progress"*.

Most students from rural schools agreed that English as the language of instruction and in most cases, their third language, causes major problems for them. It also transpired that students are scared and hesitant to ask questions in class or to seek assistance from lecturers and tutors. One student supporter referred to the remark of a student who was in need of support: "*I don't want them [lecturers] to think that I do not belong here, so it is better to keep quiet*." This language barrier contributes to some students' withdrawing from group discussions or refraining from asking questions in class. Student supporters speak various African languages which made it easier for students in a country with 11 official languages, to express themselves more clearly in their mother tongue during conversations.

Students' attitudes and approach to studies

Linked to the issue of seriously lacking proper career guidance at schools, are the attitudes towards and their approach to studies at tertiary level. Some students see themselves as victims. Everybody else is responsible for their failures. They demand relief in some or other format and if it does not arrive, the system has let them down. The language problem and their weak language competecy, contributes to them losing faith which all culminate in the attitude of despair. Student supporters elucidated how they struggle to encourage students who have already given up.

5.2 Non-academic factors that impact on student success

The following non-academic factors were identified as themes for discussion: personal, social and financial challenges, living conditions, socio-cultural and systemic factors.

Personal, social and financial challenges of students

It has become a known fact that the allocated amounts by the National Student Financial Aid Scheme (NSFAS) and the available bursary funds within TUT, are clearly inadequate to meet students' financial needs. Many students are on a daily basis without food and basic

necessities. Student supporters explained how these conditions cause embarrassment and stress for students and how impossible it is for them to focus on their studies.

According to one student supporter a female student admitted during the first conversation that she got involved in prostitution to buy food and clothes. The student supporter convinced the student to report to the SDS for professional counselling. The supporter remained involved throughout the rehabilitation process and ultimately the female student, with the necessary profesional counselling and financial assistance, changed to a healthy lifestyle.

Another supporter, while walking on the campus, met a young man who was an orphan and came with only his backpack from the deep rural areas of the Eastern Cape Province with the hope to receive financial assistance and be admitted into the university. Although he did not apply in advance, he was determined to wait. Without been noticed, he lived on the roof of a campus residence for several weeks. The student supporters organised temporary accommodation for the student and provided in his basic needs while arranging a meeting with the NSFAS officials. Eventually the young man succeeded to receive financial assistance, was allowed into a course and at the end of 2015 successfully completed his first year of study.

Living conditions

The majority of students, even those who are accommodated in TUT hostels at the campus, are complaining about their living conditions. The Soshanguve campus, before the dawn of democracy in 1994, formed part of the historically disadvantaged higher education institutions and although many resources have since been made available for the upgrading of this campus, it is still far from being an ideal living space for students. Protest actions are sometimes the result of students not being satisfied with the living conditions on campus. Student supporters, mostly also living in the hostels, are now the ones who report threatening situations in hostels to the faculty management.

Socio-cultural and systemic factors

Despite orientation programmes for new students at the beginning of the year, the lack of sufficient interaction between students and the academic, social and support systems of the university is probably the most important reason why students cannot cope with life at tertiary institutions. As a result of the Student Support Programme, the Faculty of Humanities, at the beginning of 2016 has intensified its first year orientation programme and is looking forward to determine the effect thereof soon.

5.3 Challenges faced and experiences gained by student supporters

To trace some students is diffucult because of missing and incorrect contact details and students not responding to messages. Apart from the 19 hour per week appointment of student supporters, student supporters spend many additional hours moving around campus, in residences and sometimes even in classes to trace students at risk.

Winning the trust of some students and convincing them to open up, is a time consuming process; even more because of the stigma attached to students who were labelled by others as "poor performers" or "underperformers". Supporters sometimes also find it difficult to keep students motivated and not to withdraw from the support programmes.

The growing number of students seeking support, become impossible to manage. That impacts on infrastructure which requires a need for more private spaces to conduct interviews with students.

When posing the question to the student supporters "*What have you learned and gained from your involvement in the Student Support Programme?"* they were unanimous that this peer support programme is much more effective than the availability of *"… highly qualified staff members waiting in their offices for students to report during their consultation hours"*. For the student supporters this journey was an enriching, but also an emotional experience. Although it was and still is not expected from student supporters to councel other students, it is clear that they often found themselves caught up in a situation where they are forced to give advice to their fellow students in need. Student supporters admitted that reaching out to their peers in this way was a life-changing experience. One student supporter was quite emotional when he remarked: "*I believe that every single student that has been saved by my effort, is a life and a career that was saved. It definitely changed my life for ever."*

6. Conclusion

The research question, *"How effective is the Student Support Programme to enhance students' living and learning at a South African University?" was answered in the discussion of the findings.* Although clear challenges still exist concerning the implementation of the Student Support Programme, the positive results and success stories are remarkable. A large number of students' living standards as well as their attitude towards academic matters and subsequently, their academic performance changed drastically because of the involvement and intervention of students supporters which resulted in the consecutive professional aid by the university's support systems. The

Faculty acknowledges that this intervention must be continuously adapted and intensified to provide in the growing need for student support to enhance student success.

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Improved learning performance based on a flipped classroom concept – a case study

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Abstract

Aim of the research was to improve effectiveness of university education. With the use of new digital tools the learning processes in many different disciplines have been enhanced. However, the traditional class room training can hardly be replaced entirely as the students' motivation drops with less direct interaction with the instructor. Hence small private online courses are more successful than massive online education. The authors have developed a sophisticated flipped classroom learning approach incorporating various digital tools ranging from different kinds of videos to a class response system combined with class room lectures. The case of the course introduction to management accounting at the University of Applied Sciences Berlin is been presented to demonstrate the usefulness of the flipped classroom concept. An empirical analysis confirms that the students' acceptance is highest if various methods of teaching are been applied. In particular relying on digital tools only is seen as ineffective and of less value. Eventually, based on the analysis and classroom observations improvement opportunities have been derived in order to further increase the learning performance.

Keywords: *Digital learning, flipped classroom, motivation, learning performance, class response systems, blended learning.*

1. Introduction

Study wherever and whenever you want! No more dependence on time and space. Every student can listen to top professors. MOOCs (massive open online courses) raised several expectations and during the last years MOOCs are one of the most common buzzwords in educational science. Everything started with the first MOOC introduced by the University of Manitoba in 2008. The breakthrough was in October 2012, when 180.000 students enrolled for the free edx.org course CS50x (a Harvard MOOC of Introduction to Computer sciences) and just one month later the New York Times announced "The year of the MOOC". However, less than 1% (1.439) of the course participants received a certificate. Empirical findings on MOOC-participants indicate a drop-out rate of around 90% for almost all MOOCs (Schultz 2014). John Hennessy (president of Stanford University) named the problem and said "such courses were too large to engage and motivate most students successfully" (Hill and Waters 2014). As a consequence some of the MOOC-providers changed their views. Instead of "massive" the providers decreased the amount of participants. These new alternatives are called SPOCs (small private online courses) and they provide - because of their relatively small size - the possibility of an intensive dialog between student and lecturer.

As a result of this development some Universities support teachers with ideas around flipped classroom lectures. These hybrid-lectures include the classic frontal teaching combined with online content and ensure an active exchange and quick feedback. This shall increase the student motivation. A basic assumption is, that a professor in traditional courses often realizes weaknesses and gaps among students not until the exams. However, online feedback can be seen in real-time, if required already during the lecture. With this new approach, the professor is able to recognize weak students seeking for help. Another advantage of flipped classroom lectures is, that the student is still present in the classroom. A recent meta-study showed: as more present students are as significant better are their results (Schulmeister 2015).

This paper deals with the question if the mentioned considerations are adoptable for the course "introduction to managing accounting" at the Hochschule für Technik und Wirtschaft (HTW) University of Applied Sciences Berlin. More detailed the authors analyse student motivation depending on a flipped classroom concept.

2. Student motivation and the new learning concept of the course: introduction to management accounting

The influence of new media on the learning behavior is an often mentioned topic and scientists have analyzed it extensively during the last years. Under the influence of an increasing amount of students and the development of new technology, the learning behavior is – without a doubt - changing. Therefore this chapter introduces a short section

about student motivation (2.1) as well as an introduction to the new concept and the used digital tools of the course: introduction to management accounting (2.2).

2.1. Student motivation

Every performance which exceeds the daily requirement of a student (routine decisions), request for abilities and effort. This basic assumption can be found in different models regarding learning performance (e.g. Heller 1991, Helmke and Weinert 1997 read in Rheinberg et al. 2001). According to Rheinberg et al. (2001) these models include 2 important factors: cognitive competence (e.g. intelligence, knowledge) and motivational factors (e.g. self-concept, instrumental motivation).

Another approach from Deci and Ryan (2000) identifies different types of motivation. They are based in the perceived locus of causality, which can be internal, external or impersonal. Thereby it is important to know, that the classical motivation psychology is interactionistic. The behavior of a person is therefore, a result of interactions between personal- and situational factors. These personal factors are known as motives and can be explained as attributes which lead to a preference of stimuli. Situational factors on the other hand describe the chance to reach the preferred stimuli in a specific situation. If situational factors fit with personal factors a current motivation can accrue. Only these current motivation (and not the motives) influence directly the behavior of a person and as a consequence increase the performance (Figure 1).

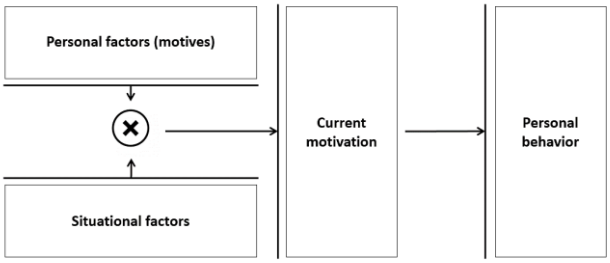

Figure 1. Classical model of motivation psychology. Source: based on Rheinberg et al. 2001

If these basic assumptions are adopted to an university classroom, there are two possibilities to influence students motivation: adjust the motives and offer stimuli.

2.2. The flipped classroom concept of the course: introduction to management accounting

The authors teach the course introduction to management accounting at the HTW Berlin - University of Applied Sciences. Main content of the course are product costing methods, special cost analysis methods and budgeting methods. Furthermore relevant topics, recent developments and international aspects are discussed. The course consisted (before

changing to the new concept) of around 50-60% classical frontal teaching and 40-50% exercises. The structure and content of the course reflected a typical German management accounting course (Dressler and Rachfall 2012). An analysis of the course statistics shows an average drop-out-ratio of 20% and an average grade of 3.0[1] over the last 5 years. This average performance so far is creating a problem as business engineers often are employed in technical sales and large project accounting tasks in which proficient management accounting capabilities are required. There is a latent risks that graduates are not optimally educated for the job market requirements. Due to this and the relatively high drop-out-ratio the authors decided to develop the new concept.

To support the learning process of the students - without lowering the high level of the course – the authors changed from a classical lecture format to a flipped classroom design. Several different tools are part of the new concept:

Theory videos: To increase the effectivity of the lectures, 12 theory videos were produced. They cover the 12 most important lectures and are based on the original Power Point slides of the lectures. Each of the videos last for approximately 20 minutes and is uploaded in advance. So, every student has the opportunity to be well prepared for the lecture (e.g. structure first questions). Furthermore the students are able to learn at an individual pace and they can repeat the videos for as many times as they wish.

Presentations: Moreover, the Power Point slides of each lecture (#14) are uploaded (as a PDF file). Every student can take notes, comments and questions.

Exercise videos: Additionally, 31 videos were produced with different exercises. These Excel based videos last for around 6 minutes each. On the basis of these videos it is possible to understand and reproduce the content and approach of the exercises.

Class response System (CRS): Following the students wish to provide more exercises, the authors introduced a CRS. The system selected and used is called ARSnova and is provided as an open source solution by the TH Mittelhessen. At the moment the students can find more than 90 exercises and questions which deal with the content of the lecture. ARSnova offers advantages for both, students and lecturers. The first can test their knowledge and practice and lecturers have due to ARSnova the possibility to monitor the level of knowledge. As a result weaknesses can be identified and eliminated. Consequently a target oriented knowledge transfer can be provided.

[1] A 3.0 can be translated as satisfactory – a performance which meets the average requirements. The corresponding equivalent would be C.

In combination, the different tools should create a continuous engagement of the students. During the whole course the student has to deal with the content of the course. Figure 2 shows the general proceeding of a typical course week.

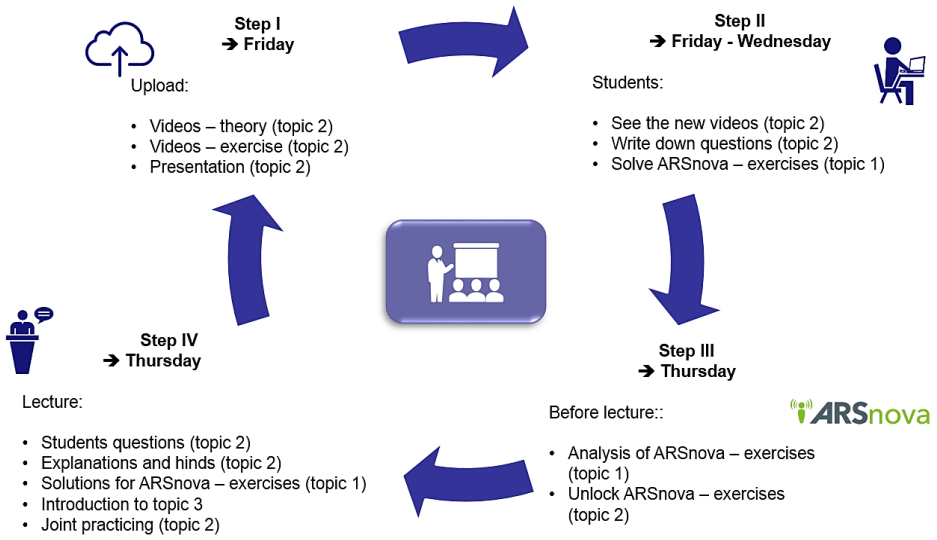

Figure 2. Typical course week. Source: authors

3. Methodology

The objective of this paper is to analyze the influence of the new developed flipped classroom concept on the student motivation.

3.1. Sample and data collection process

Sample of this paper are the students of the course introduction to management accounting at the HTW Berlin. The course consists of 14 - 16 lectures, depending on the semester. The students are usually in the 2nd year of the bachelor study: business administration and engineering. The course is regularly separated into two groups of 40 students. This semester 102 students are registered in both courses. 65 students participated (64% of the sample). A questionnaire was used to collect the data two weeks before the exam. The advantage of a questionnaire strategy is that it provides standardized answers that make it simple to compile data. Because the motivation topic is a very complex one, quantitative (4 point Likert scales) as well as qualitative data were collected to triangulate findings. The collected data were analyzed with the objective of establishing links between student motivation and the new concept. Furthermore the data were analyzed by SPSS and MS Excel.

3.2. Measures

To test the influence of of the new developed flipped classroom concept on the student motivation the participants were asked regarding different topics (seperated into qualitative and quantitative clusters). The used items for the quantitative analysis were influenced by the work of Thielsch and Stegemöller (2014), Rheinberg et al. (2001), Wilkesmann et al. (2012) and Grötemeier and Thielsch (2014). The quantitative clusters were represented by the 3 following scales:

Motivation: Main objective of this scale is to find insights about the motivation of the students. A scale with 7 items was used to identify the overall motivation. A high value means that the students are motivated. The internal consistency of the scale is Alpha 0.91.

Concept: Within this scale it is important to find out how and to what extend the students accepted the new concept. A scale with 9 items was used to analyze the overall acceptance. A high value means that the participants are satisfied with the concept. The internal consistency of the scale is Alpha 0.85.

Tools: This scale analyses how satisfied the students are with the different tools (theory – and exercise videos, presentations and ARSnova). A scale with 16 items was used to analyze the quality of the tools, the usage behavior and the support feelings. A high value means that the students show a high acceptance. The internal consistency of the scale is Alpha 0.80.

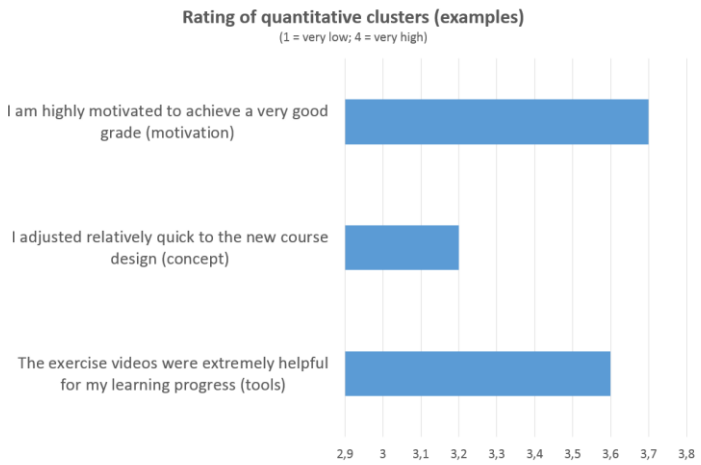

Figure 3. Examples of Likert-ratings for clusters. Source: authors

4. Findings

The core topic of this paper is, if the new developed flipped classroom concept has an impact on student motivation. Therefore the mentioned scales in chapter 3.2 were analyzed with the help of a correlation analysis. Two significant inter-correlative connections can be detected. This includes the scales concept and motivation as well as motivation and tools. The results of this research support therefore the initial assumption: The new concept and the used tools have both a positive effect on student motivation.

Apart from the correlation analysis, some other questions can be answered. The comparison between different teaching concepts in Figure 3 shows a clear preference for flipped classroom lectures. This can be supported by some of the qualitative data. 18 Students (28%) mentioned the good teaching style and the structure of the course. 23 Students (35%) mentioned, that they are highly motivated because of the provided tools. Furthermore the students state that they like the possibility to see the videos again and again (28%) and exercise whenever and wherever they want (14%). This allows a continuous learning progress.

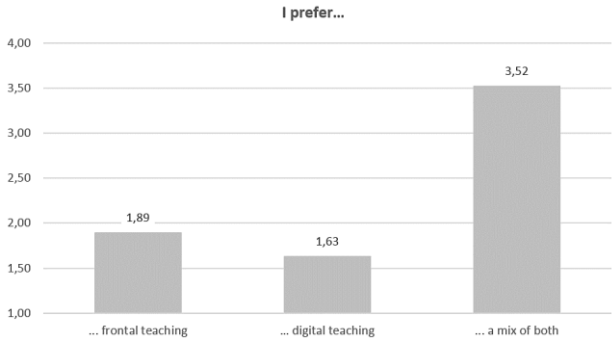

Figure 4. Different teaching concepts. Source: authors

5. Discussion and Conclusions

The findings emphasise the importance of a flipped classroom learning approach. The fact that students significantly prefer the combined teaching using both frontal lectures and digital tools versus only one teaching method indicates that the most effective learning takes place through combination. Classroom teaching has been the classical method of teaching for centuries and is the most applied form of teaching in many content and methodology-driven disciplines like management accounting. On the other hand, digital learning has been introduced already 25 years ago to external and management accounting and a diverse range of software-based learning tools have been developed since the early 1990 (Gabele et al. 1992). However, none of the digital tools have revolutionised the teaching methodologies and have prevailed as the single best methods. Students applying

computer-based self-training tools need to maintain extremely high levels of motivation and self-discipline in order to complete the course. Moreover despite the fact that most self-training tools offer the opportunity to control the learning progress, very few expose themselves to the constant monitoring and adjust their learning according to the self-test results. Without any external control mechanism motivation keeps decreasing and the learning success is in jeopardy. Observations from the class room confirm this assessment as students often feel challenged of even completing the theory and exercise videos. Only through motivation in the class room students feel encouraged to run through exercises and to recognise their individual learning progress. The use of a class response system has proven to be very effective. Students can individually work on exercises and control their knowledge and skills acquired so far. Furthermore, the instructors are able to identify significant learning and comprehension gaps and can react accordingly in the class room. It appears that the flipped classroom approach consisting of regular class room session combined with theory and exercise videos supported by a class response system turns out to be a very effective teaching concept. Certain improvement opportunities were identified by the instructors and confirmed by the students. One structural improvement related to the class organisation will ensure a better distribution of the workload over the entire semester. Students were collecting videos but were not effectively learning with them with the intent to internalise all content towards the end of the semester as part of their exams preparation. Due to the sheer amount of class materials this is an insurmountable tasks which will overstrain the knowledge absorption capacity. Therefore, the learning progress will be monitored at 4-6 milestones in form of short computer-based tests over the course of the 4-month semester in order to ensure a more balanced learning. Another improvement opportunity is related to the plenitudes of materials as well. The learning density based on videos, exercises and class room training is extremely high and partly over exceeding the mental intake capacity. Partly this is even causing stress for the students. Consequently monthly recap sessions will be introduced to summarise and recess the content.

Even though the presented multi-method based flipped classroom concept has demonstrated high levels of effectiveness it will require further optimisations. Monitoring the knowledge absorption and the ability to transfer will be key to balance over and under challenging of students.

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Promoting metacognitive reflection: a work proposal

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Abstract

The metacognition as a self-regulatory strategy presents itself as an essential element in the whole process of learning. Lead students to reflect on their way of learning and their strategies, promotes in them this self-awareness and this ability of self-regulation that are very important to help them become "expert learners". It was with this aim that we structured a course prior to the start of students' academic activities, entering for the first time in a degree at university. This work seeks to describe the aims, the structure, and the development of this same course entitled "learn how to learn", as well as with some thoughts on how it took place.

Keywords: *metacognition, online learning, adults, learning self-regulation*

1. Introduction

Students' permanence or failure in online education system is a subject that concerns all those who work in this type of learning system. Woodley and Simpson (2004) say that "most students drop out because of reduced motivation, and that the first thing students do when they are losing motivation is to stop visiting web-sites, watching podcasts, and so on" (page 465). One of the causes of this possible demotivation may be due to the ineffectiveness of strategies used by the students to work the scientific content. Radovan (2011) found in his study a strong relation between motivation, the task value, self-efficacy, and the effort to auto-regulate strategies. Auto-regulation of learning is a primordial factor to an active control of the learning process. The results of Macejka's study (2014) point out that students with a more intern orientation use metacognitive regulation strategies more frequently. These strategies become more sophisticated throughout their learning pace. It is extremely important make students think over their learning strategies, so that they become more autonomous and more expert in their learning process, and thereby ensuring their motivation and consequent retention and academic success.

2. Work proposal

In this chapter we are going to present the arguments and the underlying structure to the design of this module.

2.1. Context

In the previous chapter, we described the importance of metacognitive knowledge and of self-regulation in the learning process. Since our work was developed within a very specific learning context, we are going to describe some online learning characteristics. This learning system is characterized by the absence of spatial temporal constraints. Thereby, the learning process occurs without being present in the same space and at the same time the different agents (students and professors). The learning environments are organized in a way that students can reach them in any part and at any moment, according to their availability. Within a virtual class, interactions are structured asynchronously in order to allow everyone to participate accordingly to their availability. This system allows to have students from different places of the world, creating real learning and interaction networks. This interaction is done in two ways – between knowledge and between people.

Online learning is a social process which should facilitate collaboration, interaction between people and contents, and implies changes between the different agents in the process – organization, professors, and students. Implies a change in their roles and in the way they relate with themselves, and implies that contents are appropriated. These changes are implemented in the structuring plan and planning courses and curricula, assessment

systems, ways of teaching and learning, goals to achieve, among others. So we can say that it is expected that students are able to planify their study in order to reconcile to other aspects of their lives; being able to read and write in an adequate way, looking in an effective way into their information sources. It is also expected that they are able to interact with their peers, in virtual class environment, creating their own learning networks. According to Brindley (2004)

> Accordingly, studying at a distance requires maturity, a high level of motivation, capacity to multi-task, goal- directedness, and the ability to work independently and cooperatively. (page 287).

In order to ensure that this happens, it is necessary to find ways to help students maintain their motivation and to reactivate the remaining competences. According to different authors, the role played by the structures that support students has become crucial to keep their motivation, their effort and their success (Brindley, 2004; LaPadula, 2003; Mills, 2003; Simpson, 2002).

The professor plans and structures the learning environment in an open and flexible way, with diversified communication resources and channels, with dynamic and motivating teaching materials. This aims to cover a greater number of learners features and learning styles; to guide the student learning in order to develop the ability to learn how to learn (metacognitive reflection), the ability of self-regulation of learning and, with this, the ability of being autonomous as a learner. These characteristics are not only essential for a certain moment as a learner, but also should be part of essential skills in today's society. That is, a lifelong learning society.

Online learning means that the learner becomes a more active element in the whole process, leading to the construction of knowledge. It is expected that students take the initiative to learn and interact with each other. The work of Azevedo & Cromley (2004) draw attention to the implications of the virtual learning environment design for the acquisition of knowledge. So, "It's the conceiver job to find more appropriate strategies to achieve its goals. The diversity of pathways is vast. Therefore, the online distance education should include a set of learning activities to help the student to achieve the required knowledge, accounting for individual needs and characteristics." (Goulão,2015, page 11) and we add now, that promote students' autonomy.

Together with the characteristics inherent to online education, we cannot fail to equate the features which are related to the students who attend this type of education. As mentioned above, in general, we find an adult audience that seeks to reconcile the different aspects of their family and professional life with the need to increase or consolidate their knowledge and current competencies, and the requirements of studying. The analysis of these situations [Goulão et al, 2015)], aiming to ensure the success of our students, has led us to

analyze the variables which might help balance how to promote their success. That is, to create support structures, in addition to existing ones, so that students feel more comfortable in learning situations, promoting their empowerment as learners. This is one of the four areas marked by Brindley (2004) that reflect the support for students: "Four major areas for investigation are identified: targeting investment for greatest effect, capacity building, learner support as a professional practice, and fostering student to student support." (pág.303).

So, one of the variables that was noted, relates to their ability to reflect on their metacognitive strategies and the consequent self-regulated learning.

2.2. Goals

Taking into account what was described in the preceding paragraph, this variables' analysis held over two academic years, for students attending undergraduate (bachelor), 1st and 3rd year.

This analysis' results point to the need to work with students in a clear and systematic way, to the issues inherent to their individual features as learners, the need for effective self-regulation of the learning process and how to operationalize all this.

It was in this context that the module *learn how to learn* arose. This module aims to raise awareness among students of the 1st year degree for the relevance of learning self-regulatory mechanisms. Thereby, the relevance to become more aware of the mechanisms that each one develops to devote themselves to a study / learning task.

In this first exploratory phase, the module will be offered, on a voluntary basis, to students who will start their academic career at Universidade X, in the Education degree. This takes place entirely online, and in specific time periods, according to the students' needs and to the topics' objectives to be addressed.

2.3. Structure

To fulfill these goals, the module will be structured in 3-axis and it will primarily supported by the book *Comprometer-se com o estudo na universidade: Cartas do Gervásio ao seu umbigo* (Rosário, Nuñes & Pienda, 2006). The authors of this book had the following aims 1) to teach the self-regulated learning processes; 2) to work with students a repertoire of learning strategies that help them in their in college and in their life learning (page 7). Although the students have access to the entire book, it were only worked the following letters on the module development.

Axis 1

Goal 1: Planning goals

Material to use: Gervásio's letters nº2 and nº6

Letter nº2 – *What goals do I have? What is truly a guidance in my acting, in my study at the University, in my hobbies, in my sports, in relations with others, in my laziness ...?*

Letter nº6 – *Who governs your learning? You know how to distinguish those students who achieve academic success?*

Axis 2

Goal: Planning the task and the time to avoid postpones

Material to use: Gervásio's letter nº4

Letter nº4 – *Do you know how to overcome postpones, Gervásio?*

Axis 3

Goal: Preparation for the classroom tests

Material to use: Gervásio's letters nº10, nº11, and nº12

Letter nº10 – *How do you have this class so well organized? How do you prepare to the exam so intensely?*

Letter nº11 – *(...) must the study be different according to exam type?*

Letter nº12 – *So what is this anxiety to the exams?*

The choice of just this set of letters held up with different factors. Firstly, we consider that the selected letters address the points considered central to the work that we were developing; secondly, the time we had available, as well as the students, did not allow us to contemplate the 13 letters; lastly, some of the topics covered in the unselected letters were more targeted to a younger audience and with other features, other appeals, and other concerns.

In addition to these thematic areas the module has three other parts. That is, the module *learn how to learn* is structured around 6 parts. To know:

It starts with a first introduction and, beyond this contextualization, it presents three types of resources - one News Forum, one Doubts and General Questions Forum, and a Module Plan.

These features are accessible throughout the training. The News Forum is only accessed by the teacher in order to provide relevant information about its functioning.

The Doubts and General Questions Forum allows students to interact between themselves and with the teacher, to clarify possible questions about the module functioning.

In Module Plan we find information on the module's goals, its structure, working methods, resources, skills to achieve, timing, and what is expected of the student throughout their development.

Then is another part where we can find three different items. The first was questionnaire about their willingness to participate in the module; the second was a Presentation Forum; finally, a questionnaire on self-regulated learning strategies.

Next there are the items related to the three axes mentioned above. Each one of these axes is operated independently and this has created a forum for participation of all students. The axis 2, in addition to the forum, students relied on a questionnaire entitled *Student Profile*, consisting of 20 statements, with answer YES / NO.

Finally, we have an item related to the assessment module made by the students.

Figure 1 schematically seeks to portray the module *learn how to learn* structure.

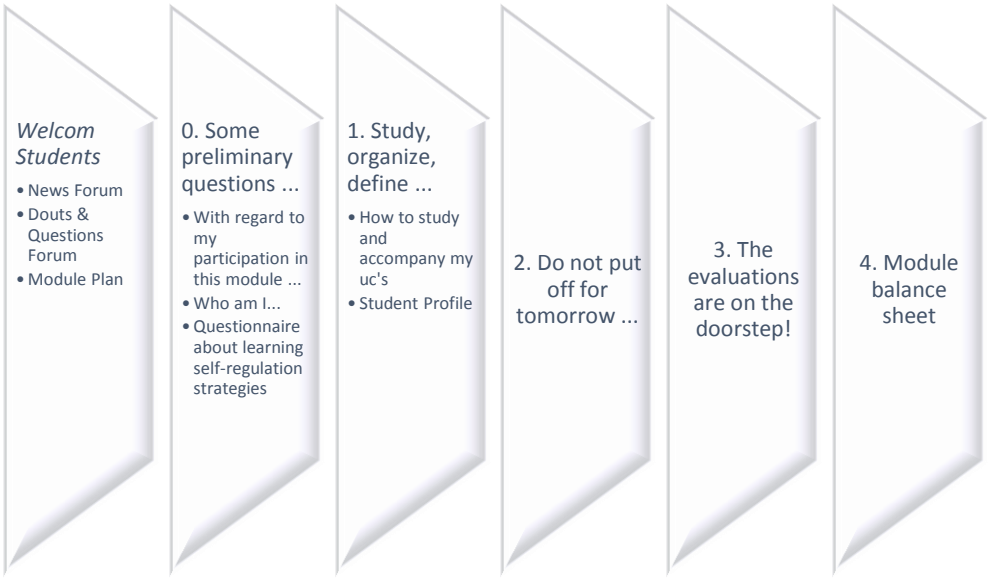

Figure.1. Module learn how to learn structure

2.4. Development

These questions are developed in the form of debate, and it is created a forum for each axis where its objectives and the different letters that guide the debate / exchange of ideas

among students were presented. With this discussion, exchange of ideas and experiences we seek to promote self-reflection on these aspects and, therefore, to develop students competences that make them more self-regulating their learning process. The teacher takes here the role of mediator.

The module was offered completely online.

Given the nature of the contents, the axes 1 and 2 exploration took place early in the school year, immediately before the school activities had started, and the axis 3 the week before the exam period of the 1st semester.

According to the Module Plan, the item related to the preliminaries questions lasted two days. One welcome message was sent to students in the News Forum calling for the participation in the module. The remaining items would only be made available on the dates indicated for this purpose. After the student's choice, only those who chose to participate continued to have access to the activities of the module. To these students, it was requested to do a brief presentation and at the same time to answer the questionnaire on self-regulation strategies. After this first time, the activities related to the three axes started.

Given the contents nature, we chose to work each of the three axes separately each having a duration of one week. Given the time constraints, the second axis was developed, in part, in the beginning of the school activities.

As we said earlier, the last axis, related to the issues of assessments / exams, took place only after the course of teaching activities and before the week of the classroom exams started (exams or assessment tests continues -efolio).

Each axis began with a teaching message, in the appropriate Forum. This message situated students who were working and made available the respective letter.

3. Reflection and next perpectives

As noted earlier, the design of this module had as a precondition to make available to students a structure to support their learning. Not in the sense of formal scientific content, but to help them to reflect, in a systematic and orderly manner, on their own metacognitive strategies of learning and, thereby, provide them with tools for an effective learning self-regulation.

We are in the analysis phase results not of the way that each module took place itself, but also the assessment that the students did with each module. After the analysis of these two parameters, we will seek to adapt it according to the directions outlined and the needs felt throughout the process. So that it becomes an effective response to the needs of our students, and thus help promote the it permanence and it success.

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English-Medium Instruction in the Education Faculty of Málaga University: Students' profiles

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Abstract

This paper seeks to attain a better knowledge of the students that have joined the first partially-taught-in-English degree course in one of the six groups of the Bachelor's Degree in Primary Education in the University of Málaga. The aim is to comprehend their different profiles so that professors can cater for their needs. To achieve this objective, as part of an innovation project led by a multidisciplinary team, different questionnaires were designed, the first of them to get information about their personal data and English training. It was taken by first year students, for two consecutive years (2014, 2015).

The results of this questionnaire revealed that, as no specific requirements were asked, and only English level indications were given, we have to work with an heterogeneous group of people, which results in a multi-level proficiency, very demanding group, to deal with. However, comparing the results from one year to the next, we noticed that there has been an improvement in almost every parameter we were interested in assessing, and the participants of the developing innovation project are committed to evaluate their needs and provide the necessary support that teachers and students deserve.

Keywords:. *Tertiary Education; English medium instruction; Student profiles; English training; proficiency level; innovation project.*

1. Introduction

English medium instruction (EMI) in tertiary education is a significant growth area, with over half of the world's international students being taught in English, and universities offering an increasing range of courses in this language (Graddol, 2006). The ultimate challenge is to be fluent in English, acquire and convey knowledge through this language, and therefore, be able to communicate in the lingua franca the western world has adopted as a means of communication, so greater efforts to integrate content and language can be seen in post Bologna Europe (Doiz, Lasagabaster, & Sierra, 2013).

In Málaga University (UMA) this is a recent phenomenon, and English Medium instruction has been implemented in one of the groups of future Primary Education teachers, the present year being the second of their four year degree. After the first years' experience, regarding the outcomes of a questionnaire about the student's background and expectations, this challenge has definitively been taken seriously, and the multidisciplinary professionals involved have created a PIE ("Programa de Innovación Educativa" or Innovation Project in Education) to follow the developing curriculum and make changes as necessary; to complete their instruction, to create and share materials, and ultimately, to improve the quality of the degree course.

This first task aimed to ascertain the students' background and their previous educational profiles, so the teaching staff could adapt their classes to the level of the students in the vehicle language, making the necessary changes. With this aim in mind, we produced a questionnaire which has been filled in by first year students in two consecutive years, and it has provided us a vast amount of useful information which will be very relevant for our purpose.

2. Questionnaires results : Students' profiles

2.1. Personal data

The former academic year (2014-15) group was formed by 68 students, though the questionnaires were completed by 61 of them. Most of them were women (77%), the sample age ranged from 17 to 30 years old, the majority being 18 (59%). Eight of them were 17 when they filled out the questionnaire (13.1%), and ten were already 19 (16.4%), the seven left were between 20 and 30 years old.

More than half of them studied in State primary and secondary schools (56%), while 39% came from private centres, and the 5% left were from private centres that receive State

funds. Only one had studied in an English curriculum school. Virtually every one of them (97%) came from "Bachillerato" (equivalent of the A-levels in Great Britain or 12th grade High School in the U.S.A) and passed the university access exams. The other 3% came to the University as mature students.

The present academic year (2015-16) gives us similar data. The group is formed by 67 students, and 62 completed the questionnaire, (of which 79% were women), plus five Erasmus students that will study only during the first term. At the time of the questionnaire, 32 were 18 years old (51.6%), while fourteen were 17 years old (22.6%). The rest were in a 19 to 45 year-old range. There were five 19-year-old students (8.1%), four 20-year-olds (6.5%), six between 21 and 30, and just one of them older than 45.

This time there are even more students that come from State schools (75%), only 5% come from private schools, and the rest (17.7%) come from private centres with State funding. Two of them had studied for a while in English curriculum schools, and another two have already finished another university degree. In this sample 91,9% had accessed from "Bachillerato" and passed the university access exams.

The university access exam, together with the "Bachillerato" mark, averaged out, gives the overall mark which determines the possibility of studying certain degrees. Last year, students were admitted into this group with an average of 7.874, while this year that number has raised to 8.999, or more, in order to get a place there.

Table 1. University access overall mark for the partially-taught-in English Bachelor's Degree in the UMA: Bachillerato and University access exam. Comparison between consecutive years

Year	Average
2014	7,874
2015	8,999

Source: Student Profiles questionnaire (2016)

Considering that last year this course was not known by the student community, and wasn't well advertised, this year there has been an improvement in the promotion of this course (though in my point of view, it is still insufficient) and by word of mouth, more students requested entrance than the previous year. The increase in the mark required for acceptance onto this course shows a growing interest for this type of instruction and therefore, in time, could reflect in higher social esteem for teachers.

2.2. Formal English training and level of proficiency

One of our main interests was to know the students' previous instruction in the target language, as they were not subjected to any specific entry requirements in that area. Not only was it important to learn about their level of English through the exams they had taken (Cambridge, Trinity, Official Language School, etc.), but also their experiences throughout the educational system, (Type of school and secondary School: bilingual or not, foreign curriculum, etc.) and those gained in a non formal environment (international exchanges, student mobility, etc..). We even took into account their personal assessment about their proficiency level in the English Language. The questionnaires show the following results in these matters:

In 2014 only 4.9% of the students had studied in bilingual primary schools and 14.8% in bilingual secondary schools. A year later those percentages had raised to 12.9% of students in bilingual primary schools and 19.4% in secondary schools. This data displays the ongoing rise in bilingual schools in our community, due to the implementation of bilingual programmes in the Andalusian school system since 2005, as well as the good level of acceptance from these students for this type of instruction. Although for many years, the country's national level of English has remained one of the lowest in the European Union (EUROSTAT, 2010), and therefore a very low percentage of higher students could study and work in this language, (Dafouz, E., Camacho, M. & Urquía, E., 2014); as a result of a decade of CLIL implementation measures in Spain in compulsory education settings, there may soon be 'a new generation of students (and teachers) in tertiary education, who will consider learning through a foreign language a common practice' (Dafouz and Núñez 2009, p. 110).

The previous year, 11.5% had studied at one of the Official Language schools (6.6% English courses) and the present year, 19.4% of them had studied or is studying there now (12.9% English courses). In comparison, last year 42.6% of them had passed at least one of the Cambridge or Trinity exams, and this course more than half has, (51.6%), mostly at intermediate level (B1 or B2).

When asked for their personal opinion about their English level within the Common European Framework of Reference for Languages (CEFR) though, in the first year most of them situated themselves as follows: in B1 level, 71.7%; the next highest group 14.8%, thought that they were at B2 level; 9.8% considered themselves as having an A2 level, and only 3.3% felt were at the highest levels (C1-C2). In this second year, the figures go up in the upper-intermediate levels: a total of 51.6% feel they are at B1 level and 38.7% at B2

(90.3% in total), while the others, beginners (A2) and advanced (C1-C2) are very similar to the previous years' figures. Nonetheless, it is very common that some students overestimate their proficiency levels, or even situate themselves in very different ones according to their competence in the four skills (oral, reading, listening and writing).

Table 2. Appreciation of level of English. Comparison between consecutive years

Year	A2	B1-B2	C1-C2
2014	9.8%	86.5%	3.3%
2015	8.1%	90.3%	1.6%

Source: Student Profiles questionnaire (2016)

Regarding their personal experiences abroad, again we noticed an increase in the percentage of students that have participated in international exchanges, comparing this year with the year before, varying from 39.3% in 2014 to 48.4% in 2015. As before, the students mobility in secondary education between countries had raised as well, from only 9.8% in 2014, to 16.1% in 2015.

Finally we enquired about their expectations at joining this group, and they all coincided in admitting the increasing importance of mastering English in our society, allowing them better job opportunities in the future by improving their linguistic competence and their curriculum; similar expectations other studies have stated before (Wilkinson, 2013, p.16). In both years most of them expected to have at least 50% of the contents taught in English, which wasn't the case in the first year, as only one of the teachers involved fulfilled this requirement. Students also demanded lectures with a high oral English competence, and different kinds of linguistic support (a language advisor, conversation classes and different elective courses to choose from, depending on their needs), have been the most solicited, as well as the students requesting proper feedback about their language skills.

3. Conclusions

The results obtained from these questionnaires have drawn the following conclusions:

This group of students is mostly formed by women, with an average age of eighteen years old, who predominantly come from 'Bachillerato' studies within the State School System, had a previous English instruction to an intermediate level, and aimed to join the EMI class

in the Education Faculty of Málaga University as a way to continue their training, improve their competence in the English language, and enhance their employability.

While their self-assessment on their linguistic competence is normally higher than the factual data they can provide, they are still very far from being a homogeneous group in that sense, some of them exhibiting fear at not being able to follow the classes, in contrast with others that consider the general level too low for their own expectations, making a very difficult task for their teachers to manage their instruction.

As previous studies on CLIL have stated (See Aguilar and Rodríguez, 2012; Dalton Puffer, 2008; Lyster, 2007) when at the end of the first year, students were asked about their perception of language skills improvements, although no significantly changes were appreciated, the two skills that they considered to have improved the most, were listening and speaking, as opposed to reading and writing.

To meet with their demands, and improve the quality of the Degree, a collaborative interdisciplinary innovation project has been designed and later approved by the University of Málaga Vice-rectorate for Academic Organisation and Teaching Staff with the subsequent challenges:

- Continue improving the lecturer's instruction in CLIL methodologies and English proficiency, offering training courses, together with the FGUMA (Fundación General de la Universidad de Málaga).
- Facilitate the exchange of experiences and coordination among the staff involved in the EMI and external collaborators, through monthly meetings, online contacts and forums.
- Invite different professionals to organize seminars and workshops about bilingual Education and implementation of the Bilingual School System in our community.
- Request that fourth year students from the Degree of English Studies conduct their practice time with this group as language advisors; correcting pronunciation and writing essays, giving students and teachers feedback, etc. This idea has been carried out with success in Cordoba University as part of their plurilingualism plan for the last few years (Fontanet, I., 2015). This point has actually already been approved and four language advisors, or mentors, have been assigned to this group next term.
- Create online resources to provide information about the partly-taught-in English Bachelor's Degree in Primary Education group, to enhance the possibility of

encouraging more international students to participate, as part of the Erasmus programme.

- Encourage the submission of papers by the innovation project participants, to publicise the results.
- Further research to identify the effect of the second language on content learning. As Wilkinson & Zeggers stated: 'If only negative effects can be observed, then the longer-term outlook for content learning through a foreign language may be at risk. Simply demonstrating positive effects on language learning may be insufficient… What is required is research into the impact that foreign-language-medium instruction has on the ability of students to communicate content knowledge in their mother tongue' (Wilkinson, R., & Zegers, V., 2008, p. 7).

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Online courses offered in Brazil: mapping the latest years' context

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Abstract

This paper aims to map the supply of MOOCs in Brazil, starting from the Godwin-Jones' assumption that "MOOCs are neither open nor massive, but often regular online simply courses that have been re-branded" (Godwin-Jones, 2014). At the same time, it approaches the Brazilian context, through an exploratory and descriptive study, based on a qualitative and inductive research strategy, divided into two main phases: the first step maps the MOOCS offered by Coursera and Veduca portals, and the ones delivered by the higher education institutions (HEIs). In contrast, the second phase compares the evolution of a different category of online courses, other than MOOCS: the accredited online undergraduate courses offered by HEIs, through the longitudinal analysis of data from the Census of Higher Education, between the years 2008 and 2013. It concludes that the courses offered are not regular online simply re-branded ones, as there are different provisions, but they are subject to the Brazilian particular regulatory conditions.

Keywords: *Massive Open Online Courses; MOOC; E-learning; Undergraduate Courses; Higher Education.*

1. Introduction

The term MOOC was first used in 2008 (Thille, 2014) but only in 2011, it became visible when US elite universities began to offer open and distance free courses. Greater attention was given to this type of course when institutions such as Stanford, MIT, and Harvard began to offer them through its platforms - Coursera, MITX, EDX, respectively. However, the prominence of MOOCs is the result of growing enrollment, the aggressive stance by the prestigious universities, and the increase of the investment by foundations and other stakeholders (Thille, 2014).

In Brazil, the first e-learning courses were offered by correspondence, via TV or primitive forms. The first MOOC initiative was launched by the Universidade Estadual Paulista "Julio de Mesquita Filho" in 2012 and titled "Open Unesp"[b] (Wikipedia, 2015). Moreover, in 2013, MOOCs were launched by the University of São Paulo (USP), in partnership with the Brazilian portal Veduca (Veduca, 2015). The MOOCs have specific characteristics. It allows the entry of a vast number of students. The courses are free; usually offer no diploma, only one conclusion certification; and vary in their educational purposes, philosophies and the technological resources used (Thille, 2014). This model has also been evolving to different stages of development, similarly to what has occurred in other countries, and there are various types of courses with varying degrees of openness, course fees, qualification requirements (Commission, 2013), credit-earning, and models of delivery (UK, 2013).

Considering that the studies don't take into account how MOOCs are being used in Brazil, this paper aims to map the supply of Massive Open Online Courses - MOOCs in the country, starting from the Godwin-Jones' assumption that "MOOCs are neither open nor massive, but often regular online simply courses that have been re-branded" (Godwin-Jones, 2014). At the same time, it approaches the Brazilian context, concluding that its courses are not regular online simply re-branded ones, as there are different provisions, subject to the Brazilian particular regulatory conditions.

This paper presents an exploratory and descriptive study, based on a qualitative and inductive research strategy, divided into two main phases. The first step maps the MOOCs offered by Coursera (Coursera, 2015) and Veduca (Veduca, 2015) portals, and the ones delivered by the higher education institutions (HEIs) precursors of such offer in Brazil. In contrast, the second phase compares the evolution of a different category of online courses, other than MOOCS: the accredited online undergraduate courses offered by Higher Education Institutions - HEIs, through the longitudinal analysis of data from the Census of

[b] Universidade Aberta

Higher Education, an annual survey conducted by the National Institute for Research and Educational Studies Anísio Teixeira - INEP, between the years 2008 and 2013.

The remainder is organized as follows. The next section presents the MOOCs' offer in the Brazilian Context and the Discussions. The last section points out the Preliminary Conclusions.

2. The MOOCs in the Brazilian Context

The first phase developed research in the two MOOCS portals in Brazil (Coursera, 2015; Veduca, 2015). From both platforms, the courses offered by higher education institutions were selected, where only two Brazilian HEIs were identified: State University of Campinas - Unicamp and the University of São Paulo - USP (**Table 1**), which represented 2.15% of all related partners (N=139) from 28 countries (Coursera, 2015).

Table 1. MOOCs offered by Coursera through HEIs

	MOOC
UNICAMP	How to create 2D games for iPhone and iPad
	How to enhance and monetize the app for iOS
	The Entrepreneurship and Entrepreneur Skills
	Creating and publishing application for iPhone and iPad in the App Store
	How to create an iPhone app
	Creating applications with multiple screens for iPhone and iPad
	Digital Signal Processing - Sampling
	Pluralities in Brazilian Portuguese
USP	Big Data in Health in Brazil
	Accounting History
	Origins of Life in the Cosmic Background
	Fundamentals and Business Language: Accounting

Source: Coursera, 2015.

The classes are free and in reduced number (**Table 1**). From a total of 1,484 (N = 100%), MOOCS provided by the platform, only 12 (0.8%) are of Brazilian HEIs. Moreover, from this total, nine (0.6%) were being offered at the time of this research, which was based on documentary research in the virtual environment, from November to December 2015. The portal Veduca (Veduca, 2015), in turn, includes different categories of courses: for free,

MBAs[c] and extension; and comprise various areas of knowledge. Seven Brazilian HEIs provide online courses, but MOOCs are offered by three of them (**Table 2**).

Table 2. MOOCs offered by Veduca Platform

HEI	MOOC
USP	Basic Physics
UNB	Bioenergetics
Unisinos	Brazilian Sign Language - Libras

Source Veduca, 2015.

The next phase mapped the current offer of the two public HEIs, recognized as the MOOC precursors in Brazil: UNESP and USP. According to UNESP (UNESP, 2015), and in particular, to the *Open University*, the courses are organized by areas of knowledge (**Table 3**) and are free of charge. Despite the fact that the courses intended to be MOOCs, there is no reference to MOOC terminology neither in the name of the courses nor the web portal of the institution.

Table 3. MOOCs offered by the Open University, UNESP

Knowledge Area	MOOCs
Biological	Content and Teaching of Physical Education
Exact	Numerical Calculus roots functions - method of Bisection
	Machinery Diagnostic Tools
Human	The Education Basis and Guidelines Law
	Public communication, citizenship and digital democracy
	Literacy Content and Curriculum
	Content and Teaching Arts
	Content and Teaching of Science and Health
	Content and Teaching of Geography
	Content and Teaching of History
	Content and didactics of Portuguese Language and Literature
	Course Assistive Technology, Projects, and accessibility. Promoting School Inclusion
	General Didactics
	Administrative law
	Education and Language: Early Childhood Education
	Education and Society
	Inclusive and Special Education
	Children's education: curriculum approaches
	Early Childhood Education: Different forms of Expressive and

[c] Master in Business Administration

	Communicative Languages
	Ethics and Citizenship
	Philosophy of Education
	Children's Education Foundations and Principles
	History of Education
	Introduction to Scientific Research
	Educational politics
	Educational Psychology
	Relations and procedures in the Workplace
	Sociology of Education

Source: Portal UNESP, 2015.

According to the USP web portal (USP, 2015), the identified courses are listed in **Table 4** and include different categories, other than MOOCs. As already seen above, in the USP web portal there are no explicit references to MOOC terminology to the courses offered. Both are free.

Table 4. Courses offered by USP

Undergraduate	**Blended undergraduate course in Sciences**
Specialization	Specialization in Ethics, Values, and Health in School
	Motor Learning
Update	Food and Agribusiness Marketing
Diffusion	Introduction to Education Design

Source: Portal USP, 2015.

The second phase of the study maps the supply of online undergraduate courses in Brazil, 2008-2013, based on the Census of Higher Education (INEP, 2013). It adopted the year 2013 as a reference for being the last to official data available and the 2008 year for a comparative 5-year analysis. This part of the study had the intention to check if the Godwin-Jones' assumption could be confirmed or rejected, by evaluating the online courses offered by the HEIs in the country and compare them to the MOOCs category. The results are presented below.

In Brazil, for decades, there has been an increase in the number of HEIs, with a corresponding rise in the number of courses and places offered. From 2008 to 2013, this represents an increase of around 6%. In the same period, regarding the accredited online undergraduate courses, it can be observed an increase in the number of classes offered and students enrolled, but a decrease in the number of places offered, as shown in ***Figure 1***.

In this period, the number of undergraduate courses almost doubled. The number of students enrolled in 2013 also had a significant increase compared to 2008, indicating a potential interest in e-learning. However, only 18,75% of all the country's student body is enrolled in online undergraduate courses. The number of places offered is already greater than the number of pupils enrolled, pointing to a vast number of vacant (available) places.

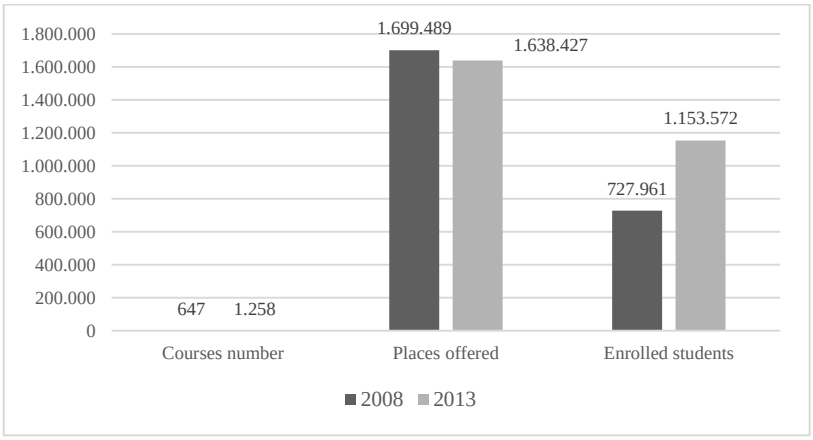

Figure 1. Number of courses, places offered and enrolled students. Source: MEC, INEP, 2013.

The vast majority of online courses offered, according to the Census of Higher Education (INEP, 2013), are in the areas of education; Social Sciences, Business, and Law; followed later by others, as demonstrated in ***Figure 2.***

Taking into account the OCDE main areas, there is more receptivity to the courses offered in the Humanities and Social Sciences, although such courses are still small in gross numbers if compared to the total traditional undergraduate courses (N=30.791) provided in the country.

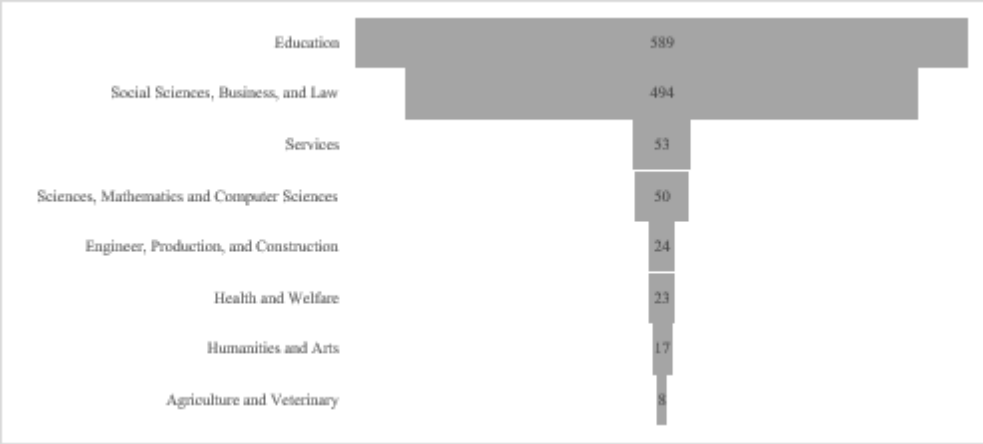

Figure 2. Online courses offered, OCDE main areas, 2013. Source: MEC, INEP, 2013.

3. Overview

Unlike MOOCs that early in its offer were free, undue courses and did not provide certification; in Brazil, the undergraduate online or blended courses are from a different provision category, offered only by accredited public or private higher educational institutions. They can be free or paid, depending on the HEI category – if public or private. These courses depend on prior accreditation by the Ministry of Education, which regulates, supervises and evaluates the institutions of higher education and its undergraduate courses (Educação, 2007; Selingo, 2014). Many of the online undergraduate courses, according to Brazilian legislation (Educação, 2007; Selingo, 2014), though not obtain the title of MOOC or use its terminology, may have a high number of places offered, which means they can be massive; also can be free; but are not "open" in the MOOCs context, cause the students obligatory need to have concluded previous education.

Besides the fact that some countries already discuss the possibility of credit-earning MOOCs courses, in Brazil, they comprised, exclusively, the courses without accreditation and delivered through third platforms. Including the courses offered by HEIs, which are *open* about their content availability to any person; are modest in quantity, but can rely on payment for the issuance of a certificate, and are delivered through Coursera and Veduca platforms. Their "denominations" also are entirely different from those accredited courses offered in online or blended mode by HEIs (**Tables 1**, **2, 3**, **4).** Concerning the assumption stated by Godwin-Jones (2014), in Brazil, the MOOCs are open and massive courses, but are not regular online courses that have been re-branded, because the "regular online courses" are the accredited ones. It is important to state that, besides the limited number of

MOOCs offered in the country, even by HEIs, it is highly recommended to evaluate the number of students enrolled, to map its *massive* extent. Besides that, the courses have different publics as a target.

Another interesting conclusion depicted from this research is related to knowledge areas of the courses offered (**Figure 2**) which are Education; and Social Sciences, Business and Law despite the 'apparent' resistance of Social Sciences area to the use of technological resources, as shown by the literature (Education, 2013; Reichard 2015). There is no much overlapping concerning the topics dealt, despite the differences between the MOOCs and the online undergraduate courses. Apparently, this situation can be justified by the government policy of training of the teaching workforce, specially, in basic education.

It becomes necessary to think about new ways of offering courses in a connected society in which new paradigms guide the communication practices, looking out at present as a promise of renewal of knowledge, motivated by new ways of knowledge formation, enabled by digital networking environment (Burdick, 2012). At the same time, it is necessary to discuss that, as an essential part of the societal role of universities is to facilitate lifelong learning, regardless of age, place of residence and life situation. Flexible education is a core term in this context as it deliveries mean education that can be carried out regardless of time and place; that require less presence on campus.

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Curricular Contagion: A Case Study in Curriculum Development, Distribution, and Adoption

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Abstract

The collaborative contagion model is a byproduct of a three-year endeavor to identify and address curricular deficiencies in business ethics and entrepreneurship (BE&E) courses. Designed to increase curriculum adoption using professional educators' established networks, the model combines a series of four-day disruptive innovation workshops with an online forum to promote collaboration in the design of BE&E materials, and to provide ongoing support for educators with unique contextual constraints. Our primary goal in developing the collaborative contagion model was to create a framework through which teachers could prototype, refine, and distribute BE&E course materials at no monetary cost. Given the variety of participants invited to the disruptive innovation workshops, we expected to produce curricular materials that incorporated a wide array of perspectives and experiences relating to BE&E instruction. After our first year of workshops, 20 K-12 and 20 higher education participants helped formulate 10 modules and 60 grade-specific K-12 lesson plans. Through the process, we have established pilot programs at 13 separate institutions, and built partnerships with seven organizations. In addition to providing educators with professional development opportunities and an enhanced academic network, we conclude that the collaborative contagion model promotes improved curriculum quality, and increases the likelihood of curriculum implementation.

Keywords: *Collaborative curriculum design; professional development; disruptive innovation workshops; curriculum distribution; networking.*

1. Introduction

Since 2013, we have worked to develop a novel curriculum that will challenge the status quo in the design and delivery of business ethics and entrepreneurship (BE&E) courses. Building from previous work by Fawson et al. (2015), which assessed innovative models for gathering input from academic networks using targeted colloquia and workshops, we have begun implementing a new model for curriculum development and distribution called a collaborative contagion model.

Adding to well-studied approaches of collaborative curriculum design (CCD), teacher design teams (TDTs), and course design intensives (CDIs), the contagion model is designed to aid in the adoption of curricula using established professional and educational networks. Our main goal has been to create a framework through which teachers can prototype, refine, and distribute quality BE&E course materials free of charge. After hosting a series of four-day disruptive innovation workshops with participants from across the United States, we developed on an online forum for generating, hosting, revising, and rapidly distributing modules for BE&E courses. The academic network built through this process, consisting of 13 pilot programs and seven institional partnerships, shows promise of improving both curricular quality and rates of adoption. This purpose of this paper is to summarize the literature behind the collaborative contagion model, track the model's early implementation, and explore its successes and areas for improvement.

2. Relevant Literature

We divide the literature behind the contagion model into four groups. The first group focuses on the benefits of CCD in teachers' professional development and in promoting a collaborative culture among faculty and staff. The second highlights potential obstacles between curriculum development and implementation, suggesting ways to increase the likelihood of implementation. The third introduces the collaborative contagion model. The final group compares CDIs with an integral part of the contagion model: the disruptive innovation workshop (DIW).

2.1. Benefits of CCD for Teachers and Educational Faculty

Multiple studies show how collaborative curriculum design (CCD) aids in the professional development and learning of teachers (Voogt et al., 2011; Drits-Esser & Stark, 2015; Clark & Hollingsworth, 2002). Teachers who assist with curriculum development show "increased self-confidence, increased pedagogical content knowledge, a deeper understanding of subject matter content, refined ideas of curriculum development in their

personal practice, and perceptions of good teaching and being a good teacher" (Dritts-Esser & Stark, 2015, p. 2). The collaborative process also provides teachers a means for engaging peers and experts in an environment that broadens teachers' perspectives and builds leadership skills required for curriculum implementation (Voogt et al., 2011, p. 1243).

Advantages for individual teachers aside, the educational climate at an institution stands to benefit from CCD (Burrell et al., 2015). Robert Rothieaux (2015), the facilitator of a new, collaboratively-built MBA curriculum at Hamline University suggests that the "design and implementation of innovative curricula can provide a reason and means to break down barriers and create a more collaborative culture and climate" (p. 124). To this end, Rothieaux (2015) encourages bringing faculty, staff, and administrators, who generally "have little interest or reason for true collaboration," into the process (p. 124). Collaboration, in this sense, is a catalyst for greater knowledge sharing and interaction among faculty.

2.2. Bridging the Gap between Curriculum Development and Implementation

A primary challenge for curriculum designers is bridging the gap between curriculum development and implementation. Ideally, the professional development benefits from CCD would translate into improved classroom practice, and potentially, enhanced student outcomes. In reality, professional development often falls short of changing classroom practice. During a workshop, teachers have to navigate unfamiliarity with the design process, new pedagogical methods, and novel subject matter, thereby developing a host of new skills and knowledge (Huizinga et al., 2014). Unfortunately, teachers often return to environments that do "not always support classroom implementation of the newly learned knowledge and skills" (Voogt et al., 2011, p. 1236; Guskey, 2000). Without adequate support during and after the curriculum design process, it is unlikely teachers will experience anything more than short-term teaching changes (Clark & Hollingsworth, 2002).

Clark and Hollingsworth's Interconnected Model of Professional Growth (IMPG) elucidates three domains in which teachers can achieve long-term change through collaborative curriculum design: (a) the personal domain (in which teachers change their knowledge, beliefs and attitude); (b) the domain of practice (in which teachers change via professional experimentation); and (c) the domain of consequence (in which the collaborative process produces salient outcomes for teachers and/or students) (2002). A fourth domain in the model, known as the external domain, provides teachers with external sources of information or stimuli. Enactment and reflection in one domain may have an impact on others (Clark & Hollingsworth, 2002, p. 951). Change through these domains can lead to simple, short-term teaching changes, or long-term professional growth. The realization of the latter depends on, among other things, the level of ongoing support from

colleagues and administration, resources and equipment, and the broader context in which teachers work (Clark & Hollingsworth, 2002).

Researchers have investigated the support needs of curriculum designers required for curriculum adoption (Huizinga et al., 2013; Voogt et al., 2011). In addition to limitations on time and knowledge, teachers often lack the design expertise required for curriculum development (Huizinga et al., 2013, p. 34). Incorporating design specialists into TDTs enables teachers to apply their knowledge, skills, and contextual understanding to content and pedagogy efficiently. Another option is to provide teachers with "existing or exemplary curriculum materials…to help the team define the goals and design task" (Voogt et al., 2011, p. 1243). In any case, ongoing support and guidance by external facilitators and specialists improved teachers' overall learning during the design process (Voogt et al, 2011). Voogt et al. (2011) also discuss the importance of maintaining an explicit focus on implementation during the design process, but curriculum implementation ultimately hinges on "teachers' ownership of and their knowledge about reform ideas" (Huizinga et al., 2013, p. 33). In other words, teachers are more likely to adopt curriculum changes in which they are involved (Dritts-Esser & Stark, 2015, p. 3).

Realizing the support needs required for curriculum adoption, we have built two follow-up workshops into our BE&E curriculum design process. We designed these conferences to provide ongoing support for unforeseen contextual challenges, and to build the network in a continuous fashion. Additional support is provided through a curriculum specialist at Utah State University and a website to cultivate a community of curriculum adopters.

2.3. Description of the Contagion Model

Sorenson et al. (2005) note that "knowledge spreads from its source not in concentric circles, but along conduits laid by social connections" (p. 4). New innovations are adopted in a manner that resembles an epidemic spreading through a population, "growing slowly at first, then accelerating rapidly, and finally slowing to reach some asymptotic saturation level" (Sorenson et al., 2005, p. 3). Social connections and proximity to the original source affect where new innovations are adopted and the rate at which they spread.

Without adopting the epidemic analogy in its entirety, our expectations for the collaborative contagion model share in many aspects of Sorenson et al.'s (2005) description of knowledge spreading. Curricular contagion begins at disruptive innovation workshops (DIWs), and relies on the efforts of workshop attendees and their own individual networks. After the workshops, which are designed in part to create a working community of conference attendees, we provide support for teachers to refine, adopt, and share developed

materials with their colleagues. Deploying a curriculum through established networks enables us to reach a variety of new faculty, students, entrepreneurs, and policy makers.

2.4. Comparing and Contrasting CDIs and DIWs

Developed by Oxford Brookes University in 2003 for large-scale e-learning applications, course design intensives (CDIs) promote innovation and networking through curriculum design workshops. In a span of three to four days, CDIs yield tangible course materials as output (Dempster et al., 2012). In a program evaluation, Dempster et al. (2012) describe how CDIs utilize extended teams alongside assistance from technologists, curriculum specialists, educational developers and subject librarians (p. 137). CDI's focus explicitly on cross-disciplinary networking, using "multiple program teams working in parallel…" (Dempster et al., 2012, p. 137). Instead of leaving lecturers to their "usual subject-focused autonomy," CDIs encourage participants to work collaboratively at the program level, thereby engaging a wider array of stakeholders with various skills and experiences "to confront and to engage with alternative and better conceptions and practices" (Dempster et al., 2012, p. 136). Dempster et al. (2012) measured CDI success using the following variables: tangible deliverables, confidence and collective ownership of developed materials, networking beyond department colleagues, and conceptual and pedagogical changes for lecturers (pp. 143-144).

DIWs share many foundational ideas with CDIs. Both workshops aim to produce tangible output in the form of modules, with another expressed goal of broadening participants' networks. Like CDIs, DIWs use parallel sets of extended teams, equipped with experts to analyze theory, discuss technical obstacles and solutions, and draft modules. Dempster et al.'s (2012) measures for successful CDIs apply equally to our internal measures for gauging curricular contagion.

Unlike DWIs, CDIs "are not a tactic to initiate change or raise awareness" (Dempster et al., 2012, p. 137). We intend our DIWs to change the delivery and design of BE&E courses through heightened awareness and outreach. The contagion effect depends on participants' willingness and ability to share resources and improve BE&E course quality.

The composition of teams also differs between CDIs and DIWs. The CDIs reviewed by Dempster et al. (2012) assembled teams from faculty and staff at a single university. Our DIWs, on the other hand, hosted educators from multiple institutions ranging in size, approach, scope, and location. It was our goal to create an environment that would address a broad range of programmatic needs heretofore inhibited by geographic and institutional siloing, thereby encouraging nationwide curriculum adoption.

3. The Process Behind the Contagion Model

We began the process of developing the contagion model after researching potential gaps in existing BE&E curricula. After surveying 170 BE&E course syllabi throughout the United States, we found that new offerings in these subjects had taken on a variety of forms, transitioning from appendages of more established disciplines into discrete, stand-alone courses. Entrepreneurship courses often considered only new venture startup, without broader discussion of what it meant to be entrepreneurial, or the benefits of entrepreneurship for society. Different AACSB-accredited schools offered courses under the business ethics banner that contained completely disparate content (Fawson et al., 2015). Some business ethics courses emphasized a foundation in classical philosophy, whereas others focused exclusively on a legal-positivistic approach, stressing adherence to established codes and policies. While we have always viewed educational flexibility and license in a positive light, our concern was that such disparity might leave business students ill-equipped to navigate an array of moral dilemmas faced in the workplace.

We designed the innovation workshops to utilize the dispersed knowledge of participants, and to draft modules that would address these and other shortcomings in existing courses, consolidating, to a degree, BE&E curricula being offered throughout the country. Our goal was to initiate a process of collaboration and refinement that would culminate in usable, standards-ready materials that could be shared and adopted at no monetary cost to teachers.

While recruiting attendees for the innovation workshops, we sought a balance of individuals within our network and others with little or no connection at all. Our academic network and social media presence helped us identify individuals within business schools, philosophy departments, K-12 teaching positions, and administration, all of whom would, we hoped, make significant contributions in developing new course materials. Although participants' notoriety and roles varied, each demonstrated a shared desire to effect a positive change in the current orientation of ethics and entrepreneurship courses.

Prior to the innovation workshops, we asked participants to submit any readings that could provide a baseline for subject matter competence, and would facilitate conversation among participants on common difficulties in teaching BE&E. After compiling and distributing the readings, we asked that participants read all materials before coming to the workshops.

At the beginning of each day during the workshops, we used design-thinking activities to encourage new ways of thinking about BB&E, and to overcome barriers to participation. Round-table discussions at the conference helped teachers and administrators establish the current state of the courses, and navigate pedagogical and institutional obstacles they face when trying to innovate in their classrooms or utilize a new curriculum.

We encouraged ownership of developed materials by asking workshop participants to contribute activities and lesson plans from their experience. As they did, we constructed prototypes. These prototyped lesson plans were then posted online for educators to use freely, revise, and distribute to their colleagues. The website continues to provide a virtual medium for ongoing collaboration, keeps a log of new participants in the growing network, and tracks where curricular adoption takes place.

At the end of the workshops, participants were surveyed about the knowledge they gained from the experience and their ongoing commitment to implement modules and lesson plans in their various faculty positions across the United States. We provided post-workshop support for teachers in the form of pre-prepared course evaluation tools and surveys for future BE&E courses.

4. Results & Early Indicators of Success

We worked with a total of 20 K-12 and 20 higher education participants at our first two disruptive innovation workshops. Through these events, we established pilot programs at 13 separate institutions, and built partnerships with seven organizations. Participants produced five general lesson ideas/activities, from which we have built 10 modules and 60 grade-specific K-12 lesson plans.

Many of the participants attending the conference had little experience with design activities and lacked the requisite vocabulary for understanding and producing novel curricular components. The discomfort was especially pronounced for K-12 educators. One K-12 teacher said, “There was a bit of disconnect between the university professors and the ‘ground truth’ of K-12 educators.” Another K-12 teacher expressed concern that “the majority of the conversations seemed about philosophy rather than pedagogy,” making it difficult to participate. While professors thrived in the open-ended, early curricular discussions, several K-12 educators wanted more definitive pedagogical items to discuss.

Very few of our participants came from outside the United States. In the future, we hope to field test our collaborative contagion model in foreign networks. We are presently providing support for educators who attended the workshops and others who have been introduced to the curriculum via social networks.

5. Conclusions

Citing ideas from economist Kenneth Arrow, Sorenson et al. (2005) describe how “the generation of new knowledge often requires substantial investment in research and development, but the repeated application of this knowledge, once produced, entails little if

any incremental cost" (p. 1). We designed our collaborative model to help educators develop and share quality BE&E materials. Ongoing refinement of modules among participants in different professional networks has produced multiple prototypes of lesson plans from which teachers can choose and adapt to various situational demands. In our model, teachers also have incentives to participate: better lesson plans, professional development hours, network building, and program development ideas. Utilizing the dispersed knowledge of participants, the contagion model has helped us avoid knowledge sharing limitations and the siloing of content along geographic boundaries, ensured essential coverage of foundational principles, and encouraged wider curricular adoption.

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Knowledge generation and utilization in wiki supported teamwork – An experiment

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Abstract

With the rapid advance of communication technologies and the free-flow of information, the concept of collaboration extends beyond physical locations and time zones in the form of virtual teams that are globally connected. This study considers how modern Web 2.0 based collaborative technologies (wikis) relate knowledge creation and utilization in student groups and aims to find out if these collaborative technologies are better suited to tasks requiring extensive asynchronous collaboration in an educational setting. To perform controlled experiments a sample of student teams that have worked in technologically and demographically diverse groups was selected, from which we had 49 experimental and 48 control teams with 193 and 192 participants respectively. We found that wiki technologies do not suit all kinds of tasks and do not always increase knowledge creation, knowledge maintenance, problem solving and thus knowledge utilization in team collaboration.

Keywords: *wiki; web-2; knowledge creation; teamwork.*

1. Introduction

The current pace of technological development is forcing higher education teachers and trainers to keep up with the latest IT innovations in order to transform the static learning process into a dynamic cognitive process. Collaborative learning enables users to capitalize on each other's resources, skills and ideas in an environment where participants are engaged in a common task and goal with every individual dependent on and accountable to the others. The field of this collaboration can be effectively supported with innovative technology.

It is presently unclear how these technologies influence learning and problem-solving processes as studies often investigate the problem unilaterally with a focus on certain kinds of tasks and technologies and usually inadequately from a methodological and statistical point of view. This research is intended to overcome these deficiencies with an extended experiment based on an original concept of (Shu & Chuang, 2011, 2012) and rigorous statistical methodology. The experiment separates tasks and technologies and measures their respective fit and the evolution of productivity and decision quality during the solving of case studies under controlled conditions. The paper seeks to illuminate the relationship between different types of tasks and technologies from several aspects.

2. Recent Trends in Web-Based Team Collaboration

Recently, internet is returning to its origins as a read/write tool and entering a new, social phase as a participatory tool. This second wave has led Darcy DiNucci to create the term Web 2.0 (or web2) for those Web sites that allow users to interact and collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community.

Web 2.0 technologies enable remarkable interactivity and create many new collaboration models such as Wikipedia or InnoCentive. What encourages us is not only its popularity but its idiosyncrasy; simple and parallel editing, version control, and real-time updates (Trkman & Trkman, 2009), in contrast to the 'bottleneck effect' referred to by Bean & Hott (2005), where updates are delayed through a centrally managed entry. Created by Ward Cunningham in 1995, wikis are web-based hypertext applications intended for collaborative writing. In addition to writing and viewing their own pages in real time, people who use a wiki can see pages others have published and hyper-textually link to them without having to wait for an editor to assemble the various components developed individually on multiple PCs. During the writing process, content can be displayed immediately to other team members, who can immediately add their own contributions and see others' revisions without having to wait for an editor to assemble the various elements from people working on other PCs (Lin, Chuang, & Shu, 2012). McAfee argued that "the technologists of Enterprise 2.0 (e.g. wikis) are trying hard not to impose on users any preconceived notions

about how work should proceed or how output should be categorized or structured. Instead, they are building tools that let these aspects of knowledge work emerge" (McAfee, 2006). Wikis have evolved as a tool capable of matching these various characteristics (Lin et al., 2012). Instead of serving as a control centre, a wiki serves as a collaboration and creation platform and a central repository. This makes asynchronous cooperation across time zones possible. Beyond the alleviation of physical constraints, the potential for greater collaboration is further augmented by the usage of wikis in the following three ways: Wiki provides an equal opportunity for all opinions to be heard. As Bean & Hott (2005) commented, rather than the back-and-forth exchanges of e-mail attachments or discussion boards, wiki allows direct exchanges of opinions centrally and stored permanently, enhancing the efficiency of the organisation through the increased teamwork efficiency as recent studies show (Hadjerrouit, 2014; Li, 2013; Wang, Zou, Wang, & Xing, 2013). However, these studies omit many aspects of wiki collaboration and are lacking methodologically.

Secondly, unlike blogs or micro-blogs available today, wiki usage allows two-way communication, which makes it a dynamic process closely resembling real life communication as referred to by Zhang, Fang, Wei, & He (2013). Mattison (2003) pointed out that when compared to blogs, most wikis provide forums where authors can discuss and resolve conflicting opinions through seeing others' postings and offer their own thoughts.

Lastly, the entire methodology is built on trust, which means all entries are assumed to be genuine and correct and filters are established only when necessary. The assumed trust and the way a wiki encourages continuous enhancement of data, in turn harnesses the power of diverse individuals to create collaborative works globally (Shu & Chuang, 2012).

3. Research methodology and model framework

During the entire research process the methodology presented in Lin et al. (2012), Shu & Lee (2003), and Shu & Chuang (2012) were followed. This methodology is based on the separation of collaborative tasks into intellectual type and preference type tasks on the one hand, and the separation of collaborative technologies to traditional (face-to-face meetings) and wiki Web 2.0 based technologies on the other. The aim is to measure the fit of the two dimensions (tasks and technologies) and team performance (see figure 1).Zigurs & Buckland (1998) have shown that groups adopting a group support system are more motivated to express their ideas than groups that do not. Additionally, systems that support parallel editing and allow multiple participants to instantly share and express their opinions, ideas, and information could be far more efficient than conventional systems in which editing and expression are sequential (Berndt, 1992). In this paper we put forward hypotheses concerning the effect of systems (wiki technologies) on knowledge utilization in teamwork.

Our research model is based on a causal path model as it is in figure 1.

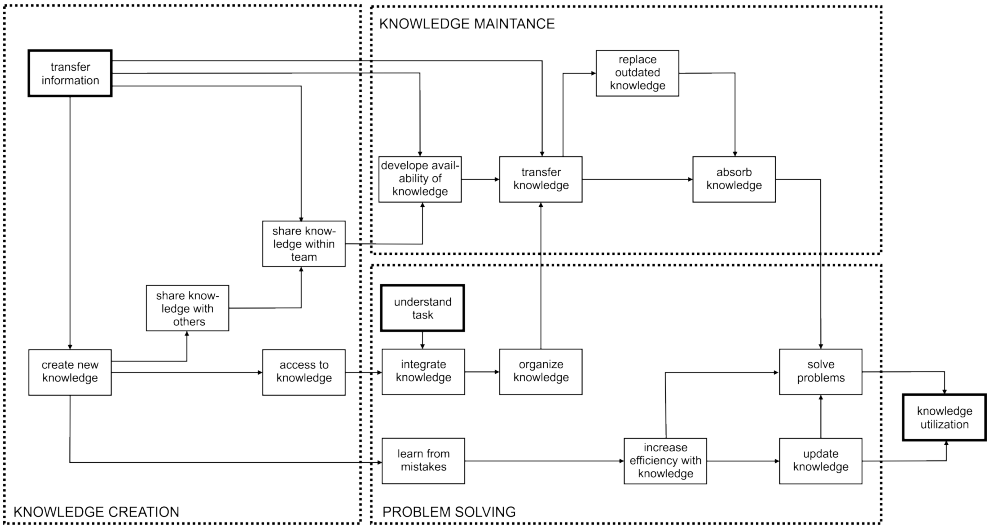

Figure 1. Casual path model of knowledge utilization in teamwork.

All paths are statistically significant as it is shown in discussion. The model consists of three main process of measured variables: knowledge creation, maintenance and problem solving. Each process has variables which have been measured before and after the experiments on a 5-point Likert scale. In the path model linear regressions were performed by enter method, standardized betas were calculated to ensure direct comparison.

3.1. Experiment design and procedure

The research took place at Budapest Business School, Faculty of Finance and Accountancy with part-time master students of the Finance and the Accounting Programmes between 2012 and 2014 (one experiment per year). A demographic survey was carried out among participants prior to the experiment to detect their attitudes and habits regarding teamwork and wiki usage. The frequency of using wiki platforms (social sites, cloud computing devices, and on-line collaboration tools) was measured for each participant and dichotomous variables were defined as a means of classifying them as wiki users or not. Teamwork habits were also measured with questions about how often and how many times participants work in teams. Dichotomous variables were also defined to classify whether they are team players or not. With this information teams of four people were formed with special regard to their demographic features (general attitude to IT and Web 2.0 tools) – as detailed in table 1.

According to these two dimensions 385 participants were divided into 97 teams with four members (3 groups had only 3 members) and it was ensured – according to demographic

variables – that at least two of them were unfamiliar with each other or any other member of the team. In table 2 the distribution and number of teams in each category (and number of participants) is shown according to the year of experiment. The numbers in table 1 are the number of teams, and number is brackets are the number of team members.

Following this, the pre-experiment surveys were implemented, testing the attitudes towards collaboration of the teams for several attributes (general aspects of task/technology fit, decision quality, and productivity in teamwork).

Before experiments all teams were divided randomly into two (each segment defined by the two dimensions of familiarity with wiki tools and teamwork in table 1): 48 experimental teams with 190 (49.4%) participants (including 2 deficient groups) and 49 control teams with 195 (50.6%) participants (including 1 deficient group).

Table 1: Construction of the participant teams (team matrix)

		Team workers									Total			**Total**
		no			yes			misc						
		2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014	
wiki user	no	8 (32)	4 (16)	0 (0)	10 (39)	4 (16)	1 (4)	3 (12)	2 (8)	0 (0)	21 (83)	10 (40)	1 (4)	**32 (127)**
	yes	4 (16)	7 (28)	0 (0)	12 (48)	23 (92)	2 (8)	3 (12)	4 (16)	0 (0)	19 (76)	34 (136)	2 (8)	**55 (220)**
	misc	0 (0)	1 (4)	0 (0)	0 (0)	1 (4)	0 (0)	3 (12)	2 (8)	3 (10)	3 (12)	4 (16)	3 (10)	**10 (38)**
Total		**12 (48)**	**12 (48)**	**0 (0)**	**22 (87)**	**28 (112)**	**3 (12)**	**9 (36)**	**8 (32)**	**3 (10)**	**43 (171)**	**48 (192)**	**6 (22)**	**97 (385)**
			24 (96)			**53 (211)**			**20 (78)**			**97 (385)**		

For the experimental teams a 60-minute training course on "Modern Web 2.0 based applications for on-line teamwork and mass collaboration" was held and some specific freeware applications (Skype, Dropbox, Google Drive, etc.) were demonstrated as Wang et al. (2013) suggest in their study. The intention was to promote commitment to solving their team tasks with these tools on-line without face-to-face communication. Control groups had no information about the research; those teams just received one of the experiment case studies to solve. The first sampling issue in the research was a pre-experiment survey about team members' attitude to teamwork. We measured many performance factors (see: Heidrich, Kasa, Shu, & Chandler, 2015), however in this paper we focus only on knowledge utilization.

All the experiment's participants had to solve case studies with preference and intellectual tasks. After the experiments were finished and all the groups have completed their tasks a post-experiment survey was conducted with the same variables as the pre-experiment test. In this sense pre- and post-experiment results can be compared, such as control and experiment group results, or more specifically preference and intellectual tasks, or wiki and face-to-face groups also.

4. Discussion

4.1. Pre- and post-experiment results

The significances in path model did not changed much after the experiment, however some remarkable changes in standardized betas have been occurred. In knowledge creation process, after the experiments knowledge share within the team and the development of knowledge availability is much more supported by information transfer. That means that after the experiment participants thought that after information is transformed into the team, it is much easier to share it, and make it available. After organizing knowledge, it became easier to transfer it in the team, however replacing outdated knowledge did not support better the absorption of knowledge. But this absorption contributed better problem solving. Learning from mistakes much more supported the efficiency of teamwork with knowledge and lead to knowledge update which forced better knowledge utilization in teamwork. These positive changes through the experiment have paired with some weakening in three relationships: share of knowledge outside the team did not supported better sharing within the team; access to knowledge did not grant better integration of knowledge; replace outdated knowledge did not support better absorption of knowledge. These changes can be seen in details in table 2 below, with all regression betas, their significance level, the determinant coefficients (R) and its significance level. All sub-models are significant.

Table 2. Path model weights in pre vs. post experiment and control vs. experiment groups.

Submodel		PRE experiment			POST experiment			Δβ	Controll group (F2F)			Experiment group (WIKI)			Δβ
Dependent	Independent	β	p	R^2 p	β	p	R^2 p		β	p	R^2 p	β	p	R^2 p	
knowledge utilization	update knowledge	0,212	***	0,657 ***	0,308	***	0,753 ***	0,10	0,285	***	0,806 ***	0,337	***	0,698 ***	0,05
	solve problems	0,658	***		0,598	***		-0,06	0,651	***		0,536	***		-0,12
solve problems	absorb knowledge	0,433	***		0,614	***		0,18	0,623	***		0,605	***		-0,02
	increase efficiency with generated knowledge	0,247	***	0,470 ***	0,191	***	0,712 ***	-0,06	0,171	***	0,697 ***	0,208	***	0,732 ***	0,04
	update knowledge	0,105	*		0,165	***		0,06	0,167	*		0,164	**		0,00
update knowledge	increase efficiency with generated knowledge	0,635	***	0,403 ***	0,774	***	0,598 ***	0,14	0,8	***	0,641 ***	0,739	***	0,547 ***	-0,06
increase efficiency with generated knowledge	learn from mistakes	0,363	***	0,132 ***	0,499	***	0,249 ***	0,14	0,671	***	0,451 ***	0,586	***	0,343 ***	-0,09
learn from mistakes	create new knowledge	0,435	***	0,190 ***	0,432	***	0,187 ***	0,00	0,463	***	0,214 ***	0,411	***	0,169 ***	-0,05
create new knowledge	transfer information	0,563	***	0,317 ***	0,485	***	0,235 ***	-0,08	0,495	***	0,245 ***	0,474	***	0,224 ***	-0,02
share knowledge with other participants	create new knowledge	0,629	***	0,396 ***	0,648	***	0,420 ***	0,02	0,626	***	0,392 ***	0,668	***	0,446 ***	0,04
absorb knowledge	replace outdated knowledge	0,556	***	0,474 ***	0,408	***	0,332 ***	-0,15	0,357	***	0,245 ***	0,455	***	0,435 ***	0,10
	transfer knowledge	0,218	***		0,250	***		0,03	0,208	**		0,300	***		0,09
transfer knowledge	transfer information	0,218	***		0,212	***		-0,01	0,285	***		0,095			n/a
	develope availability of knowledge	0,339	***	0,411 ***	0,067		0,484 ***	n/a	-0,019		0,460 ***	0,197	**	0,531 ***	n/a
	organize knowledge	0,201	***		0,520	***		0,32	0,531	***		0,516	***		-0,02
organize knowledge	integrate knowledge	0,757	***	0,573 ***	0,754	***	0,568 ***	0,00	0,727	***	0,529 ***	0,781	***	0,611 ***	0,05
integrate knowledge	understand details of the task	0,154	***	0,466 ***	0,236	***	0,385 ***	0,08	0,213	**	0,389 ***	0,262	***	0,382 ***	0,05
	access to new knowledge	0,612	***		0,456	***		-0,16	0,482	***		0,428	***		-0,05
access to new knowledge	create new knowledge	0,583	***	0,340 ***	0,637	***	0,406 ***	0,05	0,653	***	0,427 ***	0,621	***	0,385 ***	-0,03
share knowledge with team members	share knowledge with other participants	0,719	***	0,711 ***	0,296	***	0,468 ***	-0,42	0,344	***	0,439 ***	0,253	***	0,517 ***	-0,09
	transfer information	0,188	***		0,488	***		0,30	0,407	***		0,576	***		0,17
replace outdated knowledge	transfer knowledge	0,483	***	0,233 ***	0,503	***	0,253 ***	0,02	0,500	***	0,250 ***	0,506	***	0,257 ***	0,01
develope availability of knowledge	transfer information	0,229	***	0,352 ***	0,421	***	0,492 ***	0,19	0,527	***	0,518 ***	0,262	***	0,484 ***	-0,27
	share knowledge with team members	0,426	***		0,354	***		-0,07	0,269	***		0,490	***		0,22
*p < .05, **p < .01, ***p < .001.		n=385			n=385				n=192			n=193			

In order to highlight the difference between actual control and experiment groups' results we calculated $\Delta\beta$.

Control (face-to-face technologies) and experimental (wiki technologies) group statistics were also compared and too great differences were not experienced. Knowledge share was much more supported by information transfer in experimental groups, and it led to better development of knowledge availability. However, control groups over performed knowledge utilization by problem solving (they had stronger causal relationship) and they can build the availability of knowledge through information transfer better. In every other relationship the differences between standardized betas are not significant.

4.2. Control and experiment group results for intellectual and preference tasks

For intellectual tasks experiment groups had much better results after the experiment than the control groups. Almost every relationship has become stronger in knowledge creation and maintenance processes as it is shown in table 3.

Table 3. Path model weights for intellectual and preference tasks.

	Submodel	Intellectual task * F2F				Intellectual task * WIKI				Δβ	Preference task * F2F				Preference task * WIKI				Δβ
Dependent	Independent	β	p	R^2	p	β	p	R^2	p		β	p	R^2	p	β	p	R^2	p	
knowledge utilization	update knowledge	0,029		0,902	***	0,154		0,284	*	n/a	0,071		0,803	***	0,256		0,894	***	n/a
	solve problems	0,929	***			0,421				n/a	0,834	***			0,716	***			-0,12
solve problems	absorb knowledge	0,469	*			0,007				n/a	0,576	**			0,815	***			0,24
	increase efficiency with generated knowledge	0,318	*	0,647	***	0,386	*	0,733	***	0,07	0,076		0,794	***	0,075		0,744	***	n/a
	update knowledge	0,183				0,574	*			n/a	0,323				0,048				n/a
update knowledge	increase efficiency with generated knowledge	0,828	***	0,686	***	0,774	***	0,599	***	-0,05	0,785	***	0,617	***	0,821	***	0,674	***	0,04
increase efficiency with generated knowledge	learn from mistakes	0,549	**	0,301	**	0,758	***	0,574	***	0,21	0,723	***	0,522	***	0,321		0,103		n/a
learn from mistakes	create new knowledge	0,371	*	0,138	*	0,686	***	0,471	***	0,32	0,442	*	0,195	*	0,506	*	0,256	*	0,06
create new knowledge	transfer information	0,323		0,104		0,59	**	0,348	**	n/a	0,585	**	0,342	**	0,62	**	0,384	**	0,04
share knowledge with other participants	create new knowledge	0,42	*	0,176	*	0,741	***	0,550	***	0,32	0,605	**	0,366	**	0,43	*	0,185	*	-0,18
absorb knowledge	replace outdated knowledge	0,034		0,145		0,63	**	0,480	**	n/a	0,015		0,255	**	0,308		0,159		n/a
	transfer knowledge	0,367				0,091				n/a	0,498	*			0,119				n/a
transfer knowledge	transfer information	0,227				0,167				n/a	0,411	*			0,021				n/a
	develope availability of knowledge	0,320	*	0,539	***	0,513	*	0,491	**	0,19	0,094		0,553	**	0,347		0,549	**	n/a
	organize knowledge	0,494	**			0,100				n/a	0,347				0,449	*			0,10
organize knowledge	integrate knowledge	0,609	***	0,371	***	0,797	***	0,635	***	0,19	0,672	***	0,451	***	0,754	***	0,569	***	0,08
integrate knowledge	understand details of the task	0,309		0,416	**	0,231		0,557	***	n/a	0,433	*	0,446	**	0,274		0,091	***	n/a
	access to new knowledge	0,395	*			0,544	*			0,15	0,398	*			0,047				n/a
access to new knowledge	create new knowledge	0,504	**	0,254	**	0,621	**	0,385	**	0,12	0,873	***	0,763	***	0,413	*	0,170	*	-0,46
share knowledge with team members	share knowledge with other participants	0,494	**	0,447	***	0,321	*	0,744	***	-0,17	0,548	*	0,419	**	0,521	**	0,602	***	-0,03
	transfer information	0,422	**			0,615	**			0,19	0,174				0,384	*			n/a
replace outdated knowledge	transfer knowledge	0,353	*	0,124	*	0,650	**	0,423	**	0,30	0,497	*	0,247	*	0,692	***	0,479	***	0,20
develope availability of knowledge	transfer information	0,496	*	0,281	*	-0,332		0,356	*	n/a	0,546	**	0,683	***	0,437	*	0,572	***	-0,11
	share knowledge with team members	0,067				0,842	*			n/a	0,429	**			0,403	*			-0,03
*p < .05, **p < .01, ***p < .001.		n=31				n=22					n=23				n=25				

For preference type tasks this improvement cannot be significantly separated between experimental and control groups. However, some relationships were also over performed by wiki users: knowledge organization – knowledge transfer – outdated knowledge

replacement and knowledge absorption – problem solving. Nevertheless, better problem-solving does not support better knowledge utilization for preference tasks.

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ABET Accreditation: An Engineering Experience from Sultan Qaboos University, Oman

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Abstract

The Accreditation Board for Engineering and Technology (ABET) accredits college and university programs in engineering under the Engineering Accreditation Commission (EAC). The process follows Engineering Criteria (EC) 2000, which focuses on outcomes (what is learned) rather than what is taught. This paper presents an overview of the processes developed by the civil engineering (CE) program at Sultan Qaboos University to satisfy ABET Criteria 2, 3, and 4. The program had a successful accreditation visit in November 2013. Program educational objectives (PEOs) were developed. A review and revision process for PEOs was also developed. ABET student outcomes (SOs) were adopted by the CE program. SOs were broken into outcome elements. Key performance indicators were developed for each outcome element, according to the six levels of Bloom's taxonomy for cognitive domain. The process used direct indicators from student work as well indirect survey instruments. The program has developed a detailed and systematic approach for assessment of SOs with feedback and follow-up on implementation of actions for continuous improvement. Planning for the next accreditation cycle of SO assessment proved valuable, as the new accreditation committee started executing an already laid out work plan.

Keywords: *ABET; Accreditation; Civil Engineering; Oman.*

1. Introduction

The Accreditation Board for Engineering and Technology (ABET) accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology at the associate, bachelor, and master degree levels. It is driven by 35 member societies who set the standards for the accreditation process. ABET accreditation provides students, employers, and the society confidence that a program meets the quality standards that produce graduates prepared to enter a global workforce (ABET 2016). ABET requires a program to satisfy eight criteria and one program criterion under the Engineering Accreditation Commission (EAC) (ABET 2012). Criterion 2: Program Educational Objectives (PEO), Criterion 3: Student Outcome (SO), and Criterion 4: Continuous Improvement can be considered the core of the accreditation process, as they require special attention in documentation and preparation for accreditation.

Several programs have reported their experiences in accreditation. Soundarajan (2002) reported the experience of the Computer Science and Engineering program at Ohio State University, under ABET Engineering Criteria (EC) 2000. A recent report by Sundararajan (2014) presented the experience of the Mechanical Engineering at Iowa State University. Instructors were asked to set a criterion that reflects the demonstration of the particular outcome. A mix of course activities already in-place were used for evaluation. Rubrics were also used for laboratory reports and design projects. Faculty involvement was maximized while minimizing the efforts, resulting in a sustainable process.

Felder and Brent (2003) and Mourtos (2003) presented the work of Besterfield-Sacre *et al.* (2000) on defining outcome elements and attributes. Besterfield-Sacre *et al.* (2000) suggested breaking each outcome into separate elements. They suggested that some outcomes are easier to break than others; elements are literally extracted from these outcomes. Outcome attributes can be written as actions that explicitly demonstrate mastery of the abilities specified in an outcome or outcome element. Attributes were defined for the six levels of Bloom's taxonomy for the cognitive domain and the valuation levels of Krathwohl's taxonomy of affective domain.

This paper presents an overview of the ABET accreditation process for the civil engineering (CE) program at Sultan Qaboos University, in Oman. A successful accreditation visit took place in November 2013. The focus in this paper is on the development and documentation process for satisfying ABET EAC Criteria 2, 3, and 4.

2. Program Educational Objectives

The civil engineering program at Sultan Qaboos University has accepted and implemented the use of the term "objectives" as described in the ABET Criteria (ABET 2012). Hence,

the Program Educational Objectives (PEOs) are broad statements that describe what graduates are expected to attain within a few years of graduation. The major constituencies of the CE program included: (1) Engineering faculty, (2) Current Engineering students, (3) Alumni, (4) Employers, and (5) Industrial Advisory Board (IAB). An external examiner was included as a stakeholder, as he is an experienced academic in curricular matters, who is selected by the vice chancellor's office for the assessment of curricular and other activities in the program.

The first set of PEOs were developed in 2001 by soliciting feedback from stakeholders on PEOs. This resulted in a revised version of PEOs presented in the first ABET substantial equivalency accreditation visit in 2006. The PEOs went through another cycle of review and revision from 2008 to 2012. The current PEOs for the CE program are to prepare civil engineering graduates who will: (1) Design, construct, and maintain civil engineering systems using technical knowledge, design principles, and modern engineering tools; (2) Use their communication, leadership, and team-work skills effectively, and deal responsibly with the ethical, professional and social issues; and (3) Stay current through self-learning experiences, professional development, or postgraduate studies.

Prior to October 2012, employers were asked to review PEOs and the degree at which PEOS were being attained was assessed through surveys of alumni and employers. On October 2012, ABET introduced changes to Criteria 2 and 4 for the 2013-14 review cycle. The assessment of PEOs was removed and a documented process, systematically utilized, for periodic review and revision of the program PEOs through the constituents was required. As a result of these changes, a process for systemic review and revision of PEOs using input from all constituents in line with the institutional mission was developed prior to the 2013 accreditation visit. The developed review process for PEOs was a three-year cycle, which normally starts at the beginning of the academic year in the fall and takes one year to complete. A period of three years was expected be reasonable to keep up with relatively infrequent changes in constituency needs.

The systemic review and revision process starts by reviewing the PEOs by the department's accreditation committee to be in consistency with ABET criteria and the institutional mission, which is reflected in the college's mission, and the department's mission. SOs are also taken into account. Alumni and employers are invited to review the PEOs. Results are analyzed by the accreditation committee and are passed to the department board for review. The revisions are sent to the external examiner, to obtain an outside perspective, as well as to IAB members. The recommendations are implemented by the accreditation committee and reviewed by the department board for final approval. PEOs are then updated, if necessary. The information is passed to the curriculum committee for implementing any changes to the educational practice or strategies. The changes in PEOs may also affect the SOs. A retrospective discussion of PEOs with graduating students

takes place at the end of each spring semester. The constituent input to the process is shown in Table 1.

Table 1. Constituent input to PEO.

Input Method	Schedule	Constituent
Accreditation Committee	three times (during review process)	1. Eng. faculty
Departmental Board	Twice (during review process)	1. Eng. faculty
Student exit interview	Every year	2. Current students[a]
Alumni survey	Every three years	3. Alumni
Employer survey	Every three years	4. Employer
IAB meetings	Every three years	5. IAB
Email correspondence[b]	Every three years	6. External examiner

[a]retrospective discussion of PEOs and students' career paths; [b] or annual visit.

3. Student Outcomes and Continuous Improvement

Student outcomes (SOs) are what students are expected to know and be able to do by the time of graduation, in terms of skills, knowledge, and behaviors (ABET 2012). As recommended by the CE faculty members, ABET student outcomes (a) through (k) (ABET 2012) have been adopted as the CE program outcomes. SOs support the PEOs of the program. The association of SOs (b), (d), (e), and (i), as an example, with PEOs is shown in Table 2.

Table 2. Example of association of PEOs and SOs.

Student Outcome (SO)	PEO 1	PEO 2	PEO 3
(b) an ability to design and conduct experiments, as well as to analyze and interpret data.	✓		
(d) an ability to function on multidisciplinary teams.		✓	
(e) an ability to identify, formulate, and solve eng. problems.	✓		
(i) a recognition of the need for, and an ability to engage in life-long learning.			✓

Each outcome was defined by elements or different abilities specified in the outcome. In several outcome elements, a set of lower level attributes or performance indicators (PIs) were defined for each element to clearly define the actions that explicitly demonstrate the mastery of the abilities specified. This was done in order for the SOs to be communicated to the students and measured in a consistent and reliable manner in the assessment process. Table 3 shows the outcome elements and PIs for SO (b), as an example.

Table 3. Example of student outcomes, element and performance indicators.

Student Outcome	Performance Indicators
(b) an ability to design and conduct experiments, as well as to analyze and interpret data.	**b.1** Design experiments, given the stated objectives: − Choose testing parameters. − Choose appropriate equipment. − Determine appropriate number of samples. − Describe steps for performing the experiment. **b.2** Conduct experiments: − Become familiar with the equipment. − Follow the proper and safe procedure to collect data. **b.3** Process Data: − Carry out necessary calculations. − Check data variability. − Tabulate and plot results. **b.4** Analyze data and Interpret results: − Identify trends. − Compare with specification or predictive equations. − Draw conclusions.

3.1. Assessment Methods and Plan for the Next accreditation Visit

The assessment methods for SOs were divided into direct and indirect methods. The direct assessment relied on student coursework to provide quantitative data; and included exam questions, term papers or projects, laboratory reports, field and laboratory observation on conducting experiments, teamwork, use of modern equipment, and senior design project reports and presentation. On the other hand, the indirect assessment collected data from faculty members in the form of core course report comments and recommendations as well as student exit survey for graduating students. Core course reports were submitted every semester, and have been organized to include comments on: any shortcomings in students' previous knowledge of engineering subjects, general knowledge, skills,…etc; course learning objectives; student outcome assessment (if done in the course); implementation of actions for continuous improvement; and instructor's recommendations. The instructor's

recommendations were further divided into recommendations related to: SOs, department or curriculum committee, or course management (course specific).

Figure 1 shows the SO assessment process. Core courses were mapped to PIs through meetings with course instructors and review of the learning objectives of the courses. From the mapping of courses to PIs, sampled courses were assessed using direct assessment methods. Outcome assessment was conducted in three cycles for the ABET six-year accreditation period. Each cycle was comprised of one fall and one spring semesters. In each cycle, every PI was assessed in selected number of courses. The assessment of SOs relied on both the course component grades (specific questions in exams, reports, etc…) as well as on rubrics (for laboratory reports, presentations, and capstone design project). A simple Excel sheet was used to compute the percentage of students achieving the target, typically set at 70% of the students achieving 70% or higher grade in the assessed course component. Assessment results from different courses for each PI and SO were presented in a matrix. The average results were also presented graphically for each assessment cycle. The student exit survey was conducted at the end of the spring semester, and provided two types of information: students' perception of their acquired abilities, as described by PIs, and additional comments related to SOs or to the program in general. The survey requested rating on a 1-4 point scale, from disagree to strongly agree. The target was set at 70% of responses indicating agree or strongly agree for a particular PI. Indirect assessment results from exit surveys on PIs (SOs) were graphically presented with the direct assessment results.

A plan for the next six-year cycle of activities for SOs was prepared. Year 1 consists of review of PIs and mapping of courses versus PIs, as well review of assessment sampling plan. Data collection should be conducted in year 2 for all SOs. Evaluation of data should be in year 3. Actions should be implemented prior to year 4. Years 5 and 6 are similar to years 2 and 3. This cycle should be repeated every six years. The plan proved valuable as a road map for the new accreditation committee working on the next accreditation cycle.

3.2. Evaluation and Actions for Improvement

The evaluation of SO assessment results, and recommendation of actions for improvement for each assessment cycle (Figure 1) started from the Accreditation Committee, which met for this purpose once at the end of each semester. In the fall semester, the committee met to discuss the core course reports. The recommendations were reviewed and revised. Another similar meeting was held at the end of the spring semester with more tasks at hand. Direct and indirect assessment data were analyzed. Core course reports of the spring semester were discussed. The committee finally performed a review and revision of the recommendations for the entire year. At the end of the spring semester, a general meeting

for all the CE faculty members was held to discuss and revise the proposed actions for improvement. Additional actions related to the program were discussed, ending with the approval of the department board. Feedback was provided in the form of recommendations: (1) to instructors teaching core courses covering the relevant PI or SO, (2) to the department or curriculum committee, and (3) specific to a course, for next offering.

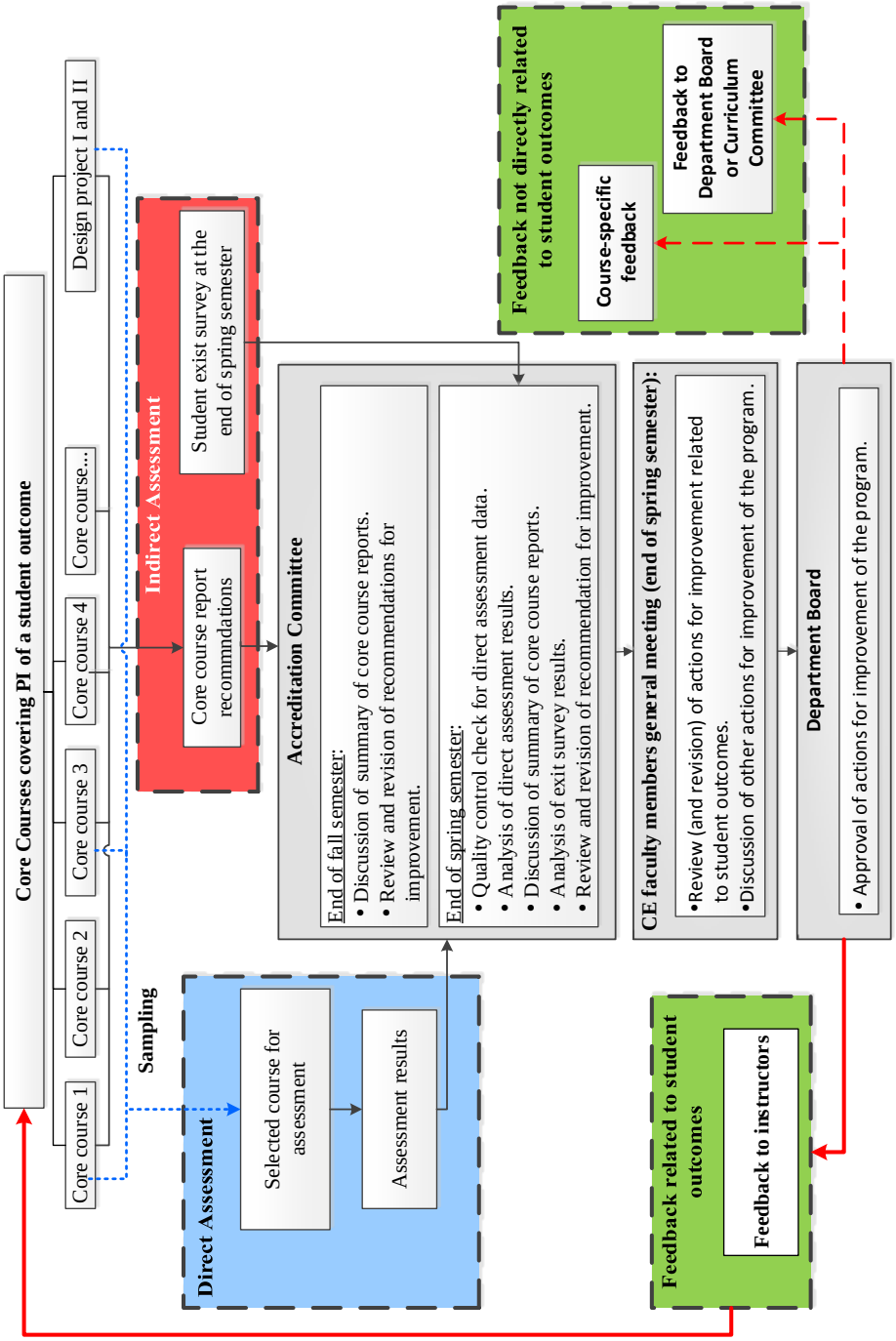

Figure 1. Student Outcome assessment process.

4. Conclusions

This paper described an overview of the processes developed by the civil engineering program at Sultan Qaboos University to satisfy ABET EAC criteria 2, 3, and 4. A successful accreditation visit took place in November 2013. This visit was preceded by a substantial equivalency visit in 2006. Program educational objectives have gone through several major revisions by the stakeholders since first developed in 2001. Finally, a process for review and revision for the program educational objectives has been developed.

ABET Student Outcomes (a) to (k) were adopted as the program SOs. The program has developed a detailed and systematic approach for assessment of SOs. SOs were broken into outcome elements. Key performance indicators were developed for each outcome element according to the six levels of Bloom's taxonomy for cognitive domain. The process used direct indicators from student work as well indirect survey instruments. Rubrics were used for assessing laboratory reports, presentation, and the capstone design project. Within the process, data were analyzed to identify necessary changes for continuous improvement. Feedback was provided and implementation of actions for improvement was also monitored. Planning for the next accreditation cycle of SO assessment proved valuable, as it paved the way for the new accreditation committee.

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TED-Ed web-based blended learning to support teaching: An action research project

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Abstract

The use of video material to support the pedagogical shift to blended learning has begun being utilised in traditional campus based universities. This student centred approach has supported higher education practitioners in adapting their practice to better meet the diverse student populations entering university. An action research project utilizing TED-Ed to introduce out of class, student centred learning was conducted by a Dubai based lecturer. A class of 65 students enrolled in a second year Psychology module completed between one to three online activities and answered a qualitative survey sharing their opinions towards completing the tasks. The results showed that blended learning could be effectively used as a teaching tool to support practice in a 'traditional' university with a focus on the lecture/seminar approach. Lecturers seeking to extend their students' learning into out of class environments should consider the use of TED-Ed as a suitable tool for not only achieving this but also supporting the needs of 21st century tertiary students.

Keywords: *TED-Ed; Blended learning; university; student learning; learning environment; action research.*

1. Introduction.

1.1 The Problem

Within the first week of class, whilst discussing the module handbook, students were asked if they had any questions. Instantly a confident young woman asked, 'When are the seminars and workshops?' to which my answer was 'There aren't any'. The first piece in the puzzle that was my problem had emerged. PSY2014 focuses solely on theories with the only workshops occurring as support for the first summative assignment. The need to cover so much theory leaves little room for student-centred pedagogical practice or any form of interactive learning. My research with a colleague regarding students' learning strategies identified a lack of reading, surface approaches to learning and a lack of out of class studying as major contributors to the lack of understanding within modules across the sample studied. As the second puzzle piece making up the issue I was facing this one was closest to my heart. I wanted my practice to give students the opportunity to learn what they felt was personally relevant, and of interest to them, coming back more motivated as the year progressed. Finally, in the most recent board of studies for Psychology, students had requested more videos, which ironically the student representative had found humourous due to the already frequent use of video within the class to help consolidate theory. I realized however on reflection that despite the use of videos in the class, the students had not identified this as a learning tool.

1.2 The Solution

As a result of the modern knowledge society, fundamental shifts in the role of the lecturer and pedagogy to a learner centred environment is essential (Hoic-Bozic, Mornar, & Boticki, 2009). The use of e-learning is a suitable way of shifting the focus of the learning environment, making the students' role more active (Garrison, 2011). Video material has been used for many decades to support the motivation and learning of students in higher education (Chin, 2004), and has been recently suggested as one of many additional learning resources which can be utilised by lecturers to foster deep approaches to learning (Azer, Guerrero & Walsh, 2013). Indeed, videos used in class can support the link between theory and real life (Seidel, Blomberg, & Renkl, 2013) in developing understanding of abstract ideas (Eick & King Jr., 2012), and encourage learning outside the normal teaching environment (Mitra, Lewin-Jones, Barrett, & Williamson, 2010). Students currently entering university are seen as digital natives (Prensky, 2005) and benefit when digital technology is incorporated in the learning environment, with younger students reporting greater enjoyment when video is used as a teaching tool in class (Fee & Budde-Sung, 2014). The use of blended learning, an approach which utilises a combination of face to face teaching as well as online learning has been identified as better than either of these approaches used in isolation (Mehaffy, 2012). This pedagogical approach has the power to

promote higher-order thinking skills and foster critical reflection (Garrison, 2011), both of which are identified as key elements in using a deep approach to learning (Biggs & Tang, 2011). In contrast with the expository, didactic approaches of typical face to face learning, blended learning typically engages students in an active learning process (Means, Toyama, Murphy, & Baki, 2013). This student centred approach, which bases its pedagogy within the framework of constructivist principles (Norberg, Dziuban, & Moskal, 2011) has been found to encourage students to be more autonomous, more critical and use deep learning approaches (Baeten, Kyndt, Struyven, & Dochy, 2010; Carper, & Nicholson, 2011; Slevin, 2008; Vogel-Walcutt, Gebrim, Bowers, 2011). Although there are challenges associated with integrating online education in to the current HE system (King & Alperstein, 2015), as a means to solving the many problems I was facing within PSY2014 a video based blended learning approach seemed to be appropriate. TED-Ed (TED-Ed, n.d.), launched in 2012, allows teachers to extend learning beyond a lecture format (Education Letter, 2012). The website allows anyone to choose a video online and create multiple choice and open ended questions to support learning regarding the videos topic. As a constructivist teaching tool the facilitator can then create a paragraph asking students to 'dig deeper' and also create discussions for students to synthesise material from the video, additional readings and class, as well as critically analyse different points of views from classmates. Mehaffy (2012) discusses how these changes identified within the HE system are going to lead faculty to be more 'guides on the side' in comparison to the old adage of 'sage on the stage'. He goes on to note how TED-Ed is a more than suitable tool for supporting teaching practice in a new model of education which supports students to learn what they want, when they want, at the pace they want.

2. Methodology

2.1 Design

This action research study takes on a phenomenological design, exploring qualitatively the effectiveness of TED-Ed as a teaching tool.

2.2 Participants

Students (N=66) taking part in PSY2014; Developmental Psychology (2015-2016) were opportunistically sampled from the Dubai branch campus of a British university. The sample ranged in age from 19 to 24 and came predomintantly from Asian and Arab backgrounds.

2.3 Procedure

In weeks nine, ten and eleven students completed a TED-Ed activity designed to support learning for previous topics taught in semester one. In Week 12 students were given a qualitative open ended questionnaire seeking information regarding study strategies utilized while completing the TED-Ed activities, as well as their general feelings in its use within the module to support learning. TED-Ed web-based blended learning to support teaching: An action research project

2.4 Materials

A single 'in the moment' open-ended question at the end of each TED-Ed activity asked students how they felt about the task in relation to their learning, typically phrased as 'Write down how you found the experience of completing a Ted-Ed lesson.'

A qualitative open ended questionnaire was used as a second measure of students perceptions towards the use of TED-Ed as a blended learning tool, to identify reasons for choosing to complete the TED-Ed activities, how the video activities assisted in learning content and skills and finally whether students felt TED-Ed activities were a suitable extension of lectures in light of the lack of seminars/workshops.

2.5 Analysis

To analyse the effectiveness of using TED-Ed as a blended learning teaching tool to support deep approaches to learning, as well as benefits and changes to learning strategies from a student perspective, answers from the open ended questionnaire were read and coded using thematic analysis.

3. Results.

3.1 Thematic Analysis

The themes that emerged from the students' responses encompassed four overarching themes: Multiple Perspectives, Teaching Environment, Construction and Application, and Academic Skills. Table 1.summarises major themes and subthemes.

Table 1.Themes identified from end of activity questions and summative interview.

Themes	Subthemes
(1) Multiple Perspectives	i. Deeper Understanding
	ii. Others perspectives
	iii. Lecturers viewpoint
	iv. Appreciating Questions
(2) Teaching Environment	i. Own pace
	ii. In-class Discussion
	iii. Combining Environments
(3) Construction and Application	i. Visual Learning
	ii. Applying Knowledge
	iii. Going deeper
(4) Academic Skills	i. Synthesising Material
	ii. Critical Analysis
	iii. Referencing
	iv. Viewed as Revision
	v. Information Literacy

The theme of Multiple Perspectives came about as a result of students (approximately 40%) identifying their own understanding from a personal perspective as a result of completing the TED-Ed activities. This can be seen in the following two verbatim quotes from participants *'To gain a better understanding of what was being taught in class,'* and *'[It] helps to get a clearer idea about the topic'*.

Alongside this, an understanding of their classmates' perspectives through the discussion threads, or noting a desire to put aside some in-class time to discuss their different thoughts and feelings regarding the content of each activity was also evident through quotes such as *'It would be beneficial to know different views and opinions on different topics'*, and *'It would be beneficial, as different perspectives to the same topic can be discussed.'*

The second theme emerged around the notion of 'Teaching Environment'. This theme centred on the idea that students very much enjoyed the independence and autonomy related to the TED-Ed activities as seen in the following quote: *'I prefer TED-Ed activities as I am on my own pace…', 'I prefer TED-Ed activities as you can do it at a time that is comfortable for you as well as at your own pace'*.

However, the students were eager to have these combined with in-class seminars throughout the year, or at the very least have discussions in class to support the out of class blended activities they were completing. Quotes such as *'I like TED-Ed activities but if I have doubts at that moment I prefer my lecturers to help me then and there'* and *'The in-class seminars and the TED-Ed video could be mixed. We could get the best of both worlds,'* support these findings.

The third theme that was identified through analysis of the data revolved around that of 'Construction and Application'. Approximately a third of the students made it clear that their engagement and ability to independently construct a deep understanding through the TED-Ed activities were the result of a visual learning style. *'As I am more of a visual learner, I found the videos very interesting and stimulating as it kept my attention.'*

Moreover, approximately half the students felt that their ability to construct the knowledge and material around a real life situation and being able to apply the learning to case studies in the videos supported better understanding of the material at hand. One student noted that *'They [TED-Ed activities] gave me a more practical sense of the topics discussed, they encouraged my critical thinking skills and deeper reading skills.'*

A fourth theme of 'Academic Skills' emerged from the data whereby students made it clear that the TED-Ed activities had increased their independence, awareness and skills in synthesizing literature, going beyond the suggested material in the module handbook, thinking critically, and the use of discussion to argue viewpoints. An example quote identifying the use of independence was *'It was a kind of guide, [a] self-study tool'.*

Some students however described skills which weren't related to deep approaches or extending their skills. For example *'I skimmed through articles to find answers to certain questions especially the discussion section. I thoroughly read the recommended texts'* and *'The questions were useful since it was like a revision.'*

4. Discussion.

The aim of the current study was to ascertain whether TED-Ed activities were an effective blended learning tool in supporting the use of deep learning approaches in a Psychology module largely lacking in student centred pedagogy. Students are assessed in this module via one piece of coursework; a developmental observation report and an exam at the end of the academic year. It is hoped that by completing the TED-Ed activities that students will have a more holistic understanding of the topics covered by the exam questions. The results of the present study clearly indicate that students enjoy and benefit from the use of video based, out of class activities. Constructivist approaches such as that used in the current intervention have been identified as a successful manner in which to foster deep learning

approaches from students (Vogel-Walcutt et al., 2010). The findings of the current study show not only the use of higher order thinking skills but also a shift in the teaching environment from teacher-centred to student-centred, which has been identified as the most important pedagogical shift required in order to successfully use blended learning within one's teaching practice (Hoic-Bozic et al., 2009), and support students' use of deep approaches to learning. Results from the current study indicate that students clearly appreciate the visual aspect of using video material to support learning outside of the class. Mitra and colleagues (2010) discuss how the use of video material which supports the use of both visual and auditory processing results in better learning, engaging students in deep learning. Chen and Gilchrist (2012) extol the use of TED-Ed as a tool for creating a teaching environment which fosters deep approaches to learning, however noting that attention to the quality of the video and other learning material is an important consideration when creating activities. Learning approaches are dynamic and are interchangeably used in response to the learning environment presented to students (Azer et al., 2013). Thus, it is the responsibility of the lecturer to use video in a way which fosters reflection, synthesis and other higher order thinking, as opposed to presenting work which students see as revision. An additional pedagogical approach that is convergent with the use of blended learning is that of interactive learning (Means et al., 2013) whereby students' learning emerges as a result of interactions with each other and the lecturer (Cox, 2011). This approach is highly sought after by the students as they voiced a desire to utilise both online activities in their own time and space, but also to come back to class and discuss their opinions and thoughts, hear those of others and to clarify doubts. Previous studies focusing on student centred environments have shown that both student-lecturer and student-student interaction are both effective ways of developing sound understanding as well as support the incorporation of higher order thinking skills in to teaching activities (Baeten et al., 2010; Garrison, 2011). In order to better support the variety of students entering the HE system in the 21st century (Biggs & Tang, 2011; Prensky, 2005) it is imperative that faculty are able to adjust their pedagogy. The current study is based on an intervention which acts as a pilot study in the ongoing professional development of one Dubai based lecturer, which indicates that TED-Ed has the potential to unlock a paradigmatic shift in teaching practice. The use of technology and blended learning to support students gives rise to boundless opportunities to develop tools which ensure effective teaching in Psychology, as well as other subject areas, through student centred teaching.

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New ways to evaluate learning. Assessing teamwork using TPM and a Poka-Yoke design

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Abstract

In this paper we present a hands-on experiment for measuring learning through teamwork applied to solving a real problem.

The experiment is part of the Production Systems course and involves designing a Poka-Yoke, but not theoretically, as is usually the case, rather an actual working mechanism. To this end, a practical problem is proposed for which a physical machine has to be designed to solve the problem. As part of the same exercise, a TPM is developed, also applied to a real case, such as assembling a bicycle.

In the case of the Poka-Yoke, two simultaneous objectives are pursued: to avoid a defective product, and to maximize the production per unit time. The final score is assigned based on a measurement of these two parameters.

Once the exercise is assigned, the teamwork is verified to be measured efficiently, even when the number of students is high. The physical design of the elements, as well as the simultaneous engagement by all the students in the exercise, served to considerably raise the motivation of the students.

Keywords: *Cross-disciplinary skills, Poka-Yoke, T.P.M., production system.*

1. Introduction

Effective teamwork and problem-solving skills are becoming increasingly important. Implementing and measuring these skills is difficult, requiring new tools in order to be used efficiently.

Some authors, like Bowden and Marton (2012), have already shown the need to use project- or problem-based learning, while others, like Antoni and Laia (2008), have gone further, stating that being skilled means being able to respond efficiently to a real situation. It thus seems obvious that the starting point for any evaluation should involve a more or less real situation that somehow captures what one can find in the real world.

Teamwork is also essential to solving these real problems. Even in some highly complex problems, teamwork is more important than individual skills, as detailed by Villardón-Gallego (2015). According to Brown and Pickford (2013), these skills should be evaluated live so as to effect a better and more realistic assessment.

Considering all of these requirements – solving real problems using teamwork and live tests – we present an exercise performed as part of a Production Systems course that offers good results at a minimal cost.

2. Skills to evaluate

During their 6th semester, Industrial Electronics and Automation Engineering majors at the University of Burgos take a required course on Production and Manufacturing Systems.

The skills defined for this course and evaluated through the exercise detailed below are:

- Analysis and synthesis

- Effective problem solving

- Teamwork

The large number of students taking this course drove us to design this exercise so that we could evaluate these skills using a real scenario.

3. Production Systems

Before explaining the experiment, we will describe the subject and context on which it is based. Within the Just-In-Time production system there is a quality tool called the JIDOKA, as explained by Yasuhiro (1987).

Jidoka is a Japanese word that in the lean manufacturing methodology means "automation with a human touch". Jidoka allows for a process to have its own quality control.

Within Jidoka is the Poka-Yoke tool, a technique for correcting and detecting production defects that relies on mechanisms to warn of an operational fault or of a defective product. It can even stop the production line or machine if necessary.

Poka-yokes usually involve:

1 – A detection system, whose type will depend on the feature to be monitored and based on which they are usually classified, and
2 – An alarm system (typically visual and audible) to notify the worker of the error so it can be corrected.

The phases for implementing a poka-yoke are:

1 – Understanding how a process is failing.
2 – Deciding the correct poka-yoke approach (eliminating unnecessary elements and adding new ones).
3 – Determining if the handling, number of actions and sequence are appropriate.
4 – Using the method and checking its operation.
5 – Training workers on the measure adopted.

Total Production Management can be defined as a system through which every worker takes part in preventing, detecting and correcting faults in designs or in the operation of machinery. According to Samuel and Christopher (1994), it is a method for avoiding wastage that relies on every worker to improve processes.

4. Exercises proposed

The TPM exercise consists of assembling and disassembling a bicycle, making the associated materials, measuring parameters, etc.

The Poka-Yoke exercise proposed consists of solving the following problem:

- At a work center, four holes must be punched into sheets measuring 297x210 millimeters. On one side of the sheets is a mark indicating whether the sheet is type 1 or type 2. The mark has a 1-mm diameter.

- On type-1 sheets, the mark is 107 mm – 149 mm away from the origin (bottom left corner), and the punch holes go to the left. On type-2 sheets, the mark is 107 mm – 146 mm away from the origin, and the punch holes go to the right.

The sheet is handled vertically, as is the hole punch. All the sheets have the same dimensions.

A poka-yoke has to be designed to improve the work station so as to maximize production while ensuring that the holes cannot be punched on the wrong side. The sheets arrive in random order.

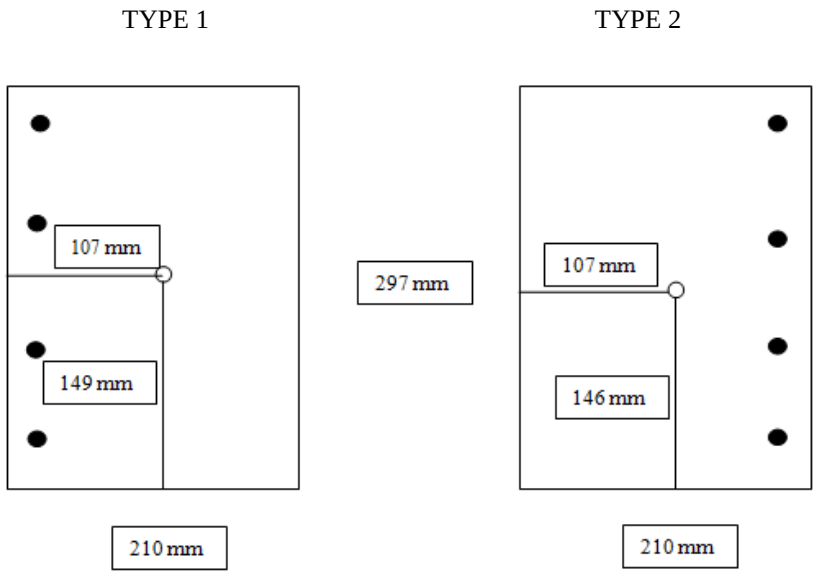

Figure 1. Problem proposed.

This is not a theoretical proposal; rather, physical components have to be developed to detect the type of sheet involved so the holes are made on the correct side. The system has to be effective. The work is carried out in groups of four students each.

The groups will be evaluated by giving each one a set of parts (sheets) that has a mixture of type-1 and type-2 parts. The part type has to be identified and the holes punched on the correct side. The two objectives are correct identification and speed, which are assessed by counting the number of sheets punched incorrectly and the time employed. The exercise is graded using the following criteria:

- The test involves 20 sheets total of both types, and can be assigned a maximum of 1.5 points.
- Two or more faults will result in everyone on the team being given a 0.
- The score with 1 fault will be 0.5 points.
- With no faults, the time used is considered for all the groups that had zero faults and a grade of 0.5 to 1.5 points is distributed proportionately.

In other words, zero faults and the worst time receives 0.5 points, zero faults and the best time is 1.5 points and the rest are graded proportionately between these extremes.

Another important condition is that the person doing the test is chosen at random from the group just before the test, thus ensuring that every group member took part in the design and practiced using it.

The four groups were given a hole punch that they could take home to use in their design and to practice with. Since four identical hole punches are available, four groups are tested at one time (see Figure 2). The test is not repeated.

Figure 2. Hole punches used.

5. Results of the exercise

This experiment was carried out as part of the Production and Manufacturing Systems course for Industrial Electronics and Automation Engineering majors (48 students).

The students were arranged into twelve groups of four.

In the TPM case, the results were very satisfactory, since the groups performed the physical assembly, made the corresponding materials and acquired all of the group skills proposed.

Figure 3 shows some of the materials made by one group, such as a graphic diagram with operations to be performed to remove the bike

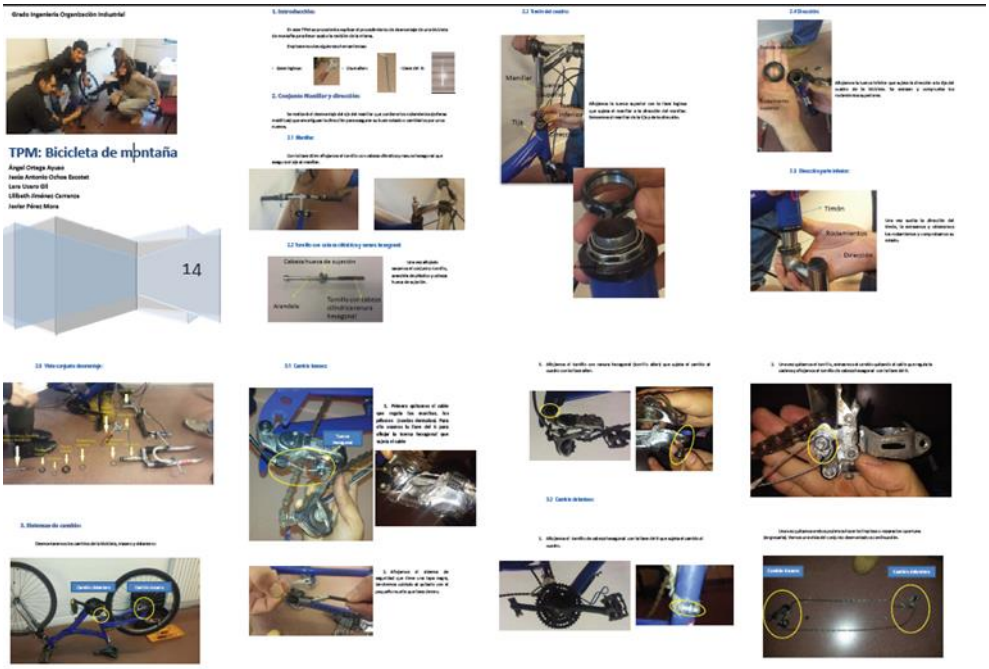

Figure 3. Sample of materials made during the TPM.

For the Poka-Yoke exercise, the number of faults, time used and final score are shown in Table 1.

Table 1. Results of the exercise.

FAULTS	2	1	0	0	0	0	0	0	0	0	0	0
TIME	-	-	6.40	5.50	4.56	4.16	3.33	3.23	3.10	2.41	2.2	1.51
SCORE	0	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5

The exercise was useful for evaluating the skills proposed (analysis, teamwork and effective problem solving). In this exercise, all students in the same group have the same note. Students had two months to prepare these two exercises

It was well received by the students and having the score depend on the relative times fostered competition.

The financial cost of this exercise is minimal. These exercises can be performed in smaller classes (e.g. 12 or 16 students), but also by smaller groups.

Different courses can use new exercises with small variations. For the TPM exercise the same methodology can be applied to the assembly and disassembly of a computer, and for the Poka-Yoke exercise, the symmetry of the exercise can be altered, as this would entail designing new physical elements. Figure 4 shows one variant in which the mark also exhibits a 3-mm symmetry about the diagonal.

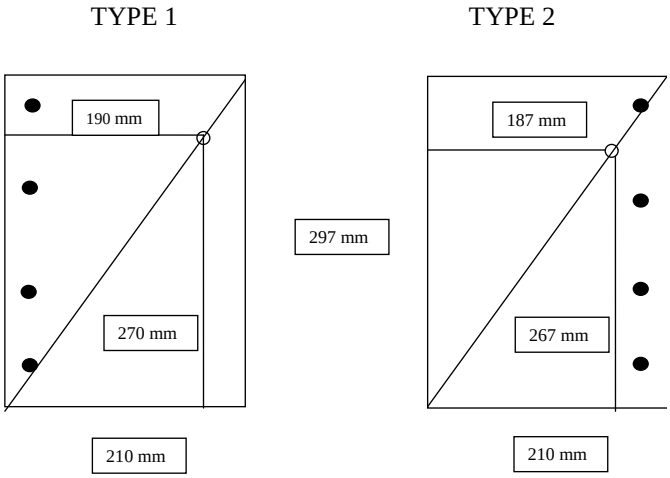

Figure 4. Variant of problem statement.

The Poka-Yoke exercise can be improved as follows:

- By using very high quality sheets. Since the marks are only 3 mm apart, a poor quality photocopy can lead to mistakes. (This was detected after performing the exercise).
- Given more time, and so as to improve the learning process, a follow-up test can be given since some of the groups did not anticipate potential problems, leading to low grades on the exercise.

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Consolidation of a professional approach experience on motivating Computer Engineering Students to the application of legal issues

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Abstract

In previous courses, professors of the degree of Computer Science and Software Engineering of the University of Zaragoza realised that students did not like studying materias related to Legislation and Information Systems. However, these topics are key when Computers Science and Software Engineers have to analyse, design, implement, and mantain Information Systems in different environments such as an enterprise, a public entity, etc. because the rights of the users/clients of these systems must be guaranteed. So, a more appeling way to teach those topics to motivate the students to take them into account was designed.

This paper describes the methodology and the main activities designed in the 2014/2015 and 2015/2016 courses in order to get the attention of the students on topics related to the current Spanish legislation and Information Systems. Moreover, some indicators about the performance of the students and their opinions about this new methodology are also described and analysed.

Keywords: *project based learning; problem based learning; professional approach; active learning; legislation; information systems.*

1. Introduction

Thanks to the development of Information and Communication Technology (ICT), during the last decades, there has been a huge increase in the amount of digitized data available to be processed. This has led to new business models and applications in many areas and sectors. So, the development of ICT has generated the need to create and adapt legislation in order to guarantee people rights in the context of Information Society. In the Spanish scope, it is important to consider the Ley Orgánica 15/1999, de 13 de diciembre, de Protección de Datos de Carácter Personal (LOPD; Personal Data Protection) and the Real Decreto 1720/2007, de 21 de diciembre, de aprobación del Reglamento de desarrollo de la LOPD (RLOPD; regulations implementing the LOPD). Some institutions, as the *Agencia Española de Protección de Datos* (AEPD; Spanish Agency for Data Protection) have already taken care of publishing this framework and try to ensure its compliance. Nevertheless, a high percentage of Small and Medium Enterprises (SMEs) are not aware of being subjected to this law framework, according to data provided by the Instituto Nacional de Tecnologías de la Comunicación (INTECO; National Institute for Communication Technologies), (Pérez San-José, Gutiérrez Borge, et al, 2012).

The learning objective here is to consolidate and improve the experience introduced last course (2014-2015), in order to engage Computer Engineering students of the need to respect regulations. In order to obtain these goals, we propose problem and project based learning by applying practical tasks of an Information System course on a research project.

This paper is organized as follows. First of all, a brief description of the technological project is presented. Then, the methodology proposed for the learning process is depicted. After that, technologies used by the students are described. Later on, results of this experience are discussed. Finally, some conclusions are drawn and future work is introduced, as well as sustainability and maintainability.

2. Bioinformatics Research Project

As it was previously mentioned, thanks to the development of ICT, there has been a huge increase in the amount of digitized data available to be processed. Thanks to that, some new business models and some new applications in many areas have been introduced. For example, in the health scope has emerged the bioinformatic area and there has been an increase in SMEs, and emerging research groups that develop management and processing systems of biomedical signals (signals originated by the human body, used in diagnosis or medical research) with different goals.

As we were involved in the development of one of those biomedical projects, we decided to take the advantage of using the project in order to motivate students to understand and to

apply legal issues when developing any information system from its firsts stages. The research project used in the experience has the reference CUD2013-11 (Peláez Coca, 2014). Its title, translated to English, is: *Identifying Situations where Military personnel Performance is Decreased, based on the relationship of Heart Rate Variability with Stress and Sleep Deprivation*. The ultimate goal of this project is to develop an automatic identifier of the operating performance of security and defence personnel from biomedical signals for carrying out activities with great physical and/or cognitive requirements. To this end, different multimodal biosignals are registered in several experimental subjects, while they face a highly stressful task with great cognitive requirements. A big amount of biological and personal data is managed at Centro Universitario de la Defensa de Zaragoza, where the project is developed. Refer to bibliography in case more information about the project is needed (Aiger et al., 2014).

Since data managed in the introduced projet is not only important for the project but also sensitive, as they are personal and also biomedical data, the relevance of its safety is really high. So, a series of guides defining behaviour protocols, were developed during the first part of the project. They introduce the convenience of the application of safety politics from the very beginning of every information system project (Lozano & Trillo-Lado, 2014). That is why we thought that this was the best environment to learn the importance of applying the normative and legal framework, and to do it from the first draft; despite the fact students enrolled Information Systems course had already taken lessons about legal issues, they did not apply those concepts, techniques or tools to design and implement their own systems.

As in the first experience the research project was used with good results, we decided to use it again as the project is still active. The idea for future experiences is to change the research project used. In spite of that, this course we preferred to focus our efforts on improving methodology.

3. Methodology used in the learning process

Target audience of this experience of professional approach are the students of the Information Systems course in the Computer Engineering Degree taught at the Escuela de Ingeniería y Arquitectura, Universidad de Zaragoza. In general, during the development of practices and problems of the course, students often worked with simple examples that do not motivate them. Besides, aspects of legislation in the field of ICT in a Computer Engineering degree do not usually appeal to students. Therefore, last academic year (2014-2015), we proposed to students working and developing their practice in a research project of the Centro Universitario de la Defensa (Peláez Coca, 2014). Briefly, the main innovation introduced by this work was the use of a real development and technological innovation

project, in order to motivate students to study existing legislation and norms on issues related to ICT and Information Systems.

Apart from the importance of the fulfilment of the law, one of the main ideas to be conveyed to students is that it is necessary to consider the security aspects of the storage, processing and transmission of data and information from the beginning of the project; and not only when implementing and parameterizing specific software. So, we try to introduce these ideas to students using some activities based on previous expertise. Thus, we designed a set of practices and problems to be solved in the classroom which were related to tasks to be performed on the CUD project following the methodologies and indications of Problem Based Learning and Project Based Learning (Blumenfeld, 1991; Luarattana et al., 2010; and Wood, 2003). Moreover, we estimated the workload of the practices assessment proposed to students; and designed the development of the practice and problem sessions.

4. Technology used in the learning process

In relation to the technologies used in this new experience, the same technologies as last course were proposed to students. So, several web technologies were explained and proposed to develop the Web Applications: HTML, CSS, Apache-Tomcat, relational and object-relational databases (Oracle, PostgreSQL, Cache, MySQL), middleware mapping object-relational (Hibernate with JPA), Java, JDBC and J2EE. Nevertheless, students are allowed to select other technologies and frameworks in order to develop their information systems. At the end of the term, we will see if those technologies were different from the ones chosen last year and the rate of students that used the proposed ones.

5. Results and Discussion

In general, during the development of practices and problems students often work with simple examples that do not motivate them. Besides, topics related to legislation and ICT in a Computer Science and Engineering degree do not usually appeal to students. However, through this experience students increase their knowledge of Information Systems and legal issues, especially the expertise and know how, in the context of an actual professional approach. In addition, students learn it in a more entertaining way, thanks to their increased motivation, because the obtained results are applied on a real project that is already ongoing.

In order to get the final results of the experience this course (2015-2016), some activities remain to be accomplished; for example the survey, the interview and the final evaluation for the students have not been completed yet. In more detail, to evaluate the new

methodology and activities designed to foster the process of learning basics of legislation and norms in the field of ICT, several surveys will be completed by the students after the end of the course. Moreover, at least four students will be interviewed (two from the current academic course and two from the previous one) in order to compare the assimilation of legal concepts related to Information Systems.

6. Conclusions

In order to get the final results, students at the end of the course should complete a survey and a minimum of four students should be interviewed (two from the current academic year and one from the previous one, in order to compare the assimilation of concepts). Before having these data, only the perception of the teachers can be analysed. Professors consider that concepts are better understood using the ideas here applied, thus we think that the main point is that students are motivated due to the relation of the activities they do with a real project. In fact, we got the perception that anything real motivate them, especially if it is usefull for someone, as it is the case here with the research project.

7. Future Work

If the results are so good as expected, we plan to repeat the experience, improving some aspects and changing the research project used. The objective in changing the research project used to motivate students is to use an active project, as the one we are using this course is about to finish (at the end of 2016). Next course (2016-2017), we will probably use the project described in (Lozano, Trillo_Lado, 2015).

8. Sustainability and Transferability

In relation to sustainability, this experience can be repeated in subsequent years in the same subject, using as a basis new projects that would be useful for the implementation of the tasks that are part of the course.

Regarding to transferability, the idea of approaching to a professional development project in an academic degree course could be exported to other related subjects. In fact, we are already doing it, in an innovation project where we share our experience with teachers who are responsible of other materias in the same area such as Databases, Web Engineering, etc. (PIIDUZ_15_296).

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Pre-gradual preparation of future teachers for cooperation and communication with student´s parents

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Abstract

Partnership of family and school is the subject of interest not only to the non-professional public, but also to profesionals of pedagogical, sociological and psychological. The reasons are continuous efforts to improve education of children and transformation of schools to modern institutions, which cooperate with their surrounding areas providing quality services to their attendingstudents and their parents. Partnership of school and family of student is organical part of these efforts and it becomes the important part of evaluation of school´s quality.

Cooperation of family and school is an undividible part of the teachingprofession. At the same time it belongs to areas which cause the biggest problemsto graduates in pedagogical practise. This observation is not only drawn from researche in this area, but also from interviews which were conducted with students after attending pedagogical practise seminars in undergraduate studies. The text is focused on undergraduate preparation of future teachers for work with parents. It shows if they are theoretically and practically ready and it is foccussed on the possibilities of evolving practical skills and applications of theoretical knowledge from the subject´s area.

Keywords: *pre-gradual preparation; pedagogical practise; cooperation; teacher; parent.*

1. Introduction

In the last decades we have been witnesses of economincal, cultural, political, ideological and other changes of society, which have been reflected also in nowadays characteristics and features of family and school. Within his or her practise, a teacher meets with various types of families and parents with who he or she has to cooperate and communicate. In practise they are still more often in touch with patch-work families, families created by people of the same sex, with people who are challenged by a socio-cultural handicap and others, which require individual access. It goes without doubt that these changes and characteristics of families are reflected also in connection and communication of a teacher with student parents. In this day and age, relationship of family and school is not influenced only by the type of family, but also by other determinants coming from family and school area. On the side of family, there are mainly social-economical conditions, on the side of teacher it is the length of pedagogical experience.

2. Pre-gradual preparation of future teachers

Pre-gradual preparation of teachers forms an important part of their profesional development, it creates the base for future professionality. Kasáčová (2006: 27) in this connection mentions that „pregradual preparation as basic time has to create an integral part of the system of teacher education on the base of respecting the rule that professional is not preparing for profession only one time and forever and definitively". This should fulfill the conditions and requirements in order to ensure a good start, and to provide a wide base of specific knowledge and skills or abilities. Preparing education in theoretical and practical level forms the base of professional teacher competencies. Slávik and Gáborová (2007) emphasize the necessity of moving the preparation of future teachers in university-based teacher-training from monological presentation of teaching materials to partner dialogues and to discussion in the interest of mutual foundation and achieving the results in an atmosphere of mutual acceptance, emphaty and authenticity. According to authors, an caring and emphatic teacher in the long run supplies knowledge but at the same time also caters for the personal needs of students which enhances a positive relationship with each other undoubtedly and also to the subject taught. By this approach, teachers get wider feedback about the teaching process which enables him or her correct and adapt not only the attitude between teacher and students to the extent of becoming a role model or idol. This helps students and learners to form a positive model of their future (acceptable and emphatical) behaviour towards students but also to student´s parents.One important condition is the authenticity of the teacher´s behaviour. Frequently mentioned requiremets are the bases of profesional forming part of which is student´s getting know all the aspects of teacher´s work. Kosová (2006: 17)

states that the biggest obstacles in development of profesionality are in college´s education or teaching following:

- Ignorance towards theories of teaching and processes in relation to teaching of university student from the side of universities teachers.
- Lack of acceptance towards the fact that becoming a teacher is a step-bystep process with distinct, consecutive phases of.
- Excessive useof knowledge-receptional methods of teaching (teacher´s speech), its inefficiency for the process of teaching and oppositness of profesional focus of study.
- Teaching of methodological and pedagogical subjects by teachers without sufficient practical experience, resulting in failure to meet the requirements of supervising students' practise.
- Non-adequate evaluation of pedagogical students, pointless testing by knowledge-based exams instead of evaluation of profesional competencies of teachers including state exams.

Professionality of teachers according to Kasáčová (2006) includes a personal, ethical and specific dimension. By reaching and meeting these dimensions study programmescan develop the teacher´s professionality, which depends on small but continuous steps, moving forward in practical teacher´s performance and also develops a system of life-long-learning for teachers.

Teacher´s education constitutes itself by four basic areas:

- General base,
- pedagogical-psychological element or part
- specific-subject part,
- pedagogical practice (Mendelová, 2011).

Theoretical preparation should not be focused only on summarizing knowledge and information. Istead, focus should be mainly on evaluation, analysis, comparison and integration to practice and also to other areas. Students should be made aware that the main point of their training is not speeches and seminars but mainly their own studies. According to Šimoník (2008), pedagogical-psychological preparation has its own internal structure and processual back-up. Pedagogical and psychological subjects are outlined according to individual science disciplines (general pedagogy, general psychology etc.) and it is possible that they are more tracted on the general level as on the school level which is closer to teaching practice. Submitted theory is very general and student is not able to applicate it.

Application of acquired theoretical knowledge which enables to students to put this knowledge into pedagogical practice should constitute an undividable part of their

pre-gradual preparation. Pedagogical practice enables students not only to interconnect theory with practice but also to form their own personal competencies and to develop skills necessary for performing their profession. Sirotová (2015) considers pedagogical practice as certain form of experience and professional teaching which creates the base for development of teacher´s style.

2.1 Pedagogical practice of future teachers

The area of cooperation of family and school plays a specific role from the pedagogical practice point of view. In contrast to the fact that it is among the most difficult parts of the teacher profession, this area is often underestimated by both, students as well as future teachers and most often for this reason they are not utilizing the possibilities of pedagogical practice to communicate with parents, parent-teacher-meetings or to conduct interviews with instructing teachers on the frequent problems with parents and on their experience on barriers in mutual cooperation. By creating an interest of students, future teachers in this area of education the amount of "reality shock" , which is pointed out by more authors (Kurincová, 2001; Kasáčová, 2007, Šimoník, 2006).

From the point of view of preparation of future teachers for work with student´s parents by way of individual subjects of pedagogical- psychological base of study they are gradually getting familiar with characteristics of family area, its diagnostic, with communication techniques. Moreover, prospecive teachers can estimate what is possible to be used in interviews with parents, with possibilities of solutions of conflicts and so on, but often they do not put these studies to practice. At the time of entering of absolvents into a study programme to become a teacherto practice, instructors are sometimes confronted with criticism of their practical preparation while attending the study programm either by the faculty which or by older colleagues. But we do not agree with the statement „that a beginning teacher does not know", but very often it comes to the phrase that a „beginning teacher is not able to or can´t ", which is possible to accept as criticism on practical preparation of future teachers." (Šimoník, 2008). Cooperation of family and school is the part of this criticism. The lacks are reflected for example in a insufficient response to certain emergency situations , in helplessness in organizing and offering activities, and in a severely underdeveloped ability to apply theory to school practice. We consider it a fact that after their entering into daily practice, beginning teachers have enormous problems to start any form of communication with parents of their students and also to building a bridge of information, advice and recommendations related to the education of students. Moreover, a vast number of young teachers also severely lack problem solving skills, which could help to overcome the aforementioned shortcomings in parent-teacher-communication.

But not every university or college can prepare professional teaching skills. Šimoník (2006: 19) presents an idea that the sequence at application of knowledge (and step by step making or creating of skills) should have following degrees or grades:

1. students are introduced to new theoretical knowledge and up-to-date example of possible usage of thisknowledge in school practice. (student is "passive" recipient of information about possibility of application.)
2. students are asked to suggest possibilities of application of new theoretical knowledge, try to evaluate usage of knowledge for pedagogical activity as to for what and how the informations can be used (Students should develop and research possibilities of application of new knowledge on a general level, not only related to parent-teacher-comunication.)
3. students should theoretically solve certain pedagogical cases which are presented to them by text, video etc. (Students develop a solution of possibility of application of new knowledge in a specific situation.)
4. students should use new knowledge in partial simulation (inscenated) situation on the faculty- "playing a role", "pedagogical studies", "performing" of part of lesson- student should explain new units, he or she should conduct an experiment etc. and other students act in student´s roles, in parent´s role, in roles of colleagues, etc. This should also include a "break" (student should act practically – speak – also about the fact that it is simulated situation.)

Furthermore, the author mentions a 5th and 6th point, which are both connected to the teaching process and the communication with teachers under real-life conditions , that is as found in a typical school. With regard to our problem, we consider the previous four degrees as suffiicient because they show ways of preparing future teachers and creating skills which makes sense also regarding their preparation for work with parents.

Further interesting suggestions for making professional beginnings of absolvents easier in area of cooperation with family of student are also presented by Střelec (2006: 144-145). This author recommens the creation of video records for training on educational activities of class teachers. Example to be analyzed include records of real and simulated class lessons, meetings of class teacher with student´s parents, individual interviews of class teacher with parents and their parents, simulated performances of students before their potencial students etc. The author also suggests the use of scientific resources, which enables a non-traditional view at problems of cooperation of family and school.

Another aspect to be added is the problem of homeworks in grammer schools which was edited in the past by Maňák (1992) and which offers a blend of practical stimuli for class teachers also in connection to join student´s parents. Useful are also the suggestions to students for interviews with class teachers or with student parents about cooperation with the class teacher. It is safe to say that this can develop into a fruitful active cooperation with teachers achieving their pedagogical masters degree. Communication with teachers

from school practice, their invitation of students for speeches, where they can present their approaches, techniques and skills will undoubtedly enable students to be detect pedagogical problems and reality of nowadays school also in the area of family and school.

3. Conclusion

The ability to communicate with parents and to make a relationship with them belongs to the most difficult in teacher´s profession. This area is more complicated when only non-sufficient pre-gradual preparation of students in the pedagogical field of study is provided before graduates enter the real-life teaching profession. During the time of the child's attendance in school, the teacher is to be consideres " a member of family" co-responsible or mutually responsible for the child's education, and that is why cooperation between family and school is of vital importance. It has been ascribed a enormous relevance mainly in the last years (thanks to trade mechanism)because it influences also quality and fruitfullness of school.

Problems of cooperation of teachers with student parents are not new in the area of non-professional and professional public. The other way around, there are still discussions about the ways of communication, possibilities of mutual communication, barriers, which often stand in the way of initiating and developing a relationship or partnership between both institutions and not as the last point also about pre-graduate preparation of future teachers for this area. Methodical directions of some faculties concerning the implementation of pedagogical practice, also tutors make a point that future teachers should focus on this area during their realization of pedagogical practice. It is a sad reality that for reasons of disinterest, underestimation or fear to name only a few, communication and cooperation with student parents is bluntly ignored. From this point of view we consider it as necessary to focus our attention not only on active cooperation and communication with training teachers and other teachers, but also on creating practical skills within pre-gradual preparation of future teachers.

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Towards Consistency: Digital Learning Thresholds

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Abstract

We report on the development of CCCU Digital Learning Thresholds (DLT). The principle aim of DLT is that all CCCU students have access to digital learning, and that all staff and students will have clear expectations about how, why and when to use digital learning. In addition DLT also align with and supports the VLE consistency agenda. Furthermore, we have developed an innovative evaluation framework to assess the success of our DLT as well proposing their integrating into a blended learned model which emcompasses a quality assurance and enhancement pathway.

Keywords: *digital learning thresholds; learning platform; consistency; student experience; blended learning model.*

1. Introduction

The Virtual Learning Environment (VLE) is a core learning system used by all Higher Education Institutions (HEIs), not just to provide more flexible approaches to learning in order to meet the challenges of students who may be learning in different modes, places and paces (Gordon, 2014); but as a vehicle which carry the learning and teaching materials, information, activites and resources for all types of programmes. Canterbury Christ Church University (CCCU) has used the Blackboard VLE since 2002, that has seen use being deployed across all academic programmes.

However, there has been a strong argument and rationale for the University to adopt and adhere to a more consistent approach on how the VLE is being used and how the student population are able to engage with it. The rational for consistency is not just local to CCCU; a significant number of HEIs in the United Kingdom (UK) are striving ahead implementing their own more ambitious consistency and "baseline" practices in response to student and staff feedback (Reed, 2014, May 7).

The paper begins by introducing the notion of consistency and how this has affected UK HEIs and students before looking at the CCCU experience. The paper goes on to outline an approach to embedding VLE consistency called *Digital Learning Thresholds* (DLT) that is being developed and driven by the University's Learning Technology Team based upon the work originally undertaken by the first author at a previous instiution in Australia.

2. Consistency

2.1. The UK HE Sector Experience

The Heads of e-Learning Forum (HeLF) is a network of senior staff in institutions who have a strategic responsibility to promoting, supporting and developing technology enhanced learning (TEL). There are currently 135 nominated Heads from UK HEIs within the forum who, collectively, have a very powerful voice in the way that TEL is being used and driven in the UK HE sector.

A recent survey was conducted by HeLF to gather information on which institutions had adopted a "minimum standards" or consistency approach (Reed, 2014, March 21). Whilst the survey attracted a low response, 18% (n:24), it was nevertheless highlighted that 75% (n:18) of the respondents had already applied consistency within their VLE, whilst 25% (n:6) were considering introducing such standards in the future (*ibid.*). For most institutions, the "minimum standards" comprised of staff profiles, learning outcomes, recommended readings, assessment requirements, lecture handouts followed by announcements and a timetable.

However, it is recognized that such an undertaking can present an additional workload for staff. One solution is to have a technical integration between the VLE and various Management Information Systems (MIS) that has the capacity to harvest many of the criteria for consistency from existing data stores (Reed & Watmough, 2015:86). This could include, for example, pulling information from human resources databases to populate staff on the course, reading lists from the library, past exam paper and handbooks on the curriculum system as well as timetabling from a central rooming system. The information can then be updated dynamically and allows staff to focus on enhancing learning and teaching rather than the administration of the course. Needless to say, such an enterprise requires considerable planning and development with senior management sponsorship supported by policies and guidelines being critical factors in the successful implementation of a "minimum standards" project (Ellis & Calvo, 2007).

2.2. The UK Student Experience

The notion of introducing a "minimum standards" for the VLE may, on the surface, appear to be quite a simple, if 'low-tech', solution. However, the effects of inconsistent layout, structure and naming conventions between modules in an institutional VLE is a "significant factor for [student] dissatisfaction" (Bee, 2013:6), with similar examples of "disparity of usage" from the 'student voice' being found across the UK HE sector (Ahmed & Morley, 2010) through student evaluation mechanism, such as the UK's annual National Student Survey (NSS) (HEFCE, 2015).

In the field of Human-Computer Interaction (HCI) and, in particular, Usability Studies, the notion of consistency, in terms of naming conventions and the location of links and content , and it's relationship with cognition can determine how (dis)engaged / (dis)interested a user is with a particular interface (Martin-Michiellot & Mendelsohn, 2000; Rovai, 2004; Nielson, 2011). Furthermore, consistency creates a perception of trust, reliability and professionalism that can have an affect upon a user's experience with an organisation – the more consistent the user experience, the more positive the user feels about the organisation (Estes, 2013) – this is what students have come to expect of their universities when using the VLE.

2.3. The CCCU Experience

Blackboard, the VLE at CCCU was first introduced as an enhancement tool for learning and teaching in 2002. It currently hosts 20,000 students and 4,000 staff users with a Blackboard site for nearly very academic course that is running, as of December 2015, there are over 2000 active Blackboard sites. It is unsurprising, therefore, that there has been

a growing voice amongst CCCU's student population in the NSS surveys as well as CCCU's annual student survey that the current structure of Blackboard sites (known locally as *boards*) are becoming increasingly difficult to use and navigate.

> *Blackboard personally has been a negative part so far. It's confusing in regards to finding work which has been set…* (CCCU student, 2015)

One of the reasons identified is the use of non-standard language, for example, submission areas being called *Turnitin buckets*, *e-submission*, *electronic submission*, or *assignments*, etc. Student feedback has also indicated that some assignments were submitted late due to confusion concerning the "submission points" and their exact location. There is also frequent frustration that Blackboard sites tend to be configured differently across different courses as well as implementing inconsistent folder structures within and between different sites.

Further evidence of the impact of inconsistent Blackboard sites is reflected in the number of student 'help desk' calls that CCCU received during the 2015 calendar year (January to December), where almost 900 calls were received from students requesting assistance in trying to locate content from within their Blackboard site.

3. Digital Learning Thresholds

Building upon the earlier work of the University's Technology Enhanced Learning and Teaching (TELT) Strategy (CCCU, 2012), the Digital Learning Thresholds (DLT) is conceived as a method for tutors to develop their digital learning environments in ways that actively support the student learning experience which increases their online activity and engagement with digital technologies, and is constructively aligned with the University's Learning, Teaching & Assessment Strategy (CCCU, 2015), as well as addressing the issue of consistency.

We redefined the digital learning environment as a 'Learning Platform', which is a conglomeration of core learning technologies (e.g. VLE, e-portfolio, lecture capture, web conferencing, media streaming, e-submission & e-feedback, etc.) being used to support learning, teaching and assessment. The notion of the DLT was being developed at the University of Wollongong, New South Wales, Australia by the first author (UoW, 2015) following on from developments at Kings College London.

Table 1. The Digital Learning Thresholds (DLT)

Learning Platform Activities	Digital Learning Thresholds		
	Stage I (2016/17)	**Stage II (2017/18)**	**Best Practice**
A) Module Information			
B) Assessment & Feedback			
C) Content			
D) Communication			
E) Collaboration			
F) Evaluation			
G) Technical			

The DLT comprises of two digital learning thresholds, Stages I & II and Best Practice, and seven learning platform activites (A to G) (see Table 1 above). Stages I & II will be phased over two academic years and is mandatory across all modules. The "Best Practice" threshold is optional. The two digital learning thresholds provide opportunities for the tutor to challenge and transform the student learning experience using a range of appropriate technologies. Whereas, the seven learning platform activities will aid with the increase of the student learning experience, by providing a technology enriched curriculum, which can equip them with the necessary skillset in readiness for graduate and professional employment.

The learning platform activities not only provide different opportunities for students to engage in with different digital technologies (beyond the Blackboard VLE), it also offers tutors with a framework and guidance in structuring their VLE sites in a consistent manner in terms of structure, layout and naming conventions, as the following list entails:

- *Module Information* would include module handbook, reading lists, learning outcomes and key dates.
- *Assessment & Feedback* provides details of assessment tasks and offer opportunities to use different forms of electronic assessment such as online tests, blogs and wikis.
- *Content* refers to those lecture and seminar notes and materials and places responsibility on teaching teams to ensure that the materials are compliant with copyright and accessibility requirements.

- *Communication* ensures that there is a welcome message on every VLE site and that students know who they can contact within the teaching and admin teams.
- *Collaboration* provides opportunities to use a range of tools to support discussions and team-based activities, such as discussion boards and wikis.
- *Evaluation* is concerned with provided tools (i.e. learning analytics) and methods (i.e. anonymous student survey) to ensure the quality and consistency of the module and teaching. This funtion tends to be 'time released' at specific points in the academic year or duration of the module.
- *Technical* encourages programme teams to perform a 'health check' on their VLE sites to ensure that the links works, the content meets accessibility standards and than student work, marks and feedback are archived and stored properly.

The Learning Platform (see Figure 1 below), therefore, introduces students to a consistent digital presence (*Stage I*, e.g. students submitting their essays electronically); through the engagement and interaction with appropriate technologies, students are enabled to become more responsible for key areas of their learning (*Stage II*, e.g. students engaging with an online test), which underpin more sophisticated and authentic activities that will develop student employability (Chatterton & Rebbeck, 2015) and prepare them for professional working environments (*Best Practice*, e.g. students collaboratively working using simulation software).

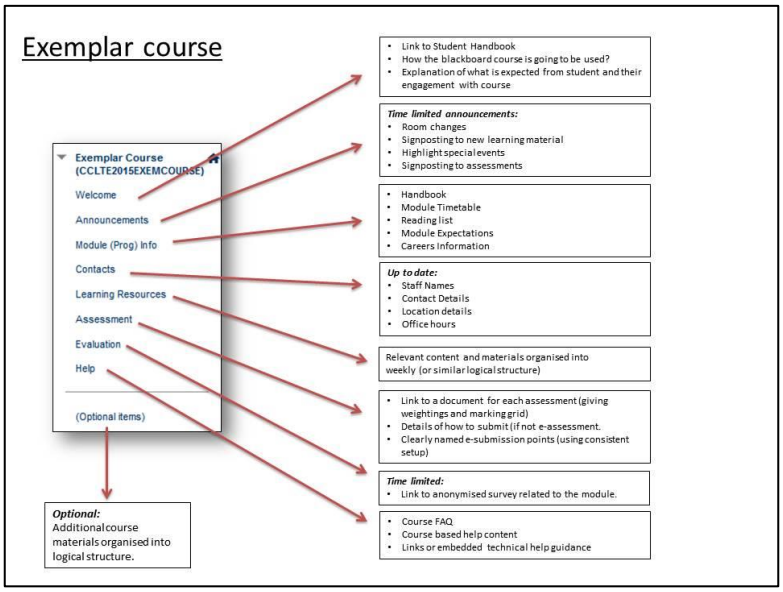

Figure 1. An exemplar VLE site layout at CCCU

3.1. DLT Implementation

The DLT has been designed to increase the digital learning experience of students through the incorporation of essential and good practices in digital learning. An institutionally-agreed "checklist" provides an overview of the key digital threshold elements and practical strategies for implementation. This "checklist" can be used by Programme Directors and/or Module Leaders for self-review, or by Faculties (via their Faculty Director of Learning & Teaching) for reviewing purposes. Furthermore, the "checklist" offers tutors an opportunity to reflect upon how they are using the Learning Platform and to consider some ideas on how to create stimulating, organised and well-resourced digital learning environments that supports and complements traditional face-to-face teaching. This project will be evaluated using the Context, Input, Process, and Product (CIPP) Evaluation Model (Shufflebeam, 2003) to gather feedback from stakeholders and users.

4. Conclusion

Our work has demonstrated that the introduction of large scale institution change regarding consistency and DLT requires robust mechanisms for staff communication, change agents and senior executive committemments to increase our capacity, capability and confidence in the effective deployment, utilization and evalution of learning technologies in order to increase academic adoption. Additionally, our work represents a compelling case for change, in an area that has been nelegected, and represents a significant step-change towards enhancieng the our students's experience of online and blended learning.

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Methodology based on micro-projects in DIY desktop machines for educational purposes in engineering degrees

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Abstract

The 21st century university has the big educational challenge of how to encourage "a will to learn" in students living in a world saturated with a huge amount of information and distractions. A needed step to keep students motivated is to update their learning environments. Herein we present a proposal with a methodology based on microprojects in DIY desktop machines (MicroP-DIY-DkM). The main idea is to consolidate students' theoretical background using motivating microprojects in which foreign entities act as petitioners. The students will also receive a broad view of current state of manufacturing technologies. At the same time, English language and Information and Communication Technologies skills can be promoted by our methodology. We provide information about the implementation of several examples of these microprojects, which were applied in the technical subject 'Manufacturing Technology'. The use of open source DIY-DkM offers students the possibility to understand essential principles of industrial technologies and processes. According to our surveys, students' scores and success rate results, the methodology proposed demonstrated its convenience to be applied in technical subjects. Students showed greater motivation level and success rate than previous years using conventional methods. Limitation of the proposal and possible means of improvement are also included.

Keywords: *Active learning, PBL, Microproject, DIY machines, open source.*

1. Introduction

The society of the 21st century shows radical differences from previous centuries, and students are not apart from this change. Today students live in a complex world that is saturated with a huge amount of information with multiple interpretations (Barnett, 2007). The 21st century university has to stimulate a *will to learn* in students to face this "*super complex"* world (Barnett, 2007). This can be done through the adaptation of the learning environments for inspiring students *to understand deeply* and to use this understanding appropriately (Barnett, 2007; McCune and Entwistle, 2011). Additionally, labour markets are demanding professionals with problem-solving capabilities, leadership skills, and adaptation capabilities for international changing environments. This situation is boosting universities worldwide to update their traditional teaching methods and provide professional that meet companies' requirements. The European Space of Higher Education (EHEA), aware of the situation, has reformulated the European educational patterns to put the spotlight on the students. In this sense, active learning is an excellent candidate that has been successfully applied in technical university degrees (Prince, 2004; Rodriguez et al., 2015; Yelamarthi and Drake, 2015). Essentially, it promotes in the student the *disposition to understand for oneself* through simulations of real life situations (Andersson et al., 2000). Some examples of particular methods to implement active learning are project-based learning (PBL), cooperative learning and simulation of real life problems. PBL promotes students' active work throughout the planning, development and final evaluation of different projects with real-world applications (Gary, 2015). In (Fernández-Ceniceros et al., 2015; Fernandez-Ceniceros et al., 2014), we proposed a PBL methodology based on *microprojects* focused on emerging manufacturing technologies and international collaboration between universities. In this paper, we bring a new proposal in which the manufacturing systems are greatly enhanced with 'do it yourself' (DIY) desktop machines. DIY is a building method in which individuals employ raw and semi-raw materials and components to produce objects or machines, without the direct aid of experts (Wolf and McQuitty, 2011). The expansion of this building method is being benefited greatly with the emerging open-source movement (RepRap, GNU, Arduino, Linux, etc.). The use of DIY desktop machines (DIY-DkM) brings important advantages and enormous benefits for the implementation of the PBL learning strategies. These are some of the advantages provided:

- Lower cost of DIY machines compared to commercial ones.
- Safer systems than industrial machines.
- DIY-DkM have more appropriate size than most of commercial machines.
- Easy access to the technology. The DIY-DkMs chosen for this proposal are open source designs. This means that all the information regarding the mechanical design, electronics and software are available to anyone. This is one of the most

important aspect of the DIY-DkM, as the students can understand the technological principles of the process from inside (Pearce, 2013).

Herein, we describe the methodology based on microprojects in DIY desktop machines (MicroP-DIY-DkM) together with the detailed formulation of several examples to apply in the '*Manufacturing Technology'* subject. Results are summarised all together with experiences performed during several academic years.

2. Summary of the MicroP-DIY-DkM methodology

The steps involved in the methodology are presented in Figure 1. The Innovation Group (I. G.) along with the international entity coordinate these activities.

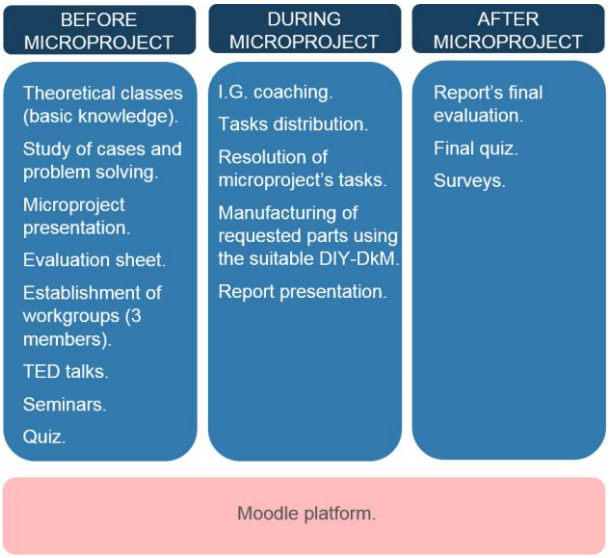

Figure 1. Scheme of the MicroP-DIY-DkM methodology.

3. Microproject based on DIY-DkM

MicroP-DIY-DkM provides a great opportunity to implement the knowledge acquired during classes and understand the technological principles of important industrial processes. Previous experiences validate the use of DIY approach for educational purposes (Pearce, 2013). Georgia Institute of Technology implemented a 'maker space' named 'Invention Studio' that offers the opportunity to students to learn through DIY-projects (Invention Studio, 2016). Other group pointed out that the capacity of prototyping ideas combining digital fabrication with engineering design integrates important aspects like mathematics, science, and engineering concepts into a highly motivating context (Chiu et al., 2013).

2.1. MicroP-DIY-DkM for the subject 'Manufacturing Technology'

The microprojects (Table 1) starts with a request formulated from a foreign petitioner (Centre of Drug Research, Finland) to the students. The petitioner asks to each team for the manufacture of a simple device or a component with strict specifications. Students will create the model of the device/piece using CAD tools and then it will be manufactured by the proper DIY-DkM (Figure 2). Before that, students need to analyse each technology behind the DIY-DkM to understand their principles and the relations between process and machine components and imaging other applications for the machines.

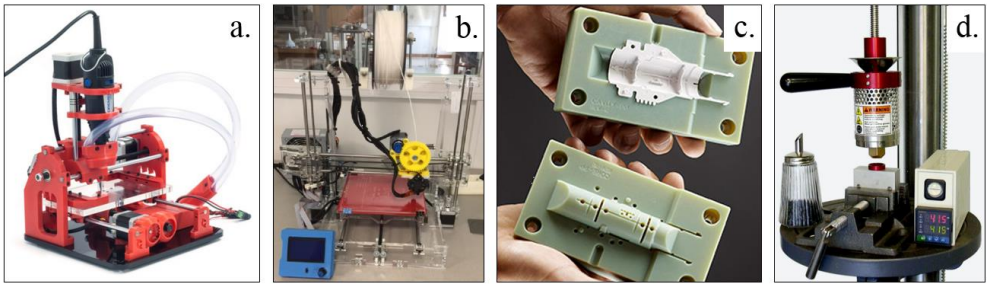

Figure 2. Microprojects' DIY-DkM: a. bq Cyclone (bq, 2016), b. Graber i3, c. Injected pieces and its printed mould (Stratasys, 2015), d. PIM-Model-20A of LNS Technologies, to convert a driller press into a plastic injection machine (LNS-Technologies, 2015).

Table 1. Four MicroP-DIY-DkM for the subject 'Manufacturing Technology'.

	MP1: Milling designed devices using DIY CNC milling machine	**MP2: Printing designed pieces on a DIY RepRap 3D printer.**	**MP3: Rapid manufacturing of an injection mould (IM) using a 3D printer.**	**MP4: Manufacture of plastic pieces on a DIY-Dk IM machine.**
Introduction	Milling is a common industrial process for machining different material to parts with controlled (CNC) shapes.	Additive manufacturing (AM), refers to the production of a 3D object by creating successive cross-sectional layers.	Industrial manufacturing process for producing plastic parts by injecting melted material into a mould. 3D printing mould prototypes.	The plastic mould printed during MP 3 will be used to manufacture the prototype of the requested piece.
Aim	The petitioner ask for proper dies and punches that will be used in a further process to produce pills.	The petitioner asks for a proper plastic pharmaceutic device to use as a unit-dose drug supplier.	The petitioner urgently request the design and manufacture of a mould to test a prototype of a dosing-spoon.	The petitioner request the dosing-spoon prototype using in the mould printed in the MP 3.
Machine	bq Cyclone.	Three RepRap 3D	The same RepRap	IM machine

	Affordable price: 500 € (a commercial one is above 25K€).	printers: Graber i3, BCN3D+ and MendelMax 1.5.	3D printers used in MP 2.	based on the workshop drill press. Low cost: 600€.
Basic principles **(Safety considerat.: SC)**	-Tool types, movements. - SC. -Influence of cutting parameters on the piece quality, tool wear, etc. -G-code. -Steps to go from CAD model to G-code and to machining.	- RepRap philosophy, AM, materials. - SC. - Influence of process parameters on the piece quality. - G-code. - Steps from CAD models to G-codes and to printing.	- CAD of moulds. - CFD simulation of the IM using *Autodesk Moldflow* (Moldflow, 2016). - Moulds manuf. - Suited plastic material. - Especial considerations.	- Differences regarding a commercial machine. - SC. - Polymers suited to be injected. - Setting the process parameters.
Other applications	Circuit board tracks, cutting, engraving, drilling.	Tissue regen., fashion and design, house building, etc.	Manufac. of punch and dies for forming processes.	Custom-made pieces, pieces with metallic inserts, etc.
Student's workload (homework: HW)	1/5 ECTS. 5 h (2h HW + 3h lab).	1/5 ECTS. 5 h (2h HW + 3h lab).	1/4 ECTS. 6 h: (3h HW + 3h lab).	1/5 ECTS. 3 h (1h HW + 2h lab).

Regarding the student's workload, it is important to point out that the laboratory hours are scheduled to ensure that only few groups (2 or 3) are working at the laboratory at the same time. In this way, groups are tutored in intensive sessions to get the maximum performance. Other microprojects that could be incorporated are: 'Cutting materials using a DIY-Dk Laser' and 'Welding of metal parts using a modified DIY-Dk 3D printer'.

4. Results and discussion

Since the academic year 2013-2014, the students filled an anonymous survey at the end of each course to evaluate their interest in the teaching/learning methodology presented herein and then evaluate it in comparison with the traditional methods. The questions are summarised in Figure 3. The answers were in a 1 to 4 scale, where 1 represented 'low' and 4 'very high', except for dichotomous Q1 ('Yes'/'No' question). Due to the limitations of space, answers 3 and 4 were grouped together. Therefore, Figure 4 and Figure 3 show the percentage of students answering 'high 'or 'very high' to the questions Q2 to Q4.

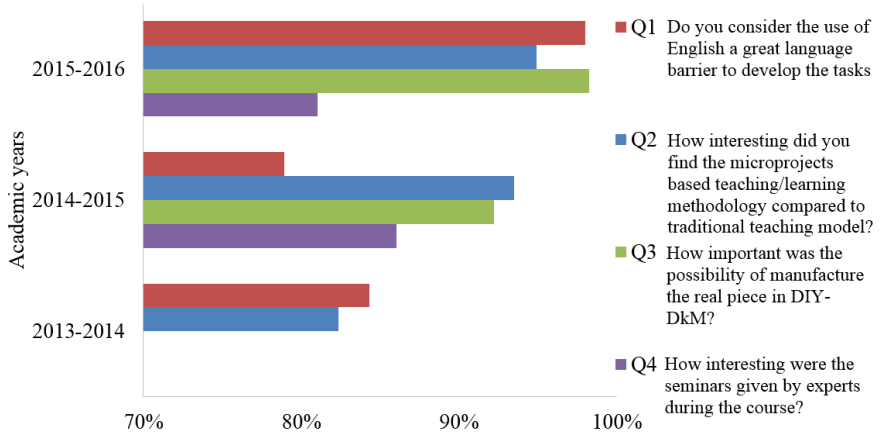

Figure 3. Percentage of students answering 'Yes' to Q1 (red bars) and percentage of students answering 'high' or 'very high' to Q2 (blue bars), Q3 (green bars) and Q4 (purpura bars) in the final survey for academic years 2013-2014 to 2015-2016.

As shown in Figure 3, by the lack of two of the four bars for the course 2013-2014, DIY-DkM to manufacture the requested pieces (related to Q3) and the seminars given by experts (related to Q4) were improvements implemented during the academic year 2014-2015. Figure 3 also indicate that the use of English did not seem to be an important barrier to the proper development of the objectives stated in the microprojects. Moreover, the students considering of high or very high interest the use of microprojects as educational resource rises every academic year. The interest has increased since the incorporation of DIY-DkM to the methodology in course 2014-2015 (from 82% in course 2013-2014 to 95% in course 2015-2016). Figure 4 represents the average score and success rates of two periods: before and after implementing microproject teaching/learning methodology. The results for the traditional teaching were from 2007 to 2010, in contrast to the microproject methodology that was implemented from 2013 to 2016. According to these results, the convenience of implementing the microproject teaching/learning model proposed for this technical subject is clearly demonstrated.

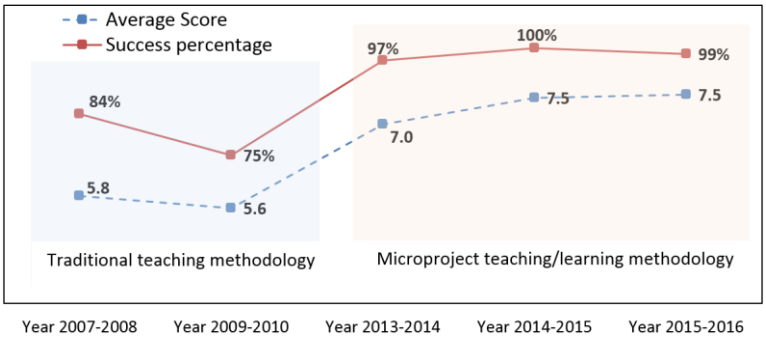

Figure 4. "Manufacturing Technology" subject average score and success rate for years from 2007 to 2016.

The research presents some shortcomings. As every academic year all students participated in the experience, there is no control group (CG) against which the methodology can be compared (Rodriguez et al., 2015). It would be interesting to let the students decide, at the beginning of the course, between participating in the MicroP-DIY-DkM methodology or to attend the classes and been evaluated by using a final exam. In this way, we could count on a CG. Another means of improvement would be to conduct pre and post-surveys (at the beginning at the end of the course) to assess the influence of the MicroP-DIY-DkM methodology on technical knowledge, transverse and generic competences (Carmenado et al., 2012; Rodriguez et al., 2015). Questions about their perception on generic competences like solving problems, teamwork, time management, leadership, etc. before and after the course could provide evidences of the positive effect of methodology proposed. All of these surveys could be also related to the final scores achieved by the students; in this particular case, a non-anonymous survey would be required.

5. Conclusions

We presented a methodology based on micro-projects using DIY desktop machines together with the formulation of several examples applied for the subject 'Manufacturing Technology'. Through this methodology students implemented the knowledge acquired in classroom facing real-world problems. At the same time, they became familiar with the use of English and ICTs during the communication with the foreign petitioner. The use of open source DIY-DkM provided the students with the possibility of understanding the principles of the industrial processes from inside, relating the theoretical knowledge with the machine's components. According to the surveys, students showed higher satisfaction with this educational method than using the traditional teaching system. Students' average score and success rate drastically rose and maintained in a high level when applying the microproject-based methodology proposed. There is, however, still room for improvement that will be implemented in future courses.

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CommonSpaces: an approach to web learning based on OERs, mentoring and collaborative learning

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Abstract

Currently, the internet is full of freely accessible resources that can provide excellent learning opportunities. However, these resources are usually not well organized, and for many users it is often difficult to use these dispersed sources of knowledge in a coordinated way. The project CommonS aims at building a space - called CommonSpaces - dedicated to communities of practice in which participants learn through the cataloguing, re-use, adaptation and sequencing of Open Educational Resources (OERs) into so-called learning paths. We define a Learning Path as an organized set of interconnected OERs (created by communities of users) that can be created by users both to organize their learning experience and to provide consistent learning sequences for others. In this paper, we briefly present the rationale and the theoretical foundations of the project. Then we discuss the features of CommonSpaces in its first prototype version and describe the preliminary findings from a pioneering experience of collaborative learning carried out by means of CommonSpaces. We conclude discussing the ongoing collective modeling of the final version of CommonSpaces and its future directions.

Keywords: *Web Learning, Open Educational Resources; Mentoring; Collaborative Learning; Learning Design; Technology-mediated Learning.*

1. Introduction

The process of digitalization is carrying profound changes in our lives, including the way in which we learn, the way we teach, the way we build new knowledge. Even the common sense understanding of space and time is changing under the pressure of digitalization (Ritella et al., submitted). The availability of multiple types of web spaces (semantic, pragmatic, cloud spaces) transforms the context of learning, and in turn, requires new ways of organizing learning practices. Learning through "digital contents" is a different activity than using a book. As an example, doing a literature review using google books or google scholar or other digital tools is radically different than visiting a traditional library (Ritella & Hakkarainen, 2012). Our relationship with knowledge changes, and our approaches to learning should change accordingly. As suggested by Hakkarainen (2009) technology enhances learning only through transformed learning practices. We refer here also to the new mix of rules, techniques, and foundational principles that characterize the "web learning" framework (referring to the Web Sciences of T.Berners-Lee, 2006).

New attitudes are already at work in the adoption of new methodologies for knowledge building in schools and universities; but in many cases there is a lack of systematicity, a lack of awareness concerning this deep innovation process. In order to avoid this risk, a multidisciplinary effort is required, able to address the multiple aspects involved. For this reason, in our project we teamed up computer specialists with pedagogists, psychologists, and Natural Language Processing experts.

With the project CommonS we want to move some steps forward toward such digital evolution in learning and education. In our project, we are designing digital tools that will provide specific support for digital learning practices, based on the pedagogical model described in the next section. In particular, we wish to capitalize on the potentially infinite resources freely available on the internet, often labeled as Open Educational Resources (OERs). We created a web space for gathering some new tools for learning through OERs: some of these will be internally bundled (embedded tools), others will be only selected and suggested to our communities.

In the next session we will describe the theoretical framework and pedagogical model on which the project is based. Then we discuss the features of CommonSpaces in its first prototype version and describe the preliminary findings from a pioneering experience of collaborative learning carried out by means of CommonSpaces. We conclude discussing the ongoing collective modeling of the final version of CommonSpaces and its future directions.

2. The background of CommonSpaces

CommonSpaces will represent the final output of the project CommonS. It is a space dedicated to communities of practice (Wenger et al., 2002) in which participants learn through the cataloguing, re-use, adaptation and sequencing of OERs into so-called learning path. Currently, the internet is full of freely accessible resources that can provide learning opportunities based on excellent learning contents, tools, platforms or a mix of these ingredients. However, these resources are usually not well organized, and for many users it is often difficult to use these dispersed sources of knowledge in a coordinated way. The risk is that the learner engages into shallow internet surfing, limiting the learning experience to the reading of separated chunks of knowledge. Therefore, one fundamental aspect of the project is to provide a consistent way to catalogue, organize and reuse them in coherent sequences on a given topic, that is, learning paths. We define a Learning Path as an organized set of interconnected OERs that can be created by users both to organize their learning experience and to provide consistent learning sequences for others.

The pedagogical model of CommonSpaces is based on some foundational principles that were abstracted from existing literature. First, some approaches to learning - such as Knowledge Building (Scardamalia & Bereiter, 2006) and Trialogical Learning (Hakkarainen & Paavola, 2009) – consider knowledge as a collective product that can be constructed and manipulated by the learner in multiple ways. The learner is called to actively work with sources of knowledge rather than passively accepting them as given; to develop soft skills such as communicative competence and critical thinking, in order to collaborate with their peers in building knowledge together. In this process, the teacher is expected to act as a coach other than a lecturer. Indeed, in these approaches, the role of the expert goes beyond the presentation of contents to the learner.

In CommonSpaces, the role of teacher, or experts in general, is to provide a scaffolding, guiding the students in the creation of their learning path. Therefore, another important aspect of the project is the development of a system of online mentoring through which experienced participants – who are granted the role of mentors – can support other participants in building their learning paths.

Finally, CommonSpaces intends to go beyond the individual use of OERs. By means of the provision of social interaction tools embedded in the platform and throught the work of the community manager and the project leaders, the projects aims at enhancing the networking between young and experienced professionals, and at the creation of communities of practice for professional development.

3. CommonSpaces: a web-space for collaborative learning based on OERs

In our project, we designed and developed a technological infrastructure - CommonSpaces - aimed at enhancing the learning processes based on OERs and implementing the pedagogical model described above. This space is organized around communities. Each community is composed by a variable number of members and a community manager. The latter can give members the possibility to form sub-groups focused on single projects with at least an internal supervisor who can be different from the community manager. Within each "project", the supervisors are able to accept membership, create new sub-projects, embed tools like forum or chat, send e-mails to all the project's participants and so on.

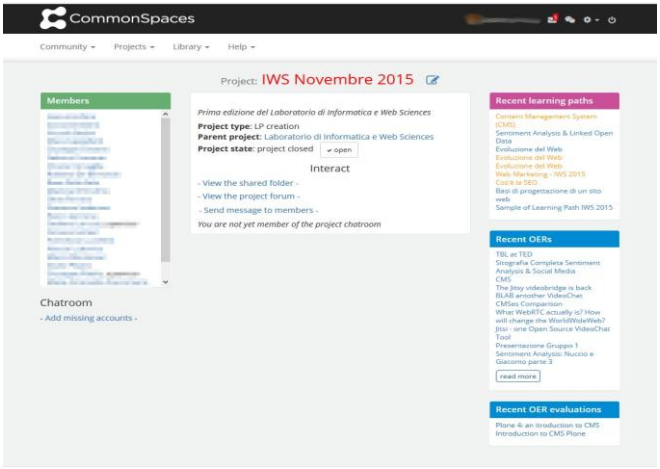

Figure 1. Screenshot from a project within CommonS

Fundamentally, projects (see Figure 1) represent the basic bricks of the whole space. CommonSpaces currently allows the creation of three types of projects:

1) OER cataloguing project: this project allows a group of learners interested in the same topic to gather OERs, add metadata and evaluate them collectively. The result is an organized database of OERs that can be easily accessible and manipulable;

2) Learning path creation project: this project allows a group to further organize the OERs in structured sequences that can be easily visualized and manipulated directly within the space, in order to reach pedagogical goals that go beyond the use of single OERs. For example, a learning path might contain fragments of video lessons, various kinds of documents and multimedia concerning a given topic. In this type of projects, participants can define relations between OERs, organizing them for a coherent learning experience;

3) Mentoring projects: this project involves only two participants (a mentor and a mentee). It is meant to support the building of a one to one relationship between an expert and a novice, so that the experienced participant (i.e., the mentor) can guide and support the learning experience of the novice (i.e. the mentee) within CommonSpace.

For all of these types of projects, Commonspaces also provide communication tools and the assistance of the project leader and community manager for enhancing social interaction within the community. In order to design CommonSpaces in line with the principles presented in this paper, the technical choices to be addressed were not easy. The selection of the environment was made during a period of almost 2 years before the real start of the project. We initially were looking at Plone, an established Content Management System (CMS) written in Python. After a long period of evaluation we finally preferred to keep the choice of Python but we opted for a different web application framework, Django, integrated with a number of optional libraries to cope with some specific functionality.

We operated this choice to maintain the basic framework as simple as possible in order to be able to steer the development of the "space" forward the direction that the stakeholders of the project ("the communities") would have been defining with their "framework modeling". Rather than proposing a full set of ready to use functionalities, we preferred to let the partners express their needs step by step. This "style" of design might be defined as "collective incremental developing". We are putting in this definition the result of many experiences of the past decades, when we developed too complex framework following passively stakeholders functional needs. The partnership is guaranteed about the sustainability of the software package since the code is uploaded and updated on GitHub, a code sharing and publishing service.

The project foresee three stages of development and 3 Prototypes: a first prototype focused on OER collective classification; a second prototype handling mentoring relations and the ability to create Learning Path re-using the bricks of OER; a third prototype dealing with the integration of tracking / monitoring capabilities of the members activities inside the "CommonSpaces". Currently we are working on the second prototype. The final version will be integrated to bring new functionalities to community and members: functionalities aiming at shaping CommonSpaces more and more as a "learning design environment", an "authoring" and "auditing" tool for learners and teachers / tutors / mentors. Some of the functionalities that we are discussing are listed as follows: exporting LP into other formats (Moodle, Scorm, e-book); definition and implementation of a set of trackable data to monitorize collaborative activities; the light integration of a sophisticated form of video interaction supporting a living archive of registered sessions. The collective incremental style is foreseen to guide also the stage after the 3th prototype: after prototype 3. we foreseen to open an "open coding contribution" where codlet and new libraries could be

added by communities and integrated (by the software keepers) into the main structure of the CommonSpaces.

4. CommonSpaces applied: a pioneering experience of collaborative learning

At present there are 7 main communities within CommonSpaces. The community "Sapienza. University of Rome 1" is working on gathering more members through the activation of new projects that students can find useful for their professional development. The first project realized was called "Workshop on Informatics and Web Sciences". It was realized in November and December 2015 for a total of five meetings of three or four hours each. The workshop involved a small group of 24 students attending a Psychology master degree (in Italian: Laurea Magistrale) who volunteered to participate. The aims of the workshops were: 1) teaching some skills in computer science through the cataloguing, re-use, adaptation and sequencing of OERs; 2) reinforcing students' collaborative skills; 3) testing CommonSpaces on a technical base, 4) testing a set of didactic guidelines to use it.

The pedagogical approach adopted was derived from the theoretical framework described above. In sum, the students were invited to collaborate with each other in building a collective learning path based on OERs, and to teach what they learnt to other students using the learning path they created. The teacher role was to advise students more than to lead them. Emphasis was on peer collaboration and the students were provided some guidance to organize the group work through role playing. For collecting data on the emerging learning practices, the organizing team administrated a motivational survey at the beginning, and a final survey at the end of the laboratory. Questions were inspired by Ajzen's theory on the planned behavior (Ajzen, 1991), for the first survey. The final survey focused on attitude changes toward the workshop.

About qualitative data, the organizers worked as participant observers and wrote a report of the experience. Moreover, they organized a short interview some days after the workshop. In addition, the students were asked to fill in diaries during each collaborative session, in order to model the students' behaviour in the platform. Finally, in the surveys there were some open questions that gave organizers some further qualitative data to work with.

4.1. Preliminary results

Presently, we are analysing the qualitative and quantitative data, so we will here describe the preliminary findings. First, starting from the participant observation and from the diary data we have created a preliminary explorative model of the actions of the students within the platform, associated with the specific tools used. This model is guiding the refinement of the platform and it will be tested during the future editions of the workshop. For example, the action "search of OER" was carried out using the tools "OER search engine in

CommonSpaces, google, google scholar, slideshare, youtube". This action was usually followed by the action "cataloguing OER" using the tool "OER cataloguing form". These two actions constituted an iterative cycle carried out many times, especially at the beginning of the workshop. The poster paper to be presented during the conference will contain a comprehensive scheme of this explorative model.

Moreover, we are analysing the surveys in order to grasp the students' ex-ante expectations and post-hoc perceptions concerning the elements of the workshop able to encourage their active participation. The results of this comparison show that throughout the laboratory there has been an increased interest in the topics of the laboratory. Although the number of students was too small, and do not allow any kind of generalization, some findings are interesting and relevant for future larger studies. While at the beginning 33% of the students mentioned the interest on the topic as a positive element for their participation, at the end 60% of the students expressed such interest. Moreover, 37% of the students expected that boredom would be an obstacle to their participation, but no students at the end of the course mentioned this aspect. Instead, the most cited negative element for the participation was that the workshop was too intensive for 65% of the students.

Finally, the interviews and the questionnaires reveal that some of the students struggled to engage in a teaching method they were not used to, giving hints for the design of the new edition of the laboratory. For example, most of the students used CommonSpaces for the cataloguing of OERs, ignoring its collaborative and social aspects, which are emphasized during the subsenquent editions of the workshop.

5. Conclusion and future directions

The challenge of designing a new "learning space", is to achieve a really Open Design. CommonSpaces has the ambition to be a three dimensional, open environment rather than a "platform". Into CommonSpaces and thanks to CommonSpaces, the learners and the community of learners should be able to reuse and create, plan and join others' learning proposal; and each one should be able and happy to trace and be traced in order to receive certification of her/his advancements in learning on some knowledge area. Many are the sub-challenges that we want to contribute to address with our effort of prototyping and experimenting :

1. to propose an aggregator, we may say a "meta-platform", using OER meta-data, capable to guide learners through many different authorities' modular Learning offer

2. to stimulate the emergence of new student-centered learning practices involving learners in programming and designing their own curriculum, exploiting the richness of the web;

3. to stimulate higher education institutions to bet on the interoperability of their offers, giving to the community of learners a more active and meaningful role.

4. to propose a new model of tracking and assessment of learning activities partially based on the evaluation of individual contributions to a collaborative practice.

5. to propose a new model of collaborative learning in which each learner contribute to the Common Knowledge by means of "coding artefact", using "logic programming skills". With coding artefact we refer to regular expressions to build query or to cooperatively analyze corpora, logs, or transactions. In this sense, the concept of "programming skills" is proposed to learners, despite of their "computer literacy". Sharing of these codlet artefacts should not be considered a job for specialists but a kind of service for the community.

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Education for Sustainable Development: a Strategic Tool for Quality Improvement of Higher Education

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Abstract

It has been long known that quality assurance (QA) is a system to develop quality standards in Thailand. However, it is not easy to implement the concept throughout a whole organization, for example, to include in a university, faculty members, program specifications, management team, and so on. This paper is to explain a case of strategic management of quality assurance using education for sustainable development (ESD) in the university with social enterprise concept. An example of the university with the mission statement of "to serve society" can drawn more attention using ESD concept to faculty in stead of QA regulation concept. The conceptual framework of the implementation was shown how QA can be developed in curriculum embedding with an ESD concept.

Keywords*: education for sustainable development; quality assurance; higher education, education strategic , social entreprise*

1. Introduction

Quality assurance concept was originally driven by industry sectors for productivity and production improvement. Quality in higher education is a prime criteria in global competitiveness for economic growth in the so called knowledge economy. The education system in Thailand was reformed in 1999 with the objective of quality improvement system (Ajpru 2014). It has been known that quality assurance has used for education management driving by the Office for National Education Standards and Quality Assessment, public organization, (ONESQA) and office of higher education commission (OHEC), Ministry of Education in Thailand. Quality in education was applied to university in Thailand both internal quality assessment (IQA) and external quality assessment (EQA). The main goal is to make sure that universities manage the education to students with qualities. Moreover, the other goals are to provide education services to their own communities. Each university has its mission statement to drive the management for its own identity. The mission of an quality assurance method is to improve the quality of teaching and learning process, facilities and infrastructures, well program specification and so on. The key is to meet the success of graduates careers.

After the implementation for decade, the results of education reforms in Thailand have not met the target goals of quality assurance (ONEC, 2005). The new topic are superimposed by several organizations and projects, including the United Nations Decade of Education for Sustainable Development (UN DESD). It was proclaimed by the UN General Assembly as a ten-year period for education action, beginning on January 1st, 2005, with UNESCO designated as the lead agency of Education for sustainability development (ESD). Therefore, the questions come to how to improve the old issue of QA management an how to integrate with an ESD concept together. The goal is to achieve student quality meeting industry expectation. Therefore, this paper aims to identify the root cause of QA management to meet graduate attributes. The samples were shown using the case from university A with the mission stamen of social enterprise concept.

2. Methodology

This discussion of the following contents is devided into two sections to discuss an eduation management in university A (Unit A). The first section is to analyze the QA stystem of university A. The following section will show the comparision data of national criteria/indicator measurement from both IQA and EQA. A function expression is displayed. The survey data of indicators relating to mission of university A was shown. The second section is to clarify the conceptual framework of ESD in QA systems: The discussion will be shown how university A using ESD as a strategic tool for quality improvement.

3. Results and discussion

3.1 Criteria of QA systems

Before 2015, QA systems of Unit A use the national criteria/indicator measured by both IQA and EQA as in the faculty and university level. In addition, the university was developed the criteria at a department level of assessment . The score of assessments were correlated among department, faculty, and university criteria which indicator scores can be formulated as following:

Score function of IQA and EQA is expressed as

$$Y = f(F, R, S, Q) \quad \text{.....[1]}$$

Where Y= score output,

F= Faculty profiles,

R= Research papers,

S= student performance,

Q= qualitative scores in any aspects of process measurement (PDCA)

Score function of Unit A is expressed as

$$Y = f(F, R, S, O, Q) \quad \text{.....[2]}$$

Where Y= score output,

F= Faculty profiles,

R= Research papers,

S= student performance,

O= Others such as academic service and management

Q= qualitative scores in any aspects of process measurement (PDCA)

From the equation above, various QA systems of EQA, IQA and Unit A were calculated and analyzed in Table 1. The indicators of each system are measured by qualitative/quantitative methods as shown in 67% of Unit, 78% of EQA, and 86 % of IQA based on qualitative assessment. Note that the score of F,R,S,O are from quantitative output data and Q score is from the qualitative obtaining from PDCA measurement. These indicators of each criteria are from EQA at 18 indicators, IQA at 22 indicators, and Unit A at 21 indicators as displayed in Figure 1.

Table 1. The percentage of indicators categorized by qualitative/quantitative methods

	Qualitative (per indicator)			Quanltitative (per indicator)		
Catagories	**EQA**	**IQA**	**Unit A**	**EQA**	**IQA**	**Unit A**
Percentage	78%	86%	67%	22%	14%	33%

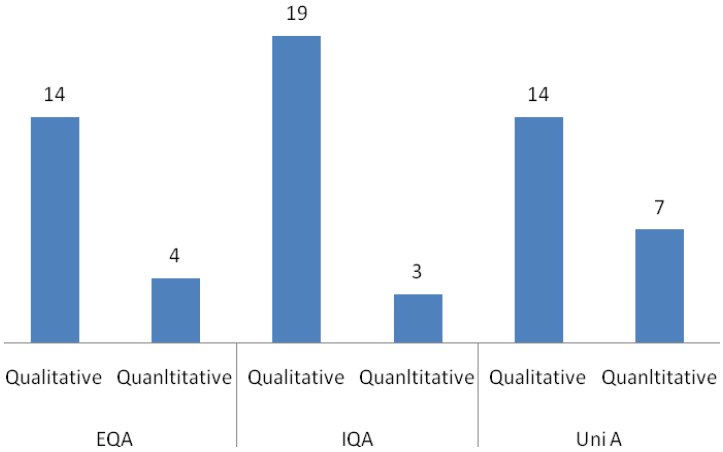

Figure 1. Sum of indicators measuring qualitative/quantitative system in each audit system

According to score functions [1] and [2], the results revealed a high percentage of indicators in the qualitative score "Q" as shown in Tables 1 and 2. Therefore, the score assessment was relied on for assessor judgements. It should also be noted that there are various dimensions of catagories in qualitative scores such as curriculum, academic service, art and culture, management, infrastructure, research, students and faculty. The survey asked for opinions from assessors and faculty members on how well the indicators correlated between Unit A, IQA and, EQA. The results showed that 7 out of 21 of Unit A indicators (3 out of 7 indicators from quantitative indicators) have less confidence in assessment correlation of diffferent levels (less than 3.75 out of 5). They also believe that the indicators are not suitable for measuring statements on Unit A's mission, even though the indicators major role is to accomplish the mission of the university, which is "academic service of serving society". This might suggest that education reforms in Thailand have not met the target goals of quality assurance due to the assessment systems and assessors. Regarding issues of development concerning faculty members qualifications and education systems, it should be noted that quality improvement was a barrier by due to the focus of quality assessment rather than working processes to improve the quality standards.

Table 2. Categories of indicators

	Qualitative (per indicator)			Quantitative (per indicator)		
Categories	**EQA**	**IQA**	**Unit A**	**EQA**	**IQA**	**Unit A**
Curriculum		4	5			
Academic service	2	2	1			2
Art & culture	2	1	1			
Management	7	6	5			1
Infrastructure		1				
Research	1	2	2	1	1	2
Student	2	2		2		
Faculty		1		1	2	2
sum	14	19	14	4	3	7

3.2. Conceptual framework of system A

The development of higher education, in particular the development of new curriculums, are designed according to the policies and needs of the country and sustainability of global issues. This challenges University A to meet its mission statement of social enterprise (SE), "to serve society", in a rapidly changing global environment.

Since the success of QA tools relating to national policy cannot enforce the SE concept from top down, indicated in the left of Figure 2, the university has supported academic service activities on the SE theme. The activities were widespread among faculty members to integrate with the classroom. However, the characteristics of graduates are not embedded in social entreprise. The proposed ESD driven model shown in Figure 2 on the right is depicted as a bottom up model. The key is to use ESD as a strategic tool for quality improvement of universities in social enterprise. This is also shown in the report from Holm showing the clear connection between QA and ESD (Holm, 2015). The short survey after implementation of an ESD seminar shows that the directors of curriculum want to set up the competency with stakeholders. They believe that development with stakeholders will help the modified curriculum achieve greater quality and sustainability. The competency of Unit A students were drawn to communication, social responsibility, and problem solving with ESD in certain elements. Some examples of curriculum building to the economic scale of SMEs are entrepreneurism in education (Wongpreedee, 2015), brand concepts in SE (Virutamasen, 2015) and so on. Such strategies include education criteria adjustment and the improvement of communication between public and private sectors for further sustainable development with stakeholders.

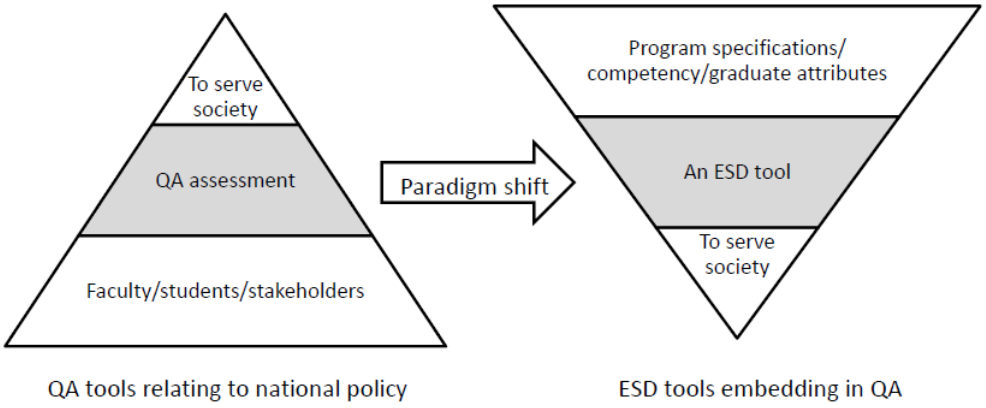

Figure 2. Schematic of conceptual framework of management tool to meet the mission statement

4. Conclusion

Thailand has focused on higher education in developing new curriculums that meet academic clusters identified by educational policies and strategies of the country. Quality assurance means policies and strategies to improve the quality standard. This paper suggests the bottom-up ESD-drive model to enhance education quality and the capacity for further sustainable development. In particular, university A with the mission statement of SE could use ESD as a strategic tool for quality improvement systems.

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Innovative learning design: Experiences from gadget workshops in business informatics classes

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Abstract

The short paper introduces and discusses the concept of a workshop for students of the Bachelor of Science in Business Information Technology study program at the University of Applied Sciences and Arts Northwestern Switzerland, based on theoretical aspects of the experiential learning theory as well as Design Thinking. The goal of the workshop was to enhance the learning outcome of students of this practice-oriented study program. The paper proposes drivers of change for experience-oriented teaching methods as well as reflects on the experiential learning theory and design thinking approaches in education for our case, followed by an elaborate description of the conducted workshops and a discussion of the respective outcomes and experiences. The paper emphazises the observational insight, that learning from active experience as well as through creative tasks should help enhancing cognitive competencies through the application and further development of imparted topical knowledge. The presented gadget workshop aimed at increasing engagement and motivation in the respective class and, as a result of observations, enabled further research on student learning as well as course-relevant practical class activitites.

Keywords: *experiential learning, business informatics, design thinking, gadget workshop*

1. Introduction

In our complex, dynamic and fast changing world, which is getting more and more digitalized and technologically advanced, there is an urgent need to reinforce the educational focus on cultivating competencies and skills that help dealing with complexity and change rather than having a main focus on pure fact-driven knowledge.

Our students are surrounded by tools and toys of the digital age, such as mobile phones and smart gadgets (Prensky, 2001). These artifacts of the digital world connect them with information, but also enable them to experience, think and reflect on the new perspectives and potentials of business information systems. On the basis of observations and experiences the authors claim that students need to be actively involved in learning design, information gathering and interpretation, knowledge creation and reflection of their own learning process. Especially in higher education at universities and in practice-oriented study programs (e.g. Information and Communication Technology (ICT) study programs) there should be an increased focus on encouraging collaboration, reflection, problem solving, agility, idea creation and creativity in students. Hence, the role of a teacher in the digital age, where information is available everywhere and all the time, shifts towards being a mentor and coach in the learning process and giving inspiration and guidance to prepare students for the job market.

The authors regard students as active drivers of their learning process, not merely as receivers of input, which should be inspired and supported in developing competencies through experience learning, especially in the practice-oriented field of business informatics. The paper presents and discusses a workshop class design based on the experiential learning theory and Design Thinking in a practice oriented Bachelor of Science in Business Information Technology study program.

2. Theoretical Background

According to the Horizon Report Higher Education it is increasingly important to promote active learning where the "typical podium is moved from the front of the classroom to the center" (Johnson et al., 2015, p. 18) and to provide a learning environment "that fosters experimentation, curiosity and above all, creativity" (p. 22).

According to Johnson et al. (2015) it is important that skills needed in the real world must be identified and promoted through informal learning and teaching methods. Furthermore, it is of high importance to improve digital literacy, hence the holistic understanding of digital tools and information. Also the flipped classroom model is emphasized by Johnson et al. (2015) as a future trend in higher education, where more active and project-based learning is the main activity in the classroom and pure knowledge acquisition is shifted outside of the classroom. Johnson et al. (2015) introduce the trend of makerspaces in higher education, which describes "workshops that offer tools and the learning experiences needed to help people carry out their ideas" (p. 40). Therefore, an "openness to experiment, iterate

and create is needed" (p. 40). The maker space trend stems from the movement of innovative entrepreneurs and designers.
The authors combine the theory of experience learning and aspects of design thinking to design educational workshops in business informatics modules with the goal to enhance the learning outcome and promote the active application of the imparted knowledge and developed skills in the study program.

2.1. Experiential learning

The Experiential Learning Theory (ELT) describes learning as a process in which knowledge is created through the transformation of experience and reflection (Kolb and Kolb, 2008). The experiential learning process undergoes four stages, which are experiencing, reflecting, thinking and acting (McLeod, 2013). According to Kolb and Kolb (2008) the basis for experiences are observations and reflection, which can then be transformed into abstract concepts for new implications and action. Furthermore, the importance of conversation for reflection and deriving meaning from experiences is being emphasized for improving the learning outcome and making experiential learning more effective.
Experience learning addresses the higher levels of the Bloom Taxonomy, where new ideas are derived from existing knowledge and unrelated parts (Cannon and Feinstein, 2005). Cannon and Feinstein (2005) state that "experiential learning involves immersing learners in an environment in which they actively participate in acquiring knowledge" (p. 349). They argue that experiential learning challenges students through prototypic and complex situations, which is also represented in the higher levels of the well-known Bloom Taxonomy of learning objectives.

2.2. Design Thinking

"Design thinking is at its best if tangible prototypes can be used to capture and validate end user needs and envision new products and services" (Gabrysiak et al. in Plattner et al., 2011, p. 219). The creation of software or product prototypes is the main goal of most design thinking projects or workshops. Thereby, people and their interdisciplinary and creative interaction are the core of the process. In order to create innovative ideas and prototypes for software or technological products, mockups are created which serve as a basis for discussion and the identification of innovative solutions (Gabrysiak et al. in Plattner et al., 2011).
In education, design thinking can support students in developing meta competencies and create a more holistic learning experience and reflection on learning (Scheer et al., 2012). Scheer et al. state (2012) that learning is achieved "through the interaction with the object and its context" and suggest Design Thinking as methodology to design learning experiences in order to bridge the gap between theory and practice. The adapted class design should have a good "balance between instruction and construction" and provide

diverse possibilities for experiencing and reflection (Scheer et al., 2012). The main stages following the design thinking approach are: observations, frameworks, imperatives and solutions (Beckmann and Berry, 2007).

3. Design of the Gadget Workshop

The focus of the workshop in the Bachelor of Science in Business Information Technology study program has been on creating business ideas for gadgets that are so far mostly used in the game industry, such as Samsung Gear VR (Samsung, 2014a), Leap Motion infrared controller (2013), Sphero 2.0 App-enabled Robotic Ball (2013), MYO Gesture Control Armband (2013) and Google's Project Tango tablet (2015). The selection of gadgets is a representation of the commercially-available, innovative and trending technologies in the digital market and of associated Information Technology (IT) components. Especially virtual reality gadgets such as Samsung Gear VR virtual reality headset aim at progressively changing the way we interact with mobile technologies (Samsung, 2014b). Leap motion and MYO Gesture Control Armband are both introducing new human-computer interaction oppurtunities as an alternative to common peripherials such as keyboard and mouse. Sphero 2.0 is a programmable robot ball which can be controlled by a smartphone or a tablet. Project Tango is a mobile tablet device for developers which is enriched by a set of sensors that support high precision tasks such as motion tracking, depth precision and area learning. All these gadgets inspire scholars to research and develop projects for innovative man-machine interaction approaches for specific use cases (Lange et al., 2000; Mendez-Zorilla et al., 2015; Wachs et al., 2011; Whyte, 2010).

In the workshop the students' task was to be creative and apply their knowledge and skills in order to develop ideas and mockups for business concepts based on the experience and testing of gadgets as well as the exchange and reflection on the respectively developed ideas. Innovative start ups and their often agile, flexible and interactive approach towards idea and product creation served as an example in order to design the different phases of the competency based workshop which made use of technology in order to inspire ideas and creative thinking.

The workshop has been divided into six parts (Table 1):

1) Factual and inspirational input on innovative technologies and gadgets:

An initiating presentation focused on giving factual input, inspiration and the introduction of the gadgets applied in the workshop. Devices from famous science fiction movies and how those inspired today's technological developments were shown. Drawing connections from science fiction movie technology from movies such as Star Trek (Roddenberry and Berman, 1987-1994), Back to the Future Part II (Zemeckis and Spielberg, 1989) and Knight

Rider (Larson and Foster, 1982) intended to motivate the students to think creatively and without boundaries, because all technologies start with an idea.

2) Gadget testing under given parameters:

Following a short instruction on how to operate the gadgets, the students were invited to test and play freely with the devices. The gadgets included a virtual reality goggle (Samsung Gear VR, 2014), an infrared controller (Leap Motion, 2012), a Bluetooth controlled robotic ball (Sphero 2.0, 2013), a muscle controller (Myo Connect, 2013) and a mobile 3d technology tablet (Project Tango, 2015). The focus of this phase was on the active experience with each gadget and the creation of respective business application ideas.

3) Group discussion and idea collection:

In the group discussion phase the students had the task to transfer their business ideas for the gadgets into sketches or mockups. The aim of this group work was to connect existing knowledge and the experience from the gadget testing and transfer those into business ideas. In this phase the idea sketches were supposed to be in an abstract state with a focus on the reflection and conceptual transformation of the experience.

4) Group discussion and idea selection:

In this phase the previously formed student groups were consolidated into extended groups. Each group had the task to pitch their ideas to the other students and then collectively decide on one final idea per group with the most potential for a business case. The students had to actively discuss and reflect on the proposed ideas, apply their knowledge and practice communication and negotiation skills.

5) Conceptual prototyping:

In this phase, the groups worked on finalizing the concept for their chosen business idea for the tested gadgets and sketch the results and main aspects on a flipchart for the presentation. Hence, the students had to work out a proper storyline for the key facts of their concepts for the presentation in a short time. During this phase, the application of knowledge as well as presentation skills were demanded.

6) Concept presentation and discussion:

In the final workshop phase a chosen representative of each group presented the developed concepts to the other participants and the lecturers. In the discussion panel the concepts were constructively discussed and feedback was given with a focus on the reflection of the working process.

Table 1. Stages of the gadget workshop in business informatics classes

	Stages of the Workshop (N=20)	**Experiential Learning**	**Innovation Process**
1	Input (30 minutes)		
2	Gadget Testing (1hour) • 5 Gadgets • 4 Groups (of 5 students)	Concrete Experience (Experiencing)	Observations (Context, information gathering)
3	Group Discussion and Idea Collection (30 minutes) • 4 Groups (of 5 students)	Reflective Observation (Reviewing, Reflecting)	Frameworks (Insights, processing information)
4	Group Discussion and Idea Selection (30 minutes) • 2 Groups (of 10 students)	Abstract Conceptualization (Concluding, Learning)	Imperatives (Ideas, convergence)
5	Conceptual Prototyping (30 minutes) • 2 Groups (of 10 students)	Active Experimentation (Planning, Implementing)	Solutions (Experiences, concretization)
6	Presentation of Concept and Discussion (30 minutes) • 2 Groups (of 10 students)		

4. Discussion and Outlook

From the experience of the authors the integration of a workshop at the end of the semester in the practice-oriented class in the Bachelor of Science in Business Information Technology led to active engagement of the students and the application of as well as the reflection on the content learned in class. The authors suggest that the workshop class design can also partially serve as exam preparation through the active recall and application of the knowledge learned throughout the semester.

The authors emphasize the importance of precise instruction for the different stages of the workshop with regards to timing and form of the expected outcomes in order to provide a framework and secure sandbox for the students' experience as well as the application and testing of the students' competencies. As experiential learning theory suggests, the phases of experiencing, reflecting, thinking and acting were followed during the workshop and led to a transformation of knowledge and experience into creative and innovative business ideas. Based on observations and oral student feedback it is being assumed by the authors that the experiential learning approach made a contribution to help the students in bridging the gap between the theoretical knowledge acquired in class and practice.

The workshop resulted in disruptive and creative ideas (Figure 1) that originated from and were developed through collaborative work and the active discussion and brainstorming of

the students in various stages of the workshop. The developed ideas will be the basis for further research in student papers and theses.

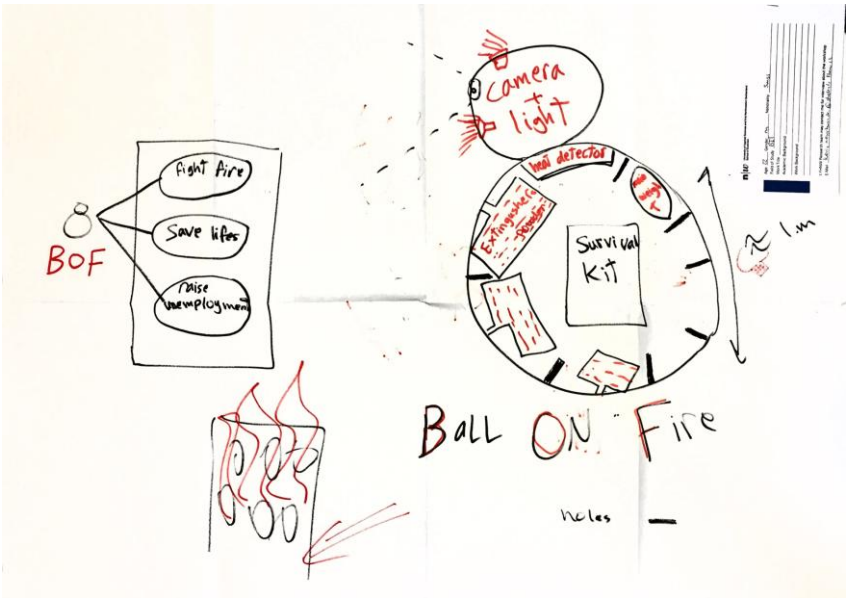

Figure 1: A sketched result from the workshop. Ball on Fire, Sphero 2.0 as a life saver unit.)

In order to verify the authors' assumption that the application of experiential learning and Desing Thinking methodologies in practice-oriented study programs, especially in the field of technology, leads to enhanced learning outcomes, further research as well as quantitative studies need to be conducted. The authors plan to conduct further workshops in practice-oriented study programs and to set up experiments in order to investigate the impact on exam results respectively learning outcomes in a structured approach. Additionally, the further development of the workshop concept and its application in other practice-oriented study programs is intended.

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The Character Educators of Future: What do they know? What do they need?

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Abstract

Providing the wholistic development of individual in terms of personal and psychological characteristics guiding our actions with educational processes forms "the character education". Teachers as an important figure in this process should be aware of character education and what they are responsible for. To achieve this, teacher education should include the essentials of character education and prepare teachers for their inevitable role within their professional life. This study aimed to reveal what the preservice primary school teachers know about character education and what their needs through their education for becoming a character educator are. The participants were preservice teachers from primary school education department in Cukurova University. The data was collected with an open ended quesitonnaire and analyzed using content analysis. According to findings, it is obvious that preservice teachers are mostly aware of the importance and content of character education and they see what their future roles are. They came up with many recommendations for teachers and teacher education. This study is thought to be beneficial in terms of revealing the situation within preservice teachers regarding character education awareness and also helping teacher educators to see what preservice teachers need to be efficient character educators.

Keywords: *Character education; preservice teacher; teacher education*

1. Introduction

Character and its formation is a longstanding issue under debate within education. Character is the wholistic development of the individual in terms of personal and psychological characteristics guiding our actions (Berkowitz, 2002; Battistich, 2011). To provide this development by various means is called character education. Character education is a cultivation of virtue in an intentional way having three main goals: making the people, schools and society good (Lickona, 1999, p.78). The main definition for character education could be structured as to provide the holistic development of an individual including personal and psychological characteristics consisting of values such as honesty, respect, responsibility, justice, caring, citizenship with the cooperation of social institutions and creating a convenient environment (JIE, 2014; CEP, 2010). This education is getting more important and popular day by day. There are also many programs carried out to enhance this education throughout the world (such as Knowledge is Power Program [KIPP], Character First Education (cf), and Character Counts!). For instance, KIPP is a program focused on holistic development of individuals including character, knowledge, skills, habits needed for success (KIPP, 1994).

When it is asked what the responsibility teachers and schools should take through this process, there is a lot to do in terms of shaping the students' character and teachers start to share the duty of families when the school age comes. Character formation is a complex process and teachers should be patient and motivated to overcome it and to help teachers to have this capacity the relationship between teacher efficacy and character education should be detected (Milson &Mehlig, 2002, p.48). The teachers also know the importance of character education to be a part of curriculum and it is necessary however, there is no consensus on what it is and how it should be carried out (Mathison, 1999). Having a crucial role in character education, primary school teachers were found to have a high level of self-efficacy in character education through the studies conducted (Demirel, 2009; Milson &Mehlig, 2002). When teaching is thought as a moral issue than educating the teachers should be in the same way according to the educators (O'Sullivan, 2005, p.4). Therefore, it is necessary to include character education in teacher education programs however, generally it is not involved (Beachum, McCray, Yawn and Obiakor, 2013, p.478). Accordingly, it can be asserted that preservice teachers' knowledge regarding character education is very limited. It is very significant that the preservice teachers have the higher education to be prepared for their moral roles through students' character formation and to achieve this, the undergraduate education they receive should possess the necessary qualities. Faculties of education should make preservice teachers understand the effect of their roles in the future on character education and increase their knowledge and awareness (Sılay, 2010, p.131). It is very important to educate them with a fully equipped teacher

education curriculum through their higher education process in which character education consists one of the biggest parts both theoretically and practically.

There are limited number of studies regarding the preservice teachers' awareness and knowledge about character education and their views on undergraduate education's role. As the character educators of future, it is very important to reveal what they know about this education and what they need through their training in higher education institutions. Accordingly, the aim of this study was "to discover preservice teachers' knowledge, awareness and recommendations about character education in their undergraduate process". Hence, their definitions for character education, descriptions for teachers' roles, views and recommendations regarding the practices of character education in undergraduate education were investigated.

2. Method

As its aim was to reveal the views of preservice teachers on character education, their awareness regarding this education and their recommendations through teachers' and teacher education's role within the process, a design would help to have a deep understanding was thought to be beneficial and the study was designed using qualitative phenomenological design.

The participants of the study were randomly chosen on voluntary basis 42 juniors and seniors (37 female, 5 male) from Primary School Teaching Department at Cukurova University, Adana, Turkey using the convenience sampling method. Primary school teachers are the teachers mostly in contact with children at a critical age for character formation and so more related to this study.

Through data collection, "Character Education In Teacher Education Form" prepared and conducted by the researchers was used. It included five open ended questions about their definitions for character education, descriptions for teachers' roles, views and recommendations regarding the practices of character education in undergraduate education. The questions structured and having the expert opinion the form was restructured. The final form was conducted through 2015-2016 Education year.

Content analysis was used to analyze the data and the forms were coded by two researchers separately. The codes and themes were checked by these researchers together objectively and the different codes and themes were discussed to have a consensus while the matching ones were used as they. Also the coder reliability according to formula by Miles and Huberman (1994) was found .86. Some quations were also presented to strengthen the reliability and validity of the content analysis. PT abbreviation was used to refer the preservice teachers used with a number to present the findings.

3. Findings

3.1. Findings regarding the definitions of preservice teachers for character education

Regarding the definitions of preservice teachers for character education, it is seen that their definitions were gathered under two themes presented on Table 1.

Table 1. Findings regarding the definitions of preservice teachers for character education

Themes	Codes	f
The education for personal and behavioral development (f:35)	The education shaping the personality and character	14
	Having the good behavior distinguishing good and bad	6
	Providing the moral and social development and creating a good person	5
	Creating awareness for and know oneself	5
	Educating and developing oneself	5
The education for providing adaptation to universal and social life (f:11)	Equipping with universal values	6
	Educating in line with social moral values and attitudes and bringing people in confirmity with the society	6

As it is seen on Table 1, *the education shaping the personality and character* was the most emphasized definition by the preservice teachers for character education. One of the preservice teachers indicated the relation between character and personality as: "*Character determines the personality. Character education on the other hand, is the education helping the personality shaping and presenting this personality*" (PT3). The other frequent codes under the personal and behavioral development theme were *having the good behavior distinguishing good and bad*, *providing the moral and social development and creating a good person*, *creating awareness for and know oneself, educating and developing one self.* The other theme regarding the definitions of preservice teachers was *the education for providing adaptation to universal and social life*. Under this theme, one of the participants related character education with *equipping with universal values* and stated it as: "*It is gaining the universal values will be beneficial for themselves and the society to our children*" (PT39) .The other codes under this theme were mostly related to the social life such as *educating in line with socal moral values and attitudes and bringing people in confirmity with the society, establishing self-respect and respect for society.*

3.2. Findings regarding the descriptions for teachers' role in character education

The preservice teachers were asked to describe the roles of teachers through character education. Findings regarding preservice teachers' views on roles of teachers were presented on Table 2.

Table 2.Findings regarding preservice teachers' views on roles of teachers

Themes	Codes	f
The qualities teachers possess (f:31)	Being a model and having the ideal qualities	17
	Being leading, supportive and incentive	12
	Being consistent	2
The practices related to character education (f:29)	Taking charge after the family	8
	Knowing the student and guiding his knowing and self-expression	6
	Caring for and applying the education towards shaping the character and personality	5
	Correcting the negative behaviors and gaining positive qualities	5
	Educating the students without hurting or pushing them	5

It is seen on Table 2 that the most frequent theme was *the qualities teachers should possess* and the most emphasized codes by the participants were *being a model and having the ideal qualities* and *being leading, supportive and incentive* under this theme. Regarding these descriptions for teachers role PT15 said: "*The teacher should lead the student and be a model and guide*". Another theme regarding the findings for teachers' role in character education was the expected practices related to character education and within this theme the preservice came up with roles such as *taking charge after the family, knowing the student and guiding his knowing and self-expression, caring for and applying the education towards shaping the character and personality*. One of the participants stressed the necessity for practices related to character education: "*Teacher is the most important figure after the family in shaping student's character. Teacher should not teach anything by being angry or humiliating to the child and be patient and tolerant"* (PT28). The other roles or duties of teachers were indicated as *gaining universal values, gaining the awareness for hospitality, using strategies or methods such as drama, etc…* and *linking with the real life.*

3.3. Findings regarding the practices of character education in undergraduate education

In this part, the participants introduced the practices regarding character education through their undergraduate studies and findings are shown on Table 3.

Table 3. Preservice Teachers' Views on Character Education Practices In Graduate Education

Themes	Codes	f
Inclusion in the courses (f:13)	Providing values education	7
	Utilizing from cases, group work, research and extracurricular activities	3
The qualities gained (f:3)	Teaching how to behave and adress students	2
	Making students sensitive to the society	1
Extracurricular activities (f:6)	Personal development and leadership seminars	4
	General gainings of teacher education	2
Deficiencies concerning the practices (f:13)	No specific practices	5
	Being limited to theoretical knowledge and abstract	4
	Inefficient practice	4

The participants' views on character education practices in graduate education were gathered under four themes and the most frequently mentioned practice was *providing values education* through undergraduate education. Preservice teachers also remarked *utilizing from cases, group work, research and extracurricular activities*, *attatinments of social studies teaching courses*. PT36 examplified the practices concerning character education: "*We are receiving values education. There are some extracurricular activities and they give some reserach work*". Another title regarding the practices was *the qualities gained* regarding character education. The most emphasized one was teaching *how to behave and address students*. The last theme was deficiencies concerning the practices of character education and some participants indicated that there were *no specific practices* or *inefficient practices* and the character education's *being limited to theoretical knowledge and abstract*. Regarding these deficiencies or absence of practices PT3 stated: "*I do not believe there are any applications regarding character education in our undergraduate education*" and PT23 said *"..... They only tell us how to act, what to do or what kind of character we should have orally".*

3.4. Findings regarding the recommendations for character education in undergraduate education

Findings about recommendations of participants are presented on Table 4.

Table 4. Recommendations for Character Education In Undergraduate Education

Themes	Codes	f
The quality of education (f:20)	Practical education more than theoretical	10
	Including in curriculum as a course	5
	An environment which personalities are considered in, allows self-reflection and free	5
The qualities to be gained (f:10)	Being understanding, responsible, warm-hearted and tolerant	4
	Making them see the students' imperfections, develop their skills and guide them	3
	Gaining personal and character properties to be a role model	3

On Table 4, it can be seen that preservice teachers put forward *recommendations regarding the quality of education* and *the qualities to be gained*. Under the quality of education, the most emphasized code was *practical education more than theoretical*. They also came up with recommendations such as *including character education as a course in the curriculum, creating an environment which personalities are considered in, allow self-reflection and free.* One of the participants' advice was *"There might be a course for this topic and this course should practical more than theoretical"* (PT10). There were also recommendations regarding the qualities to be gained to preservice teachers for character education. One of these recommendations: "*There should be an education through which I*

can reflect myself or my feelings and thoughts, respectful and tolerant. There should be curricula providing the inclusion of values we desire to be in character….." (PT22).

4. Discussion and Conclusion

Through the study, the participants were asked questions regarding their knowledge about character education and teachers' role through this process and their recommendations towards realizing these roles and enhancing the undergraduate education. It is found out that preservice teachers mostly know about character education and its content and they came up with the definitions above. These are very consistent with the definitions through the literature. Hoge (2002) stated that character education could be defined as the effort to contribute to individuals' having the desirable qulities or character traits. Another description for character education is that it is an intentional endavour to teach good human qualities (Lickona, 1997). By these explanations, it is revealed that preservice teachers were mostly aware of the content of this education.

The preservice teachers were seen to clear about the role teachers have through character education. In Sanger and Osguthorpe's study, it is seen that preservice teachers prefer teaching seeing it as a moral profession (2011) and this makes them feel responsible in the process. In this study, participants indicated some qualities teachers have such as being a model and having the ideal qualities and stated the practices they were expected to carry out. Similarly, while Avcı (2011) found that teachers stresses the activities related to being a role model, preventing the wrong behaviors, creating a democratic environment, guiding students for rights and wrongs; Narvaez and Lapsley (2008) emphasized teacher should know the relationship between caring class atmosphere and character education and they need the pedagogical competencies to create these environments.

When it came to undergraduate education, participants stated what they gained through which activities but still, many of them expressed the inefficiency of character education practices. Some of them emphasized the inclusion of character education in some courses or utilizing from curricular and extracurricular activites however, others also mentioned there were not any specific practices or these practices were inefficient. Similar studies show that the teacher education programs mostly do not prepare teachers for character formation (Munson, 2000; Beachum, McCray, Yawn & Obiakor, 2013). Regarding teacher education's role in raising character educators, the participants give some advices such as focusing on practical education, including as a course, gaining qualities such as responsibility, tolerance, creating a free environment. Munson (2000) also emphasizes teacher education programs' serving for character education to prepare preservice teachers towards the moral problems they might encounter in their classes. Based on these findings, it could be asserted that many precautions could be taken to increase the preservice teachers' awareness and efficacies regarding character education such as adding a course,

being practical not theoretical and using the hidden curriculum. Within all these arrangements, it could be achieved to make the preservice teachers graduate with the awareness, responsibility and equipment of being character educators of future.

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Teaching Abstraction

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Abstract

Many technical disciplines require abstraction skills, such as the ability to deduce general rules and principles from sets of examples. These skills are the basis for creating solutions that address a whole class of similar problems, rather than merely focusing a single specific instance. Experience shows that many freshmen students are ill equipped with these skills. Therefore, we developed an intervention that systematically teaches abstraction skills to students, and applied our approach to a cohort of freshmen students in computer science.

Keywords: *Abstraction, cognitive competencies, computer science, teaching*

1. Motivation

Thinking in an abstract manner is a key competency for computer scientists (Bucci, Long, & Weide, 2001) (Kramer, 2007), as well as in many other technical discplines. For example, moving from a notion of quantity, count or multiplicity to the representation of numbers in a computer requires some kind of abstraction. Similarly, a function that computes the sum of the values of its two parameters A and B is an abstraction that specifies the general mechanism for adding up two numbers from a given set, no matter what their values are. Finally, when analysts model a complex business process, they usually examine a set of specific scenarios, identify their commonalities and differences, intentionally drop irrelevant detail and mold the relevant parts into some kind of template that captures the very essence of the underlying business process in its "typical" form. Each of these examples involves a strong notion of abstraction.

Our experience, based on both formal tests and observation, shows that abstraction-related competencies are insufficiently developed in the vast majority of our freshmen students. Just to mention one example, the exercise given in Figure 1 was only solved by less than 30% of our freshmen-students. Even worse, most students are not even explicitely aware that there *is* such a skill as abstraction, and that it is highly essential for their chosen course of study. Needless to say, many of them don't know about their own proficiency (or the lack of it) in this area, either.

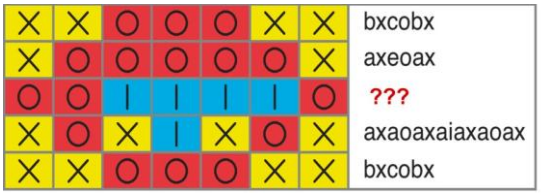

Figure 1. Example question from the 'Informatik Biber', an exercise that assesses abstraction skills of A-level students (BWINF, 2010).

However, abstraction skills are a key competence for computer scientists to be, and highly essential for learning reasonable programming skills. Therefore, in order to enable our students to successfully cope with the technical content that they are confronted with in their course of study, we have to teach them abstraction as a fundamental practical and cognitive competence.

One difficulty that arises in teaching abstraction is, that it is an "invisible" concept, meaning that there is no obvious way to make its notion tangible e.g. by suitable experiments (such as "dropping an apple" to visualize the notion of "gravity"). Another problem is that those people that are adept in the skill of abstraction usually apply it unconsciously. More precisely, experts tend to form abstractions from real world details without being able to specify the steps of the cognitive process that they applied. So

obviously, even if you *are* an expert in abstract thinking, it is difficult to teach this skill to novices if you are unaware of *how* you do it.

Therefore, in order to teach the skill of abstraction in a systematic way, experts first have to identify what they themselves do in the abstraction process. Once this is understood in sufficient detail, they can then move towards developing appropriate didactic approaches that help to evolve the skill of abstraction in their students. In addition, to measure abstraction skills we need suitable tests or tasks that focus on assessing abstraction skills on different levels of expertise.

2. Goals

To tackle these problems, we investigate how we can teach abstraction in a systematic way. Thus, this paper describes and evaluates an intervention for teaching abstraction that

- conveys an understanding of the *concept* of abstraction to our students,
- creates an awareness of what abstraction is, and why it is a necessary skill,
- makes the *cognitive process* of abstraction transparent,
- transfers to our students at least a basic understanding of this process as well as the ability to apply it, and
- helps students to assess their own current skill level in this area.

To specify the intended learning outcome in our students, we have to define which kind of skills we associate with different levels of expertise in abstract thinking. Therefore, in Table 1, we provide teaching goals that are formulated in accordance with the revised Bloom taxonomy for teaching and learning objectives (Anderson, 2001). Note that as our intervention addresses freshmen students and thus novices to the art, it only covers the four lower levels of expertise, i.e. Remember to Analyse.

Table 1. Teaching goals for the intervention on abstraction, according to the revised Bloom taxonomy.

Level	Teaching Goal: Students ...
Remember	… define the terms abstraction and concretion. … define the competence of abstract thinking.
Understand	… explain that computer science mainly deals with abstract concepts and that hence the ability of abstract thinking is essential in this domain. … reason that understanding of a domain requires an understanding of the underlying rules.
Apply	… derive concrete statements from a given simple abstraction. … extract the simple rule-set underlying a given set of concrete yet also simple examples.

Analyse	… apply a meta-strategy for finding an abstraction and solution strategy for a given abstraction task.
Evaluate	… evaluate the results of an abstraction process (i.e. the model or rule-set).
Create	… develop a meta model.

3. Related Work

Abstraction is "a process of omitting all individuating features, and retaining only what is common to all of a set of resembling particulars"
John Locke, to be found e.g. in (Wiener, 1973-1974)

Contributions towards abstraction in computer science (CS) curricula touch three categories:

- definition attempts or at least identification of abstraction in computer science
- the field of teaching abstraction abilities
- the field of testing them

Kramer states that abstraction is a key skill for computing (Kramer, 2007). He concludes that "we should focus more directly on ensuring that our teaching is effective and that computing professionals have adequate abstraction skills". As a basis, he recommends to measure students' abstraction abilities, both at the time when they apply for a place at colleges to study computer science, as well as annually throughout their college education process. But he does not give hints on how to achieve this. Kramer also mentions that many courses "rely on or utilize abstraction (...) but that it must be taught indirectly through other topics". Similarly, Bucci et al. (Bucci, Long, & Weide, 2001) observed that abstraction is severely shortchanged by current CS1/CS2 pedagogy. They give some examples of teaching support.

On the other hand, Hazzah and Kramer (Hazzan & Kramer, 2007) state that "abstraction should be introduced as an identifiable concept". This corresponds to our notion, namely to move away from the indirect teaching of abstraction to focusing it as a topic by itself. If teachers are not aware of their own abstract thinking, they might easily overlook concepts that need a detailed explanation, and take it for granted that students can understand these concepts on their own. However, we did not find any contributions towards teaching abstraction as a concept on its own, and making the abstraction process transparent to students.

Cook et al. have tried a systematic approach to teach abstraction for computer scientists to be, which is based on mathematical modeling. When basic math courses are taught in

parallel to introductory courses on software development and not up-front, an additional layer of complexity is introduced by the context of that specific mathematical subject.

Several ideas for tests that measure abstract thinking capabilities are proposed by Hazzan & Kramer (Hazzan & Kramer, 2007). However, they already require some basic knowledge of computer science which we cannot expect in our freshmen students.

4. Teaching Approach

Our teaching unit on abstraction is designed along the process depicted in Figure 2, based on Dietz & Dietz (Dietz & Dietz, 2011). Starting point is the idea to make students aware of their lack in abstract thinking. As soon as students are conscious of their incompetence and willing to face this deficit, it is possible to work with them to close the identified gap. The next step is to teach abstraction and to develop basic skills in this competence. Those skills must be practiced over and over, and improved until abstract thinking finally becomes an unconscious competence. Abstract thinking must become second nature to our students.

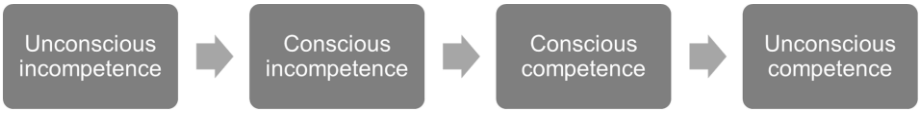

Figure 2. The different steps from unconsciuos incompetence to unconscious competence.

4.1 From unconscious incompetence to conscious incompetence

The first of two 90-minute teaching units started with an initial test to unveil the deficits in abstract thinking of our students, and to attract the students' attention for this topics.

4.2 From conscious incompetence to conscious competence

On the way to conscious abstract thinking, we tried to make transparent categorizations that unconsciously take place in everyday's life. As examples, we used verbs/nouns, round/angular shaped geometric ojects and car/bike brands, and asked our students to find the odd ones out. This demonstrates that everyone naturally uses fundamental abstraction skills. Next step was the discussion of the term "abstraction" and its common definitions. This was followed by exercises to find commonalities in sets of different entities like video game consoles, fruit, or geometric objects. Those commonalities define rule sets, which in general are the basis for the transformation into formalism of software.

On the other hand, it is important to be able to identify concrete examples from given sets of rules. Therefore, we asked students to find examples for the following three rule sets:

- primitive data types in Java
- control structures
- mandatory classes and electives in their degree course

Furthermore, in order to establish the relationship to the context of software development, we introduced the concepts of entities and behavior, which result in *boxes* (classes) and *blue prints* (class definitions).

In a second step, we introduced the concept of the abstraction of processes. As examples from everyday life, we used text formatting in a word processor, and sorting. As an exercise for the *abstraction* of processes, students had to define rules for calculating change in a vending machine. To practise *concretion* of processes, students had to apply the right-hand-rule for escaping from different mazes.

Deepen the conscious competence

A deep understanding of abstraction in the domain of computer science requires expert thinking. In order to understand the mental processes computer scientists implicitly apply when solving problems, we analyzed our thinking-steps while developing an algorithm with help of a think-aloud session of domain experts (Pea, 1986). Following the approach of Pólya (Pólya, 1973), we formalized the single steps we applied into a general approach. In order to give our students more guidance than the very general description of Pólya, we described our approach in more detail with respect to finding algorithms.

We used this approach to develop the second part of our intervention on abstract thinking, a 90 minute lecture where we focused on the problem of determining whether a given word is a palindrome (word that reads identically backward or forward) or not.

At the beginning, we introduced the task description including a short definition of palindromes. In addition, we defined the input and output of the desired algorithm. According to our approach, the first step is to find examples and non-examples. Subsequently, students were asked to informally describe an algorithm in natural language. This typically includes redundancy in terms of repeated compare-instructions on different character positions, as shown in Figure 3.

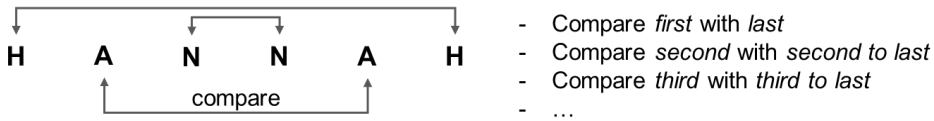

Figure 3. Illustration of the compare-instructions on different character positions of a palindrome.

The next step is to apply the following fundamental rules of formalization:

- Replace the textual sequence with an index
- Create decision trees and flow diagrams
- Use signal words like *if, while, until, repeat, …* for the process description
- Avoid redundancy wherever possible

This description is refined step by step, until the majority of our students understands how to transfer the process description into source code. In order to support students while formulating source code, we listed some general rules to help them:

- Wrap an algorithm into a method
- Map signal words to constructs of the programming language
- Convert examples to test-cases

5. First Results

In order to evaluate our special lecture, we designed a pre- and a post-test. For these tests, we used two similar questions as shown in Figure 4, as well as one question that occurred identically in both tests. Furthermore, we asked students to self-assess their competencies in concrete and abstract thinking on a scale of 1 (low) to 10 (very high).

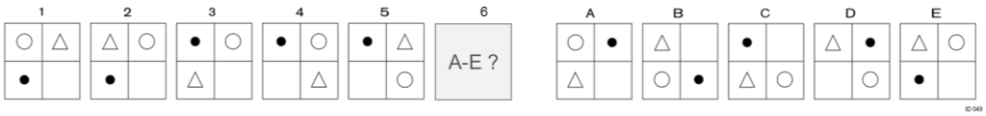

Figure 4. Task: how would the series on the left side continue?

The first test was handed out at the beginning of the first lecture, and students had 10 minutes to fill in the form. Then, we started with the lecture that took around 60 minutes. At the end of the lecture, we assessed students again to evaluate the impact of our lecture.

As students performed good in the pre-test on the questions (15 and 19 correct answers out of 21 participants) there was no significant improvement to measure. It seems that students have some basic abilities of abstract thinking at the beginning of their studies. However, this just works for common problems like the one illustrated in Figure 4. Nevertheless, if it comes to computer science related tasks like finding an algorithm (also cf. the exercise in Figure 1 for this issue), students often struggle. This is one reason, why we prepared the second part of the intervention, where we have explicitly presented the thinking process for developing an algorithm step by step.

The self-assessment of the students' confidence in their ability to think in an abstract way increased from a median of 5 to 6. At the beginning of their studies (October 2015), the same students estimated this ability with 3 to 4. Thus, this single lecture improved the ability of thinking abstractly much quicker than other lectures before.

To ask our students for feedback on the lecture, we distributed another questionnaire. Students stated that the unit was helpful to understand what abstraction and concretion is about, and that the intervention provided an introduction into the topic. Additionally, students realized that these skills are important for understanding problems from the area of computer science. As well, students stated that they felt supported individually, and that

they learned something new. However, they still felt not very confident about their individual competencies. For example, they stated that they are not sure if they are able to create abstract objects, relationships and rules by themselves for new tasks, or if they can depict complex facts clearly. All in all, they assessed themselves to be more skilled in concrete than in abstract thinking.

6. Conclusion and Future Work

We devised an intervention for teaching abstraction systematically, and tested it with our students of computer sciences. As a result, our students stated that they increased their knowledge about abstract and concrete thinking, but still struggle when solving new tasks. Therefore, they need to practice these skills regularly, to increase their proficiency in this area. Only with sufficient practice, our students' abstraction skills will evolve from a conscious competence to an unconscious one.

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A Descriptive Analysis of Doctoral Studies in Spain: Recent Changes

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Abstract

The adaptation of Doctoral studies to the European Higher Education Area has involved a complex regulatory change in Spain, with the aim of harmonizing this stage of training with European guidelines. Royal Decree 99/2011 established a new organizational structure for the Doctorate and sets out the guidelines, conditions and procedures that are to regulate the new Doctoral studies. In this paper we describe some of the most significant changes, including, among others, the novelty of the creation of Doctoral Schools, and we likewise present a succinct descriptive overview of some data resulting from the implementation of the regulations on the configuration and putting into practice of the new Doctoral studies. We conclude that these transformations are complex at the levels of management, organization and operation, although they have involved a move towards training that qualifies candidates in research competencies within a setting of internationalization and European mobility.

Keywords: *doctoral regulations; Doctoral Schools; European convergence; research competency; official statistical data.*

1. Introduction

The continuous regulatory changes that have taken place in Spain to develop Doctoral studies in accordance with the European Higher Education Area (EHEA), have led to a viewpoint tending to consolidate the regulatory changes required in order to converge with European guidelines for the Doctorate. This degree has the important role of relating the EHEA with the European Research Area as the basis for the construction of a society of knowledge, where research must be a distinctive element in doctoral and post-doctoral training (Fidalgo and Sánchez, 2007), permitting international mobility for the research training of doctoral candidates, and involving international appeal for research and the interchange of research knowledge.

The Bologna Declaration (1999) established two cycles of university education – first degree and post-graduate study – where the Doctorate was not initially contemplated as a fundamental objective (Castro et al., 2010), but merely formed part of the post-graduate cycle with more extensive training, but no separate identity. This structure was later completed with the Doctorate as third cycle (Berlin Declaration, 2003), laying emphasis on "the importance of research, research training and the promotion of interdisciplinarity, maintaining and improving the quality of higher education and improving the competitiveness of European higher education" (Berlin Declaration, 2003: 5), defining it as the first stage of a research career.

Successive communiqués (Berlin, 2003; Bergen, 2005; London, 2007; Leuven, 2009; Budapest-Vienna, 2010; Bucharest, 2012) have served to move towards the harmonization of doctoral guidelines at a European level (see http://eees.universia.es/documentos/reuniones-ministros-educacion-superior-europea/), in which the European Ministers responsible for Higher Education have defined the basic conditions for the Doctorate in the knowledge society. Likewise, the European University Association (2003, 2005, 2007) (see http://www.ehea.info/) has contributed to this definition through several studies and reports specifying recommendations for Doctoral Programmes.

As a member of these international areas, Spain has approved reforms to university legislation in order to establish principles for the Doctorate convergent with Europe. Spanish universities have designed a training model which places the doctoral candidate at the centre of research in R&D projects, thus providing quality, innovation, mobility and internationalization for trainee researchers (European Commission, 2015). These reforms must set up links for collaboration between the universities' Doctoral Programmes and business and industry, in which Doctoral Schools are to play a fundamental role. These modifications of the doctoral stage represent "methodical training in research in an

interdisciplinary, cooperative and international setting" (Nebot, 2009: 12), where the Doctorate is endorsed as "the distinctive and exclusive trademark of the research university" (Nebot, 2009: 12).

The basic aims of this paper are to describe some of the characteristics of the new Doctoral studies, to explain the novelty of the creation of the Doctoral Schools and their attributed functions, and to provide some official statistical data on the implementation of Doctoral studies in Spain.

2. Organizational structure of the Doctorate in Spain: the trend towards Europe.

One of the aims of the EHEA is to set up a network of research training to allow the development of joint quality actions in a context of internationalization, reshaping Doctoral studies. The Doctorate is the highest academic degree and fulfils a key role in establishing a link between teaching and research, in addition to being a basic instrument of connection between the university and society (Castro et al., 2010). The achievement of this aim has involved a complex administrative and bureaucratic transformation, sometimes called a tortuous process, inasmuch as four different regulations have been approved for the Doctorate (González, 2009).

Doctoral studies are regulated by Royal Decree 99/2011, which lays down requirements to be specified in the universities' statutes. It defines the Doctorate as "the third cycle of official university study, leading to the acquisition of the competencies and skills related to scientific research of quality" (Roya Decree 99/2011, art. 2.1). According to Benito et al. (2014), in the present state of the knowledge society, Doctors qualified in scientific, research and technological production represent a fundamental value for placement in the productive sector. Accordingly, the law sets out guidelines in this direction, designed to train researchers in universities for them to create qualified training capital and transfer of knowledge. One of the most important characteristics is the setting up of Doctoral Schools and the modification of the present Doctoral Programmes.

2.1. Doctoral Schools

The most important novelty of the new regulations is the creation of Doctoral Schools. These are understood as a body that manages and organizes research and the offer of activities inherent to the setting up and development of the Doctorate in one or several fields of knowledge or with an interdisciplinary character (RD 99/2011, art. 2.4). As a specific structure of doctoral training, the School is an independent unit responsible for research, with leadership in its structure to organize and manage the offer of activities

inherent to scientific research training in a field of knowledge (Roya Decree 99/2011, art. 9).

Collaboration must be established with other Spanish or international bodies, schools, institutions and entities with R&D activities. Likewise, the various training aspects of the doctoral candidate must be developed and the procedures and lines of research for the development of doctoral theses must be set out, all taking into consideration the importance of Doctors to contribute socially to a sustainable economy made possible by the transfer of research results. The priority is that students in research training "have to lead and cooperate in the transfer of knowledge towards the welfare of society (Royal Decree, p. 13.911). Each Doctoral School is governed by its corresponding Academic and Management Committees, and its activities can be organized around one or more specialized or interdisciplinary fields.

2.2. Doctoral Programmes

The new law (RD 99/2011) also establishes changes in the organization of Doctoral Programmes. The former departmental and/or interdepartmental and/or interdisciplinary structure, which made possible different research lines around a joint Doctorate and presenting Doctoral Programmes to obtain the Mention of Quality (ANECA, 2009), now gives way to a structure which specifies much more the content of Doctoral Programmes depending on the Doctoral Schools. In addition, Doctoral Programmes must now be verified by the Universities Council, recognised (Annexe II, RD 99/2011) by ANECA evaluation, and have a Coordinator, who must fulfill the requirements of having supervised at least two doctoral theses and holding at least two six-year research awards.

The law (RD 99/2011, art. 2.2) defines Doctoral Programmes as "a set of activities leading to the acquisition of the competencies and skills necessary to obtain the degree of Doctor," in which the research training of the candidates is key, and not restricted to training for university teaching. The aim is to link the candidate's research training and their incorporation into the job market, given the need to redirect doctoral students' professional aspirations, with the collaboration of "external allies", such as institutions and bodies with R&D strategies, thus creating potentialities for research.

3. Statistical data

We here describe some statistical data on the implementation of RD 99/2011, based on the available university statistics (MECD, 2015; Hernández & Pérez, 2015; University Register of Catalogue of Degrees, RUCT). Regarding the *Doctoral Schools*, there are 1042

university centres distributed over a total of 82 universities (Hernández & Pérez, 2015). Not all universities have founded Doctoral Schools. Those that have been set up are 55 Doctoral Schools, 1 School for Doctoral and Postgraduate Studies, 1 School for Postgraduate and Doctorate, 2 Schools of Master and Doctorate, 1 International Postgraduate Centre, and 1 School of Doctorate and Research, all belonging to (private and public) attendance universities (RUCT).

Regarding the denominations, Doctoral School has been chosen for the majority, only 6 universities have brought together Master and Doctorate, or Postgraduate, including doctoral training in the latter, 16 universities include the adjective "international" in the name of the school, and one other university chose the name "International Postgraduate Centre." Most of the Doctoral Schools have been set up in public universities (48), although there are also some private universities (13). The trend has also been to set up one Doctoral School per university, with the exception of the University of Granada, which has created three Doctoral Schools.

In distribution by Autonomous Community, Andalusia has the most with 13 Doctoral Schools, Catalonia has 10 and 1 School for Postgraduate and Doctorate, the Community of Madrid has 8 and 1 School of Doctorate and Research, the Community of Valencia has 6, Castile and Leon has 5, the Region of Murcia and Galicia have 3 each, the Foral Community of Navarre has 2 and the Canary Islands have 1 Doctoral School and 1 School for Doctoral and Postgraduate Studies, the remaining Autonomous Communities have 1 Doctoral School each, except for Extremadura, for which there are no records, and the Principality of Asturias, although the latter has an International Postgraduate Centre. Most of the Doctoral Schools are in public universities. There are Doctoral Schools in private universities in Catalonia (4 Doctoral Schools and 1 School for Postgraduate and Doctorate), Madrid (3), Andalusia (2), and Castile and Leon, the Community of Valencia and the Region of Murcia have 1 Doctoral School each.

The Doctoral Schools of each university offer different *Doctoral Programmes* evaluated and verified by the ANECA. The RUCT records a total of 1267 Doctoral Programmes, of which 659 are Programmes adapted to the EHEA and are at present regulated by RD 99/2011. The remaining 608 Programmes are Masters degrees and Official Doctoral Programmes and Official University Postgraduate Degrees regulated by the previous legislation and due to be discontinued. Although the Doctoral Schools are registered with the RUCT, not all their Doctoral Programmes have been registered, although their web pages show that they do offer Doctoral Programmes adapted to the new regulations.

It should also be noted that of all the Doctoral Programmes regulated by RD 99/2011 and registered in the RUCT, only a few are shared by more than one university. The Doctoral Programmes can be grouped under their respective Doctoral Schools, as in the University

of Granada, for example, or they can be classified by fields of knowledge (Arts and Humanities, Health Sciences, Natural Sciences, Engineering and Architecture, Social and Legal Sciences). Depending on the university, Doctoral Programmes can also be offered that deal exclusively with a single theme, such as at the University of Cadiz, whose International Doctoral School on Marine Studies (EIDEMAR) has Doctoral Programmes specifically on this question.

Concerning the number of *students registered* for Doctoral Studies, the preliminary statistical data of the MECD for 2014-2015 on university students show that, according to the regulations of RD 99/2011, the total number of students registered is 28,546. However, we should specify that there are still students registered for Doctoral studies under the previous legislation that have yet to conclude their studies. Hernández & Pérez (2015) calculate that there were 85,390 students registered for the year 2013-2014, representing 5.69% of the total of students registered in 1st and 2nd cycles, First Degree, Masters, Short Courses and Doctorate, mainly in public universities.

Despite the fact that Third Cycle students are a minority percentage, the data indicate that an increase is taking place in the number of students registered in all Spanish universities, both public and private. Specifically, the 74,648 Third Cycle students during the 2008-2009 academic year have grown to 88,732 Doctoral students for the year 2013-2014 (Hernández & Pérez, 2015). According to the numbers of students registered under the regulations of RD 99/2011, there is a rather equal split between male (50.20%) and female (49.80%) students. However, differences are to be found among students registered according to branches of knowledge and sex.

Regarding student registration by *branches of knowledge*, the Social and Legal Sciences have the highest numbers (26.72%), followed by Health Sciences (22.99%), Engineering and Architecture (18.23%), Arts and Humanities (17.82%) and Natural Sciences (14.24%). Female students are more common in Health Sciences (14.52% vs. 8.46%), Social and Legal Sciences (13.53% vs. 13.18%) and Arts and Humanities (9.56% vs. 8.26%), although the differences in the last two branches are slight. On the other hand, male students are more common in Engineering and Architecture (12.79% vs. 5.44%) and Natural Sciences (7.50% vs. 6.73%). The most notable differences, therefore, by sex and branch of knowledge are found in the Health Sciences, where female students predominate, and in Engineering and Architecture, with a more significant presence of male students.

These data show that, despite the democratic consolidation of women's gaining access to university education, their presence continues to be unequal in some branches of knowledge and in the categories of research thought to entail greater prestige and social recognition, thus leading to an unfavourable gender bias in women's scientific careers (Villarroya et al., 2008). This question also occurs in the access to Doctoral Studies and the differentiation

between the branches of knowledge chosen by male and female students, and, even, in the percentage of women with management positions, which is still low (Grifoll, 2009).

4. Conclusions

The entire process begun in Spain to adapt to the EHEA has involved legislative changes that have yet to allow the new guidelines in management and organization to come into effect, and to consolidate approaches more related to an international, convergent orientation for Doctoral studies (Jiménez & Sevilla, 2016). There has been a shift from a view centred on university Departments as those responsible for teaching and research, from the appraisal of interdepartmental relations and the proximity of areas of knowledge, to the consideration of the affinity of lines of research for the organization of the different Doctoral Programmes. Likewise, there has been a move away from the goal of postgraduate training linked to university teaching, to establish that research must be the central nucleus for the development of a research career with a view to incorporation into the productive sector of society (Benito et al., 2014).

In order for this shift in doctoral training to take place it is key that actions are carried out by the State, the Administration, institutions and the business sector to link the doctoral candidate with projects of research, development and innovation that qualify the candidate in the acquisition of skills, that allow internationalization and mobility in a European setting, in order to create transfer of knowledge from the university into society, and that contribute to the search for the employability of Doctors, while at the same time increasing public and private investment in R&D (Hernández & Pérez, 2015) and the public funding of the university (Gutiérrez-Solana, 2010).

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Collaborative learning: implementation of JigSaw technique in a Google environment

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Abstract

The main purpose of this research is checking the effectiveness of some online collaborative learning techniques through the development and implementation of a Google-based environment which will let us develop the collaborative technique known as Jigsaw. The research has been carried out on maths students of a school in the Principality of Asturias.28 students from different school years and classes took part in the research and several teachers at the school also participated in it. We have used a quasi-experimental design with pre-test and post-test measures as well as an equivalent control group. We have also carried out a detailed study of the requirements needed to extract information about the problems of the implementation of online collaborative activities in the classroom and about the creation of such activities focused on the use of classroom blogs and interactive animations. The results of the analysis show that a methodology such as this exerts a positive influence not only on the students' motivation but also on their academic achievements' the aims of the work, the main results obtained, and the conclusions drawn.

Keywords: *Collaborative learning, Jigsaw Technique, cloud computing-based learning, mathematics, Google environment, educational technology.*

1. Introduction

The main objective of this research is to study the effectiveness of using a previously designed online environment for learning maths throughout a collaborative methodology. It is studied whether the use of this environment influences positively on student motivation for the mathematics content, if teachers consider it an effective and facilitating learning experience giving special attention to students with learning difficulties and Special Educational Needs.

The work developed describes a learning experience using the active methodology based on the Jigsaw Technique (Aronson & Patnoe, 1997) in which several competences are aborded in an integrated way throughout several activities to develop mathematical contents related with integers and powers. Students are aged between 12 and 16 years old and were divided in two groups, control and experimental. While the control group has been working in a traditional way, the experimental one worked in an online environment and through a collaborative methodology. As pretest measure the mark obtained in the initial test on students when starting the course in the subject of mathematics has been used. Most students participating in the experience belong to the first course of Secondary Education and it is the first year they are at school and post-test measures are the results of a survey conducted by Google Form prepared by the teacher, questions have 4 possible answers, of which only one is correct. It needs to be noted that all students had previously worked in preceding years with the issue of powers, although some contents, such as the properties of the operations of powers, were new for first year pupils.

Previously to the intervention phase, a requirements study using a survey was carried out to determine the knowledge and experience of students in the use of ICT and the technological means available outside the center, the availability of teachers to participate in the educational intervention, their opinions and experience in the collaborative teaching-learning processes, and their motivation to use ICT in the classroom, and a study of the availability of resources, number of computers, compatible schedules free classrooms, internet center characteristics, etc.

2. Background

Recent studies (Vandecandelaere, M., Speybroeck, S., Van Laar, G., De Farine, B., & Van Damme, J., 2012) show that there is a close relationship between the use of learning platforms and students attitude to mathematics and that the results of the students improved significantly. There have been numerous theoretical studies on methodologies that lead to a definition of collaborative learning, (Guitert, M., & Pérez-Mateo, M., 2013) but there are less pilot projects in the field of mathematics, intending this research to approach the reality

of students in the "Principado de Asturias" and experimentally test whether JigSaw technique implemented in Google virtual environment and methodology of direct intervention in the classroom corroborates the theoretical predictions for collaborative environments.

The fact of working in collaborative groups is an essential ingredient in all teaching and learning activities. We can say that all projects using innovative methods or techniques incorporate this way of working as an experience in which the learner develops as a person. The so-called learning theory for the digital age, Connectivism, promoted by George Siemens and Stephen Downes (2015) attempts to explain the complex digital learning in a rapidly changing social world.

Methods or techniques of collaborative learning have been described almost entirely by authors such as Slaving (Slaving, RE, & Johnson, RT, 1999) and Shepherd (1990). Jigsaw (Aronson, Stephan, Sikes, Blarney, & Snap, 1978) is a type of collaborative technique in which students are divided in heterogeneous groups each of them consisting of 6 members. Teacher divides the lesson into 6 parts, each of them unique and essential in order to understand the lesson. Each student work one part and them all of them need to be placed together so as to understand the full chart. In this case the evaluation in individual for each student based on an exam of the full content.

There is a variation of this technique, Jigsaw II, in which students work in teams of 4-5 members. All students have to read the whole activity but each of them has a subtheme assigned in which the students needs to be an expert. Debates are carried out between the experts of each subtheme and then, each student returns to the original group to explain it to the mates. The evaluation is in groups based on the punctuations obtained by each group member in the individual exam about the full content.

Aronson (1978) found that the Jigsaw technique or puzzle is particularly effective in the most marginalized students, but generally the advantages that this technique can provide are (Fernández, MT, Morales, FX, & Marti, J., 2011): 1) Generates an intense interaction among students, since it requires them to be heard, 2) Positive attitudes toward the center and peers are created, 3) Self-esteem increases significantly, 4) Reduces hostilities, tensions and prejudices, 5) Improves academic performance, 6) Reduces their competitiveness, 7) Helps them see their peers as sources of learning, 8) Promotes the ability to empathize

The incorporation of ICTs to this technique requires its adaptation in order to ensure an effective implementation using the collaborative tools provided by educational platforms. The combination of collaborative techniques and online environments improve the teaching and learning processes if the following requirements are fulfilled: 1) They have to transform interpsicological processes into intrapsicological ones, from both teacher and student perspective, 2) They need to be built in a quality environment based on community

working for the teaching and learning processes, 3) They have to develop key e-competences for both teaching and learning, taking the previous points into account.

Improvement projects at university level, in response to the demands of the European Higher Education Space include experiences in virtual environments applying collaborative techniques considered motivating and enriching. In education Primary and Secondary education these experiences had been limited to geographically isolated centers in which collaboration between centers allowed to overcome this isolation. With the New Law of Education in Spain, it is necessary that these experiences are incorporated into the classroom as one of the methodological varieties for the competences treatment, so that, it is necessary to investigate the variables that influence in the development of collaborative networking activities with students in secondary education also with the technological resources available at the centers whose characteristics differ essentially from those centers and students of higher education. It is necessary to find easily accessible virtual environments from classrooms and outside them, and which do not require prior knowledge and excessive experience neither for teachers, who have to configure the environment and has to provide and organize the activities on it, nor for students who have to handle new tools and adapt to new methodologies.

3. Objectives

3.1. Research hypothesis

The literature review and the background checks detect a problem to which this paper tries to answer describing a virtual environment that allows us to implement an efficient collaborative technique to secondary school students and to allow the development of specific mathematical content, while the following curriculum competences are working.

"The addition of teaching and learning techniques based on collaborative online environments to the classroom significantly improve the results of secondary students and their motivation."

"Google environment in the Network with the tools it offers, provides the effective implementation of the collaborative technique JigSaw".

3.2. General objective

To improve students´ performance and motivation by incorporating collaborative techniques in the classroom using online tools that provide the necessary resources in order to create a Google-based environment that enables the implementation of JigSaw technique.

3.3. Specific objectives

- To implement the JigSaw technique in Google with the tools described above.

- To increase the students´ motivation, especially in mathematics, with the incorporation of students from different courses in the groups and to analyze the evolution of the students in all aspects in the development of the experience.

- To improve the results in students with special education needs and to integrate them with the rest of their mates.

4. Methodology

4.1. Research Design

Frist of all, students´ previous knowledge and motivation, Teachers´ expectative, experiences and opinion and Specific school characteristics, available infrastructure were analyzed in order to carry out the requirements study:

A quantitative quasi-experimental methodology is used due to the presence of strange and uncontrollable variables and a causal link between the before and after of the intervention process with the virtual environment without any randomness in the allocation of control subjects is intended to be stablished. Data obtained are the numerical results of observable realities dependent of use or not of the collaborative online environment, independent variable, we can manipulate.

Conducting a pre-test (before surgery) and post-test (post-intervention) by the experimental and control groups allows comparing the academic performance over the contents studied. Conducting satisfaction surveys and direct observation throughout the entire process, make possible to analyze the students' motivation and satisfaction with the participation in this type of experience.

4.2. Population and sample

Population: Formed by students of Secondary Education, of the Public Center CPEB Carlos Bousoño in course of Mathematics in all its forms.

Sample: The sample consists of 28 students aged between 12 and 16 years, 18 students are in first grade y the remaining 10 belong to other courses. Two of the students who participated are students with Special Educational Needs, SEN, so the participation and collaboration of Therapeutic Pedagogy teacher has been necessary.

4.3. Variables studied

As mentioned above, the independent variable has been the use or not of a collaborative online environment and the dependent variables are defined in terms of competences acquired and they are: digital competence, sense of initiative and entrepreneurship, specific

contents of the first course of secondary education acquisitions and mathematic competence.

4.4. Instruments

The techniques used to carry out the experiment were participant direct observation, structured and group interview using online forums and computerized questionnaires to check the contents acquisition. The instruments used were anecdotal records, control lists and questionnaires.

For this investigation, the tools given by Google, to which the access is easy throughout the creation e-mail account in Gmail, used are: Google Drive, Google Groups and Blogger due to the fact that they are very easy to use, the possibility the access from different devices and the flexibility they contribute to the using of some applications such as calculators or graphs that can have integrating problems when using more conventional environments.

4.5. Jigsaw Technique implementation

In the development of the Jigsaw Technique using experts groups the steps are: full group activity introduction, Base groups creation, experts' groups creation, return to the original base group, group work, general presentation, individual evaluation.

The proposed activities included the selection and analysis of videos, animations and Geogebra simulations of integers and powers, the presentation of a summary of theoretical aspects of powers and their history using Google Presentations and the elaboration of a compendium of theoretical and practical activities of the whole contents related with integers and powers taking into account the students with special needs.

5. Results

5.1. Assessment survey about the using of an online environment and collaborative experience.

The 94% of the students considered they have learn so much about powers using this methodology and the 100% found the experience highly motivating. The 83, 3% recognized that the most positive fact of the experience was collaborative learning. The activity that had less positive influence in students was the use of forums.

The use of the online environment outside the classroom has had a good reception among the students and 76, 5 % recognized using them at home. The 86% said they would like to continue using this type of methodology in order to learn in all subjects.

5.2. Difference between the experimental and control groups in terms of acquiring specific knowledge.

The results of the pretest and postest can be seen in Figure 1 which shows that a significant difference between the means of the pretest in both groups is not appreciated as expected because the selection of students is heterogeneous, although it is slightly higher in the control group.

Regarding the means achieved in the postest we see that in the experimental group is significantly higher, demonstrating the effectiveness of the methodology applied. Evolution is good in both groups but the difference in the experimental group is higher.

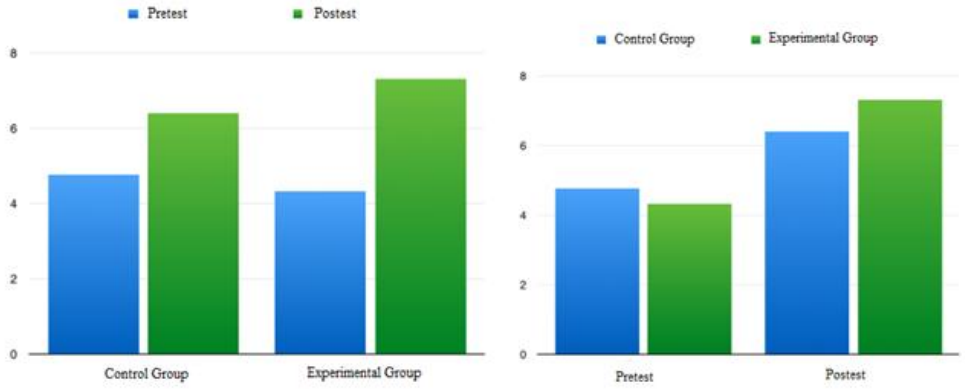

Figure 1: Left: Difference between means in the experimental and control groups. Source: Own Elaboration. Right: Difference between average punctuation in the pretest and postest. Source: Own Elaboration

To evaluate the grade of learning achieved by the students (Gil, Perez, Suero, Solano & Pardo, 2010) the normalized average gain in each group (G) is calculated. The parameter is higher for the experimental group (G = 0.53) than for the control one (G = 0.31).

5.3. Global Students Evaluation

For the global students evaluation the level of the mentioned indicators achievement has been taken into account. In general, the participation in forums has been low which is understandable considering that they are working in the same room. Blog commentaries has been satisfactory indicating that the student were highly motivating in checking their mates' problems.

The most significant difference has taken place in the global exam being the results in the experimental group higher than in the control one. Form the results, it is concluded that a motivation strategy for the using of forums is necessary.

6. Conclusions

This study has been carried out in order to find an effective way of using a free online environment to implement a collaborative methodology to enhance both the motivation and the academic results of the students. The conclusions obtained are:

- The Jigsaw Technique is easy to integrate in online environments with the characteristics of Goggle environment and stimulate the development of the teaching and learning activities. However, the use of these type of methodologies requires the permanent teacher formation which is needed to be facilitated by the public administrations.
- The use of collaborative methodologies favours both the motivation and the academic results of students but a content selection is needed due to the impossibility to deal with all of them in an online environment.
- Virtual environments are an alternative to the limitations of conventional platforms.
- The teachers and students experiences in the using of these methodologies based on online environments is going to increase and difficulties will decrease as a consequence.
- The use of this type of methodologies benefits the academic results in students with special needs

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Evaluation on ESQ 165 Training as Spiritual-Engineering-Based Motivation Training in an Attempt to Build the Character of the Members of the Subregional Police of Ciamis

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Abstract

The reform of the Indonesian National Police (Polri) requires the change in the behaviour of its members to be more professional in their service to the public. ESQ 165 Training is chosen as one of the programs in an attempt of character building of the members of the Subregional Police (Polres) of Ciamis. ESQ 165 Training is character-building training categorized as a type of motivation training which uses comprehensive and sustainable spiritual engineering. This research aims to evaluate ESQ 165 Training in an attempt to build the character of the members of the Subregional Police of Ciamis. The theory utilized in this research is Kirkpatrick's Framework which consists of four studied levels, namely reaction level, learning level, behavioural level, and result level. This research uses a quantitative descriptive research method. Data-gathering technique uses questionnaires distributed among 223 members of the Subregional Police of Ciamis who have participated in ESQ 165 Training, observation and interviews. The result of the research shows that 88% of respondents likes the training (reaction level), 93% of respondents understand the material of training (learning level), respondents shows changes in motivation, attitude and behaviour (behaviour level), and the public appreciate the performance of the Subregional Police of Ciamis which has undergone significant changes (result level). Therefore, ESQ 165 Training can be recommended as one of training methods utilized in character building.

Keywords: *Training, ESQ 165, Motivation, Spiritual Engineering, Character Building, the Subregional Police of Ciamis.*

1. Introduction

The reform of the Indonesian National Police (Polri) has been conducted since 2000, marked by the separation of the police organization from the military circle to become democratic civil police. The greatest challenge faced by the Indonesian National Police after the reform is the alteration of culture from a military-based institution to a civil one which respects the norms of democracy, such as equality, justice, independency and transparency.

Some efforts have been conducted by the Indonesian National Police to improve its performance, among other things, by creating grand design of 2005-2025. The grand design is divided into three strategic stages. Stage I (2005-2009) has the goal of trust building; stage II (2010-2014) has the goal of partnership building and; stage III (2015-2025) is aimed to strive for excellence (Note of Public Relation Division of Headquarters of the Indonesian National Police, 2011). In order to realize the grand design, the alteration of culture is required. The alteration of culture is required in view of the image that will be built, namely the police which is close to the public, in which the public are considered as the partner so that the police must be proactive and not repressive in involving the public. The character of arrogance, namely the authoritarian approach used to be utilized by the police, is returned to the initial track as the protector, guardian and servant of the public.

The change of culture is not only about the knowledge, but it also needs to be touched at the heart and spirituality. Spiritual dimension also becomes one of the basic principles of life as a nation and as a state as stated in the first principle of Pancasila (the national principle), namely belief in the one and only God. Therefore, since 2011 the Indonesian National Police has signed a memorandum of understanding (MoU) with ESQ Leadership Center. ESQ Leadership Centre (ESQ LC) is a training institution of human resources which has been established since 2000 with the total number of alumni of 1.4 million of all over the world. ESQ Leadership Training creates training known as ESQ 165 Training. ESQ 165 Training is considered relevant to the need of the Indonesian National Police because it uses the method of spiritual engineering which is comprehensive and sustainable in character building.

Locus of this research is the Subregional Police of Ciamis (Polres Ciamis), which is a command structure the Indonesian National Police in the Regency of Ciamis, West Java Province, Indonesia. Since 2015 Chief of the Subregional Police of Ciamis has had a policy to make more than 62% of its members to participate in ESQ 165 Training. This research is aimed to evaluate ESQ 165 training in an attempt to build the character of the members of the Subregional Police of Ciamis.

The type of ESQ 165 Training given to the members of the Subregional Police of Ciamis is ESQ 165 Training of character building 1 (personal transformation), which is the ESQ basic training among the four types of training conducted by ESQ LC. This training can be categorized as a type of motivation training that uses comprehensive and sustainable spiritual engineering. This training is aimed to build the character by combining 3 potentials of human beings, namely intellectual, emotional and spiritual quotients. Combination of the three characters answers the current basic problem in the government, especially ethics and morality.

ESQ basic training will transform the participant's paradigm on the meaning of happiness and work. If thus far, the meaning of happiness is just a material and emotional thing, then through this training the participants will be invited to find another kind of happiness, which is called spiritual happiness, so that their life will be more meaningful and more precious. Each training has a unique character, in which the alumni are allowed to participate again in the same type of training for free. It is the after sales service provided by ESQ LC to its alumni considering the success of character building cannot be instantly determined because it is a continuous, multistage and multiphase process.

The two days training is attractively presented by using sophisticated multimedia. Meanwhile, the goal of the day one is zero mind process, that is, to erase pride and egoism to be able to return to pure mind (God Spot) which is the base of emotional and spiritual quotients. The training material of the day two is focused on the character building through the 7 main virtues, i.e., honest, responsible, visionary, discipline, cooperative, righteous and caring.

2. Literature Review

Several studies on human resource development (HRD) program have been developed with the purpose to intervene the employee behaviour according to the expectation of the organization because "HRD has an important rolein generating improved organizational performance and individual growth"(Stone 2005). Therefore, HRD professionals must be able to determine the most suitable program in order to improve the performance of the organization and the employees' capacity.

Basic information that must be known by the HRD professionals before determining the most suitable program is the factors that can affect the employee behaviour. DeSimone and Werner stated that "there are two key factors affecting employee behaviour, (1) external forces-that is, those found in the external environment and work environment and (2) internal forces-that is two within the employee, including motivation, attitudes, and KSAs (knowledge, skills, and abilities)"(2012). Motivation and attitudes are the aspects that cannot be changed easily, while KSAs are the factors that can be changed easily, one of them through education and training. In the context of this research, the training is focused on the internal forces, particularly on the aspect of motivation as one of the most basic element of human behaviour (DeSimone and Werner, 2012).

Evaluation on ESQ training in the Subregional Police of Ciamis uses Kirkpatrick's Framework. Kirkpatrick states that there are 4 levels in the evaluation of training (DeSimone and Werner, 2012):

a. "Reaction (Level 1) At this level, the focus is on the trainee perceptions about a program and its effectiveness. This is useful information. Positive reaction to atraining program may make it easier to encourage employees to attend future programs.
b. Learning (Level 2) This is important criterion that an effective HRD program should satisfy. Measuring whether someone has learned something in training may involve a quiz or test–clearly a different method from assessing the participants' reaction to the program.
c. Behaviour (Level 3) This is also a critical measure of training success. If learning does not transfer to the job, the training effort cannot have an impact on employee or organization effectiveness. Observation of the trainee's on-the-job behaviour or viewing organizational records.

d. Result (Level 4) Meeting this criterion is considered the bottom line as far as most managers are concerned. It is also the most challenging level to assess, given that many things beyond employee performance can affect organizational performance. Typically at this level, economic and operating data are collected and analysed".

3. Research Method

This research uses the quantitative descriptive method to provide a description of the result of evaluation of ESQ 165 Training. Data-gathering technique uses questionnaires distributed among members of the Subregional Police of Ciamis who have participated in ESQ 165 Training, observation and interviews. The result data of the questionnaires are analysed by using descriptive statistics for measures of central tendency or central location of a distribution by using mode and mean. Population of the research is 500 persons. By using Slovin's (Silalahi, 2009:276) formula with the error tolerance of 5%, then the number of samples obtained in this research is 223 respondents.

$$n = \frac{500}{1+500\ (0.05)^2} = 222.2 = 223 \text{ respondents}$$

Questionnaires are distributed based on the Likert Scale, in which each respondent was asked to give the answer to a question. There are 5 variations of the answers, 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree.

4. Findings

4.1. Biodata of Respondents

There are 7 kinds of main information on the respondents, i.e.: (1) Sex: Respondents consist of 76% male and 24% female, (2) Age: The ages of the respondents are 7% of 19 years old or below, 41% between 20-30 years old, 24% between 31-40 years old, 15% between 41-50 years old, and 13% over 50 years old, (3) Latest Education: Respondents consist of 75% high school graduates, 23% bachelor's degree graduates, 1% associate degree graduates, and 1% elementary school graduates, (4) Length of Service: There are 42% of respondents who have served for 10 years or less, 30% of respondents who have served for 20 years or less, 28% of respondents who have served for more than 20 years, (5) Work Unit: Respondents come from various work units, such as the units of 4% Drugs, 19% Traffic, 8% Criminal Investigation, 4% Propam (Security), 15% Sabhara (the unit which is responsible to protect, to guard, and to serve the public), 4% General Affairs and Finance, and 46% others (Resources, etc.), (6) Rank: Respondents consist of 70% non-commissioned officers, 19% officers, 11% others, (7) Position: 64% of respondents are members of unit works, 10% of respondents are chiefs of unit works, 26% others.

4.2. Reaction Level

Reaction can be based on impression, opinions, and attitudes, and they identify how much the participants like the program, including its content, the trainer, the methods used and the surrounding in which the training took place (Stone, 2005).

Table 1 Opinion of the Reaction Level of ESQ 165 Training

No	Statement	1	2	3	4	5
	1) Content					
1	Enthusiastic in participating in the activities of ESQ 165 Training.	1%	1%	8%	61%	29%
2	Material accords with the expectation.	0%	1%	12%	72%	14%
3	Material is useful in performing the duties.	0%	2%	9%	67%	22%

	Mean	0.3%	1.3%	9.7%	**66.7%**	**21.7%**
2) Trainers						
4	Clearly deliver the material.	1%	1%	10%	68%	21%
5	Systematically deliver the material.	1%	2%	12%	68%	17%
6	Have a broad outlook on the material.	1%	1%	9%	69%	20%
7	Have a good ability in answering each question asked by the respondent.	1%	1%	14%	67%	17%
8	Affirm the material to make it easier to understand for me.	1%	1.3%	11.3%	68%	18.8%
9	Motivate the participants to improve their knowledge.	1%	1%	10%	68%	21%
	Mean	1%	1%	2%	**68%**	**19%**
3) Method						
10	The method used has been correct.	1%	1%	9%	69%	20%
11	Audio-visual media are in a good condition.	1%	1%	10%	72%	17%
12	Audio-visual media are very helpful for understanding the material.	1%	0%	13%	69%	18%
	Mean	1%	1%	11%	**70%**	**18%**
4) Surroundings in which Training TookPlace						
13	Training rooms are comfortable	1%	1%	10%	68%	21%
14	Seats are comfortable	1%	2%	12%	68%	17%
15	Lighting is good	1%	1%	9%	69%	20%
16	Temperature of the rooms is fine	1%	1%	14%	67%	17%
	Mean	1%	1%	11,3%	**68%**	**19%**

The result of the research indicates that:

1) **Content.** Based on the data, 90% of respondents agree and strongly agree that they are very enthusiastic about participating in the training. As many as 87.5% of respondents state they agree and strongly agree that the material of ESQ has met their expectation and it is useful for performing their duties.
2) **Trainer.** Based on the data, 87% of respondents state they agree and strongly agree that the trainers are able to deliver the material clearly and systematically. Trainers are considered to have a broad outlook and a good ability in answering each question. Trainers are also considered to be emphatic, which is shown by giving motivation to the participants and affirmation of the material to make it easier for the respondents to understand the material. Based on the result of the observation and interviews, we obtain the information that each training is delivered by 1 main trainer and 2 associate trainers. The trainers have a good ability in delivering the material, particularly in the aspects of intonation and adjusting the volume of their voices through the mixer when they emphasize the material considered important. Trainers have the ability to play with the emotion of participants. During the contemplation session, the explanation of the trainers is able to make all participants cry, and on other hand the trainers are also able to make the participants laugh when they deliver an entertaining material. The training, which is conducted for 2 days, is perceived as not boring by the participants because in delivering the material, the trainers alternate with ice breaking and door prize awarding which give a cheerful atmosphere.
3) **Methods.** Based on the data of the result of questionnaires, 88% of respondents state they agree and strongly agree that the training method has been correct. Audio-visual media are in a good condition, and even some respondents state that ESQ 165 Training is equipped with sophisticated presentation technology. The presentation of the material is accompanied with music that can help respondents indulge themselves in experiencing the material. Meanwhile, the use of multimedia in delivering the material is considered to be helpful by the respondents for understanding the material.
4) **Surroundings in which Training Took Place** relate to the indicator of comfort. Based on the data 87% of respondents state they agree and strongly agree that they feel comfortable with the setting of the rooms, seats, lighting and temperature of the room. Based on the result of the observation, there is no lighting during the presentation of the

material, and the light is obtained from the screen in order that the participants will focused on the training material.

In general, the result of the evaluation of reaction level shows that 88% of respondents like ESQ 165 Training, seen from the sides of material, trainers, methods and media used, and comfort of the training rooms. This research also measures whether there is a desire to participate in the advanced training and to recommend ESQ 165 Training to other people. Based on the data, 81% of respondents will participate in the advanced training of ESQ 165 because they consider it useful. However, there are 17% of respondents who still hesitate to participate again in the training. As many as 86% of respondents state they will recommend the training to their relatives.

4.3. Learning Level

In essence, the material of ESQ basic training is intended to build the commitment and sincerity which are realized in the 7 main virtues, namely honest, responsible, visionary, discipline, cooperative, righteous and caring. These characters are built based on the religious values which universally prevail. Therefore, evaluation on the learning level emphasizes on the aspect of the understanding of the 7 main virtues. The result of the questionnaires is as follows:

Table 2 Opinion of the Understanding on the Materials of ESQ 165 Training

No	Statement	1	2	3	4	5
1	An understanding on emotional quotient	1%	1%	6%	71%	21%
2	An understanding on intellectual quotient	0%	1%	8%	71%	21%
3	An understanding on spiritual quotient	0%	0%	7%	69%	24%
4	Improvement of the knowledge on religion	1%	1%	8%	67%	24%
5	An understanding on the importance of honesty in performing my work	1%	0%	6%	62%	31%
6	An understanding on the importance of responsibility in performing my work	0%	1%	5%	70%	24%
7	An understanding on the importance of having long-term thoughts (visionary)	1%	1%	6%	68%	24%
8	An understanding on the importance of discipline	0%	1%	6%	70%	24%
9	An understanding on the importance of cooperation to reach a goal	0%	1%	8%	67%	24%
10	An understanding on the importance of being fair to another human being	0%	1%	6%	68%	25%
11	An understanding on the importance of caring to another human being	0%	1%	5%	68%	27%
Mean		0.4%	0.8%	6.5%	**68.1%**	**24.5%**

Based on the data in **Table 2**, 93% of respondents state they agree and strongly agree that ESQ 165 Training helps them to give the understanding related to the 7 main virtues, which are universal values. ESQ 165 Training is able to give the spiritual meaning of each work. The 7 main virtues are helpful to make vision, mission and values of the company as the motivation in work so that they will not merely pursue incentives.

Based on the result of the observation, at the early stage the participants (zero mind process) are provided with the material on inner journey and outer journey, which, in essence, invites the participants to conceive how great the universe is and how tiny we are. It aims to touch the feeling so that the heart becomes tender. The heart that up to now is hard and arrogant is expected to be tender again after seeing the greatness of the One and Only God.

ESQ 165 Training does not allow the trainees to take note on the material being delivered. The participants are encouraged to listen, understand, feel and experience each material delivered. The process of understanding and experiencing the material gives a very good impression to the trainees, particularly due to the presentation of the material through sophisticated multimedia.

4.4. Behaviour Level

In order to find out the evaluation behavioural level, an observation and interviews are conducted, and questionnaires are utilized to find the opinion of the respondents on the level. Basically, the aspect of behaviour level measures the level of changes in attitudes, behaviour and motivation. The changes in the attitude of the members of the Subregional Police of Ciamis cannot be separated from the role of the Chief of the Subregional Police of Ciamis as the agent of change. He has stipulated some policies in order to change the behaviour of the members of the Subregional Police of Ciamis, among other things:

- To make spiritual values as the motivation in work, through: (1) the reciting of *asmaulhusna* (beautiful names of Allah Swt.) at the morning assembly (for Muslims). The reciting of *asmaulhusna* has a purpose to remember the greatness of Allah Swt. so that it becomes the motivation that work is not just orientated to material interest but it is a religious obligation. When someone considers that work is a religious obligation, it is expected that the 7 main virtues will spontaneously emerge. (2) Religious gathering which is often directly led by the Chief of the Subregional Police of Ciamis. It also has a purpose to remind that work is a religious obligation.
- To make the 7 main virtues as the character of the members of the Subregional Police of Ciamis. (1) At the moment, organization values of the Regional Police of Ciamis refer to the 7 main virtues introduced in ESQ 165. The values of the Subregional Police of Ciamis are honesty, integrity, cooperation, hierarchy and loyalty. (2) Every morning these values are pledged by the members of the Subregional Police of Ciamis as the process of cultural internalisation. (3)They have a habit of cleaning the office and the surroundings which will build the character of cleanliness loving, cooperation and devotion in work.(4) As the agent of law enforcement, the members of the Police must respect the law values and norms; their behaviour must be the model for the public. Therefore, the Chief of the Subregional Police regards the discipline of the members of the Subregional Police of Ciamis must be improved, among other things, by routinely checking the equipment, facilities and attribute of the members of the Subregional Police of Ciamis. The result of the checking shows that the majority of the members of the Subregional Police of Ciamis have followed the rules. (5) The value of cooperation has become the key for the the members of the Subregional Police of Ciamis in serving and guarding the public. In this case the Subregional Police of Ciamis has conducted many formal and informal activities which involve the public in order to bring about security and order based on the partnership with the public.

The Chief of the Subregional Police of Ciamis has adopted a system to follow up on the change of behaviour to be more professional in their service to the public by: (1) enforcing the rules on the discipline of police code and ethics which have an effect on a decrease of violations of the discipline of ethical code of police committed by the members of the Subregional Police of Ciamis; (2) giving reward or punishment to all members of the Subregional Police of Ciamis to enhance their motivation to do their duties as the member of the Indonesian National Police; (3) establishing the career in accordance with the principles of transparency and the right man on the right place, (4) optimizing the standard operating procedures (SOP) to avoid procedural faults in their daily performance at work.

At the behaviour level, the opinion of the respondents is also measured in a questionnaire. Based on the data, 86.6% of respondents agree and strongly agree that the material of ESQ 165 Training has changed their attitude and behaviour. They feel more honest and more responsible. They always consider the long-term impact of each of their

behaviour. They are more disciplined at work and more intensively involve in teamwork. They try to be fairer and more caring towards others.

The result of the interview with some members of the Subregional Police Ciamis indicates that ESQ basic training has an effect on their behaviour, but maintaining the behaviour needs the support of a good system, among others, through the commitment of the leaders. Respondents state that so far the Chief of the Subregional Police of Ciamis has become the role model of the behavioural change of the members of the Subregional Police. He is considered as a figure close to his subordinates, and he frequently visits the ground to find out the problems faced by his members. The Chief of the Subregional Police actively leads the morning assembly and religious gathering. Moreover, respondents also consider that as a leader, the Chief of the Subregional Police is able to give constructive directions for the improvement of the organization.

4.5. Result Level

Result level will measure to what extent the effectiveness of ESQ 165 Training improves the performance of organization. In this research, the result level has not been conducted entirely towards the performance of the Subregional Police of Ciamis because ESQ 165 Training has not yet been conducted for a full year so that the data of the performance have not been complete. In addition, as of now just 62% of members of the Subregional Police of Ciamis have attended ESQ 165 Training.

The result of the observation shows that although ESQ 165 Training has not yet conducted until 2015, it has shown the change of behaviour among the members of the Subregional Police of Ciamis to be a better one. Some members directly convey their appreciation on the service of the members of the police via short message services (SMS). The followings are the points of the SMS:

- Mrs.Sumiati appreciated the service of the Subregional Police of Ciamis because her son had been very well served when he tried to arrange for his police record (SKCK). Moreover, the officer refused the service fee given personally by Hj. Sumiati.
- Mr.Wagino appreciated the members of the Police that refused the service fee he gave personally.
- Mr.Kurniawan, Mr.Suwandi, Mr.Irsad, Mr.Dani, Mr.Syahroni, Mr. Akbar, NN expressed their extraordinary pride in the service of the members of the Subregional Police of Ciamis in making the driving license. Mr.Suwandi added that the members of the Subregional Police of Ciamis sincerely served the public.

Another impact felt by the public is they feel closer to the police because in many occasions they are involved in the effort to maintain mutual security and order.

As the comparative materials, in the result level, the opinion of the respondents is also measured in a questionnaire with the following result:

Table 3 Opinion of the Respondents on the Effects of ESQ 165 Training

No	Statement	1	2	3	4	5
1	I maintain the security of the public more intensively.	0%	1%	9%	76%	14%
2	I maintain the order of the public more intensively.	0%	1%	9%	77%	13%
3	I try to enforce the law as justly as possible.	1%	1%	9%	74%	16%
4	I try to the maximum to encourage the public to improve their awareness and obedience to the law.	1%	1%	8%	70%	20%
5	I perform my duties seriously.	1%	1%	9%	72%	18%
Mean		0.6%	1%	8.8%	**73.8%**	**16.2%**

Table 3 shows that 90% of respondents feel that after participating in ESQ 165 Training, they perform their duties seriously. It is affected by the spiritual values which have become the motivation of the members of the Subregional Police of Ciamis at work.

5. Conclusion

Based on the result of the research, as spiritual-engineering based motivation training, 165 Training ESQ can be recommended as one of the training methods that can be utilized in character building. However, the change of behaviour is not an instant process so that the values built in the training need to be internalised to become a culture. Here lies the importance of the commitment of a leader in building the character of the members of the organization towards the expected behaviour.

Recommendation of the research, a research on training to change the employee behaviour will be more effective if it uses the longitudinal survey considering the behaviour cannot be changed instantly so that it needs repeated observation of the same variables over long periods of time in order to find out the behavioural and result levels. Similar research can also be conducted if all members of the Subregional Police of Ciamis have attended the training, considering after the Subregional Police of Ciamis has signed an MoU with ESQ Leadership Center in 2015, as of now just 62% of members of the Subregional Police of Ciamis have had the opportunity to attend the training. Therefore, the performance of the Subregional Police of Ciamis has not yet fully affected by the members who have attended ESQ 165 Training.

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Digital Literacies for Language Learning and Teaching: developing a national framework

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Abstract

In an Irish national setting, the urgent need to address the national language skills' shortage has been highlighted in numerous arenas, and in the context of the need for a continued economic recovery, language skills and proficiency are essential. Against this backdrop, the national project reported in this paper aims to develop a digital literacies framework and accompanying on-line interactive resource for language learners and teachers in Irish higher education (HE). Within the scope of this project the target user groups include first year students, study abroad students, and language lecturers. The main research questions for the project are:*

- *what are the main practical issues that students have when making the transition from secondary to third level language study?*
- *to what extent are digital literacies part of the curriculum at third level and what gaps do students and lecturers identify in this provision?*
- *what are the strengths and weaknesses of the emerging digital literacies framework for language learning (as identified through piloting and evaluation) and how do these inform the final design and implementation of the 'digilanguages' platform?*

Preliminary primary pilot research conducted in 2015 as part of the project identified a number of key areas where online flexible support is best focussed. Based on these findings and international research in the field, the aim of the project is to develop online resources and activities in three broad areas:

*This project is funded by the National Forum for the Enhancement of Teaching and Learning, under the auspices of the Higher Education Authority in Ireland.

1. *Digital Literacies for Language Development*
2. *Language Learning Strategies and Practices*
3. *Transitions to Third Level Language Learning Environments*

The portal will be freely available, offering a range of OERs and will be scalable for use in other contexts. The contents and activities will afford integration into many programmes currently on offer in Irish HE.

Keywords: *Digital literacies; national framework; higher education; language learning; language teaching.*

1. Introduction

The aim of the project reported in this paper is to develop a national framework for digital literacies for language learning and teaching in an Irish HE context, and to curate and create a wide range of OERs to facilitate its implementation. The overall focus of the recently-funded, 18-month project (January 2016-June 2017) is to provide a framework and strategy-oriented on-line resource for language learners and teachers to be fully integrated into third level language programmes in Ireland, including language teacher education programmes for secondary, primary and private sectors. The project team comprises language lecturers and language teacher education lecturers from across a range of geographically diverse locations representing six HE institutions (University of Limerick, National University of Ireland, Galway, Dublin City University, Mary Immaculate College, Limerick, Dublin Institute of Technology, and Limerick Institute of Teachnology). The languages emphasis for the project extends to French, Italian, German, Spanish, Irish and English for Speakers of Other Languages. The main research questions for the project are:

- what are the main practical issues that students have when making the transition from secondary to third level language study?
- to what extent are digital literacies part of the curriculum at third level and what gaps do students and lecturers identify in this provision?
- what are the strengths and weaknesses of the emerging digital literacies framework for language learning (as identified through piloting and evaluation) and how do these inform the final design and implementation of the 'digilanguages' platform?

2. Background and Context

During a six-month pilot phase in 2015, the team engaed in a number of fundamental tasks as the foundation for this larger-scale project. Firstly, we defined the problem space, that is,

the inter-relationship between language teaching and learning, engaging both teachers and learners, paradigm shifts in Applied Linguistics, new developments at national and international level (Erasmus +, virtual mobility, 21st century skills, and graduate attributes). Secondly, we conducted small-scale preliminary primary survey and focus-group research in relation to transition with the three target user groups. 94 first year students responded to the survey and 64 study/work abroad students. In general, significant numbers of the student respondents report not having enough support when making the relevant transitions. The majority of first year (82.5%) and study/work aborad students (91.5%) indicated the need for online support to assist them with their transition. 91.3% and 77.8% respectively said that they would engage with such support. The key practical transition issues as identified by the student user-groups are summarized in Table 1.

Table 1: Top 10 practical issues in relation to transitions: student perceptions

	First Year Students	**Study/work Abroad Students**
1	Different teaching approach	Oral skills
2	Grammar skills	Language skills
3	Autonomy in 3rd level	Minimal opportunity to speak/learn the target language
4	Fast pace in class	Culture
5	Oral skills	Vocabulary skills
6	Level of language expected	Lack of practical information (general info; accommodation; organisation)
7	Taught through the target language	Grammar skills
8	Time required and workload	Lack of support
9	Vocabulary skills	Practising other languages of study
10	Focus on pronunciation	Making friends

Following this, we developed an initial design framework for digital project to assist the three target user groups (first year and study abroad students, and language lecturers) in their engagement with new language pedagogies and digital environments, based on the following core principles (see, Blin *et al*., 2016):

- An ecological approach to language development and design
- Sustainability
- Participatory design
- Critical awareness of relevant Open Educational Resources
- Localisation.

Thirdly, we established an international network of partners with relevant expertise in project core areas (see, for example, Farr and Murray, 2016) and languages to inform the direction of the proejct and related content curation and development. Finally, based on primary research results with the various end-user groups (see below), we began the development of a new framework for building digital capacity in language teaching and learning in Irish HEIs (to add discipline-specific granularity to the emerging All-Aboard national framework: http://allaboardhe.org/digital-skills/).

3. The Framework

The emerging framework centres on *three inter-related areas:*

1. Digital literacies for language teaching and learning
2. Digital language teaching and learning strategies and practices with a focus on core language skills
3. Transitioning to digital environments for language teaching and learning.

Each of these three areas will be explored in more detail in the following subsections, which outline the definitions we use, the challenges and gaps that currently exist (as identified in our research to date), and what we aim to do to addresss these gaps. This will be realised in each case through the development of an appropriate framework and the curation and development of OERs as tools to support the implementation of this framework and its integration into third level language curricula. The OERs will be hosted on a portal hosting strategy-focussed activities, which will be piloted and evaluated in the context of selected modules across partner institutions.

3.1. Digital literacies for language teaching and learning

We define digital literacy as the individual and social skills needed to effectively interpret, manage, share and create meaning in the growing range of digital communication channels (Dudeney *et al.*, 2014). Based on our preliminary primary research research, the current challenges/gaps for language learners is to acquire and develop digital literacies in a variety of cultural contexts (social, academic, professional) and languages. Our objectives are therefore for learners and teachers to:

- increase awareness of trends in new literacies movement, to enable the development of knowledge and skills for the successful integration and assessment of digital literacies in the language curriculum (*teachers*)

- to display an understanding of digital practices, multiple identities, freedom of expression, social practices in networks (including privacy and safety issues), and the development of critical thinking in different digital genres and across different cultures and Discourse communities.

We aim to achieve this more specifically through the adoption and adaptation of the framework for digital literacies developed by Dudeney *et al.* (2014), with a particular focus on:

- Language-related literacies (print, text, hypertext, multi-media, gaming, mobile)
- Information-related literacies (tagging, searching, reliable resource identification, filtering)
- Connections-related literacies (digital identity, network and participation in intercultural contexts)
- (Re-)design literacies (building on and creating new information)

This framework was used to inform the design of a survey, which was distributed in April 2016 to students (330 respondents) and teachers (66 respondents) within the partner institutions, specifically related to digital literacy integration in language curricula. The results to some relevant sections of the survey can be seen in Tables 2 and 3.

Table 2: Digital literacy curriculum integration: student perceptions (% responses[2])

	Not included and would not like it to be /would not like more	**Included adequately**	**Not included and would like it to be/would like more**
Print and text	10.82	40.66	48.52
Hypertext and multimedia	29.5	16.72	53.78
Gaming	38.69	12.79	48.52
Mobile	20.66	14.75	64.59
Tagging	49.83	9.5	40.67
Searching	13.11	25.25	61.64
Reliable resource identification	10.82	22.62	66.56
Filtering and	20.66	15.41	63.93

[2] Based on an average of 305 responses to each of these questions across a range of languages being studied

networking			
Digital identity	34.48	14.10	51.42
Intercultural networking and participation	27.54	11.8	60.66
Building on	15.08	26.88	58.04

In general the majority of students would like to see the inclusion or further inclion of most of the items from the framework. The main exception is tagging, with print and text, and gamining both coming in just under majority at 48.52%. This clearly identifies a want and a need on the part of students to increase their engagement with such digital literacies. Lecturers were asked a related question about how important (1 = least important, 5 = most important) they felt it was for their students to learn these literacies as part of their programme of study and the results can be found in Table 3.

Table 3: Digital literacy curriculum integration: lecturer perceptions (% responses[3])

	1	**2**	**3**	**4**	**5**
Print and text	2.13	12.77	27.66	36.17	21.28
Hypertext and multimedia	2.08	16.67	45.83	25	10.42
Gaming	21.28	17.02	29.79	23.4	8.51
Mobile	6.38	6.38	29.79	42.55	14.89
Tagging	41.86	13.95	34.88	4.65	4.65
Searching	2.13	6.38	12.77	44.68	34.04
Reliable resource identification	0	0	27.66	21.28	51.05
Filtering and networking	6.38	14.89	29.79	36.17	12.77
Digital identity	8.51	17.02	34.04	31.91	8.51
Intercultural networking and participation	13.33	17.78	28.89	28.89	11.11
Building on and creating new information	8.89	6.67	31.11	35.56	17.78

[3] Based on an average of 47 responses to each of these questions

The lecturer responses to this part of the survey very much mirror the student perceptions and opinions. The vast majority of literacies are considered important or very important with the exception of gaming and tagging. These results indetify the significance lecturers afford to these digital literacies in a language learning context.

3.2 Digital language teaching and learning strategies and practices

The second part of the framework includes a re-definition of core language skills in the 21st century, recognising important paradigm shifts (with references to multiple literacies, and designs for teaching and learning). The identified need here is for new language pedagogies appropriate for deployment in technology rich learning environments and Computer Supported Collaborative (Language) Learning environments (Blin and Jalkahen, 2014), which focus on new strategies and competencies for consolidating and practising written and spoken skills online. This will enable:

- the practice of language skills, using strategy-focussed entry points to the portal
- the development of opportunities for new online language use and practice (telecollaboration, journaling (Gabaudan, forthcoming 2016), virtual worlds and gaming (Peterson, 2013), synchronous and asynchronous communication, corpus linguistics (O'Keeffe *et al.*, 2007), the creation of digital and multimodal objects)
- language teachers and learners to appropriately use electronic resources to augment their linguistic knowledge (use of online dictionaries, corpora, machine translation, sub-titling, captioning/annotating).

3.3 Transitioning to digital environments for language teaching and learning

Finally, the framework carefully addresses lifelong language learning, learner autonomy, metacognition, computer supported collaborative language learning, and learning how to cope with technology. Our research shoes that there are difficulties in the transition from face-to-face to online environments, from teacher-led pedagogies (for example at secondary school) to self-directed learning (in HE), from digital vernaculars to formal learning settings, from virtual learning environment (VLE) to personal learning (PLE), from independent to computer supported collaborative language learning. The objective is therefore to provide resources to enable language learners to become lifelong learners of languages, toe enable language teachers and learners to create and maintain PLNs/PLEs and to develop appropriate strategies for the successful integration of technology for language acquisition. This involves the adaption and development of online tools for assisting language learners in assessing their language learning strategies and styles, in recognising and realising the affordances of digital tools in different languages and cultural contexts, in

building and maintaining PLNs and PLEs, and in creating an e-portfolio to showcase learning experience and outcomes.

4. Discussion

The framework outlined in the previous sections is based on preliminary research conducted as part of the pilot phase of this project, plus on-going research with the target-user groups (only some of which has been reported here). This conference paper outlines the development of the framework and presents it in detail as a set of skills, strategies and conceptually congruent pathways, which will be completed at the end of the first six-month project period of the project (June, 2016). The iterative processes involved in this development (including consultation with key stakeholders, further primary research in the form of national surveys and a number of focus-group discussions) are presented, along with key results. The beginning of the development of the OERs in each of the three key areas included in the digital literacies for language learning and teaching framework (digilanguages) are presented and discussed, along with a detailed plan for pilot and evaluation phases. The project, its outcomes, and their implementation in HE language curricula will represent a significant and unique step forward for any European country in this way.

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Assessment of UT (University of Tehran) change management in quality Orientation process based on ADKAR model

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Abstract

In this paper quality orientation process of Tehran University was evaluated. For effective change human resource of organization must have five qualities: Awareness about need to change; Desire to make the change happen; Knowledge about how to change; Ability to change; Reinforcement to retain the changes. With these human resource qualities, work dimension (for example: structures and process of doing work) need to well set with planned changes. Work dimension had five main elements too: 1- business needs and opportunities 2- setting goals and boundaries 3-desining process and systems 4-devalope way to solve problems and 5-post- implementation. These research conclusions show that UT human resource, sense high need and desire to change in quality. So, to success in quality change sense high ability in self and their colleagues, and access to needed knowledge for change in quality of UT. But university's systems don't support these efforts so that proper low support for qualitative changes. In work dimension, quality improvement opportunities, goals, and needs weren't well defined. Furthermore systems and process of accepting quality weren't developed suitably. Solution sections had some problem too. Some solutions remain in design level only and others after implementation don't evaluate for distinguish weaknesses and strength.

Keywords: *Change management-Quality of Higher education ADKAR Model-Tehran University.*

1. Introduction

In the 1970s and 1980s, many American firms experienced new challenge. This new challenge was competition with variety of obstinate competitors from Japan. Undeniably, many firms had lost the international competitive edge they had enjoyed in the 1950s and the inevitable result was declining market shares, sustained losses, unemployment, and massive soul-searching by firms. These challenges an international forces such as: increasing global competition and the struggle to survive, increasing costs, demands for accountability and rising customer expectations about quality, a number of US corporations such as Intel, Hewlett Packard, Xerox, IBM, Motorola, etc. undertook quality initiatives. Juran and Deming theory about quality that gave successful outcomes in Japan and other theories that deal with "Quality management" were considered highly by these firms. Higher education confronted with similar situation. Rapidly changing information technology, highly increasing costs and accountability, competition for best student and academic staff enrolment lead to higher education consideration get addressed to quality of teaching and other university's aspects (Venkatraman, 2007). Bingham (1993) in his paper states that the common mistakes made in implementing TQM in industry are lack of leadership, middle management muddle, misunderstanding of participation, obsession with process and failure to include the customer. He concludes that in higher education, TQM's long-term success depends on the lessons driven from industry. Conclusion of these new orientations and thinks was universities consideration to quality as a tool for maintenance in competitive environment. Must be said that, this process for success need to well managing. The first section starts on page two. incorporating all text, references, figures and tables. These guidelines are strict: papers failing to adhere to the guidelines (by being more than 8 pages, altering margins or not following the template) will be rejected without consideration of their merits Tehran University as an educational organization for fundamental change in all quality aspects had very high efforts; in fact on of the mental disturbance of this university is quality assurance system implementation. Establish of quality assessment center, UT science and technology PARK, try to development of internal evaluation culture, implement of continues evaluation system, establish total system for gathering information and so on are samples of this educational organization for fundamental change in its plans quality. So main problem in this research is change management of UT quality orientation that must be assessed based on ADKAR model (Bazargan, 1993).

Quality and higher education quality had some definitions, and any definition addressed especial aspects of this concept or sees it in a special view. Juran argued that every product that be easy for use, and consumers be satisfy from using it, that product have quality (Gourchian et al., 2003). According to international quality assurance network, higher education quality is: higher education conformity with appointed standards, missions, goals

and expectations (Gourchian et al., 2003). In UNESCO view, higher education quality is a multi dimensional concept that related to environmental situation, university systems, and standards of educational system (UNESCO, 2007). Harvey and Green to quote from Bigges (2001) argued that quality had two kind definitions 1- Quality is matching with goal. Most important goal of universities is teaching and research that receiving students to effective learning and coordination with this goal is main criterion for university's quality assurance. 2- Quality is change factor. Quality of education do change learners perceptions of their environment, application ways of knowledge for solve real world problems, teachers' perceptions from their role into education and organizational culture. This continues changes in quality accepted when lead to more reforms (Gourchian et al., 2003).

Rangnes and Haraldsena (2007) argued that change in higher education quality need to change in seven contexts that are main quality improvement elements of higher education: Change in governance at the institutional level; Increased institutional autonomy; New funding for the institutions; New degree structure, that is bachelor and master programs; New forms of student guidance, evaluation and assessment; New financial support to students; Internationalization.

In the interim of theoretical and functional definitions of quality believed that quality is a multi form and multi dimensional concept and views, values and special goals of anybody or group form the main elements of quality definition. Then he classifies quality concepts that utilized in higher education into eight set that are as following: Descriptive quality; Quality in form of loyalty to traditions and customs; Quality in form of loyalty to missions; Quality in form of loyalty to improvement and perfection standards; Quality in form of consumers' satisfaction; Quality in form of to prove to be true of consumers goals; Quality in form of added value; Quality in form of continues improvement (Gourchian et al., 2003).

Tucker believed that in addition to these cases in real world, quality related to situation. And even it is possible that could define quality in higher education as expressing of students' critical thinking skills. Based on above proper a holistic definition for quality is very difficult and challengeable; because quality doesn't come from a total model or general theory, perhaps is a special situation of higher education system and output of set of functions that must be responsible for social needs at a special time. But it is true that quality in itself addressed accomplishment need, perception of situations and changes and planning for improvement. And for accomplishment to this special situation must define this desire situation and continually try to improve it.

UNESCO (2007) summarized quality of higher education elements into four following sets:

1-Innovation in curricula and programs teaching methods and aids, interdisciplinary;
2-Lifelong learning and the qualitative transformation;
3-Accreditation and evaluation;

4- Career guidance.

Clery (1993) proposed one of the practical usages of quality management standards in higher education. His model is contains 20 orders to utilizing of ISO9000 standards.

ADKAR model for change management (2006):

Based on ADKAR model, for effective change management human resource of organization must have five main qualities: 1-Awarness: awareness about need to change2-Desire: desire to make the change happen3-Kowledge: knowledge about how to cahnge4-Ability: ability to cahnge5-Reinforcment: reinforcement to retain the changes. These five qualifications are necessity of organizational change. Organizational members must sense urgency and need about change and have knowledge and desire to do change and on the other hand organizational system must support these changes. Other dimension of change related to organizational work process. In this dimension first needs and opportunities for change must be defined and to receiving those solutions must be provide. And then solutions must be implemented and evaluated. Below figure shows combinations of these tow dimensions:

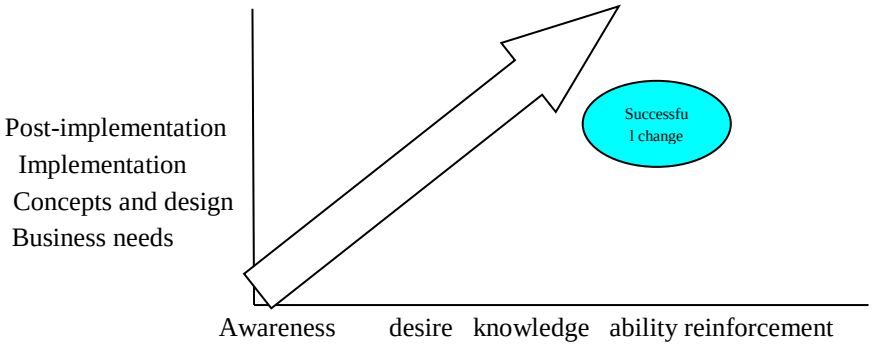

Figure 1. ADKAR a model for change management (2006)

2. Resaerch Methodology

This research is a descriptive one. Academic members of University of Tehran in 14 faculties are society of this research. These members are about 1530 persons. To gathering data in this research used a questioner that provided by researcher. This questioner has 25 question based on five dimensions of adkar model .For estimate validity and reliability of this instrument did a primarily test in a sample that had 30 members, and to validation test use formal validity. Estimated Cronbach **α** was 82% (α=82%) that show this instruments is relatively reliable. Finally do an open interview with some of members to complete data gathering.

3. Findings

Change in organization environment lead to change in organizational structure, needs, costumers, and so on. If organization want be active in this situation must be aware of these external dynamics and sense to use of these changes. Awareness is one of the change necessities. In a holistic view one of the successful change factors is that managers should percept philosophy of change and profitability of it (Kruger, 2007). The graph(1) that presented in below shows that research sample highly aware of quality of university and try to change and improve it.

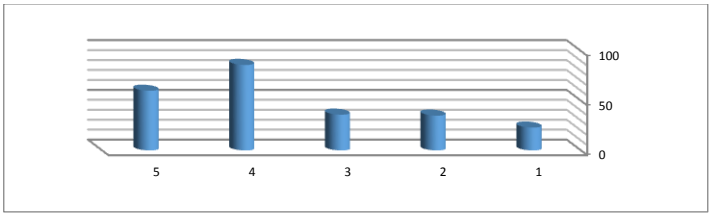

Figure 2. Awareness

Above figure shows that almost 61 percent of UT academic staff has sense need to change in quality of university and only 9 percent haven't the same senses or aren't aware of it. One of the basic necessities for change is motivated work force. Long term successful in any transformational or planned change related to desire of members to do change. Internal motivation for does change has three steps: establish a new perceptional structure, utilization and confirmation. If these steps be complete change could receive to the ends (Sarai, 1993). In this paper UT academic staff has high desire to change quality so that 69 percent of them have highly desire to participate in change in quality below graph show this matter.

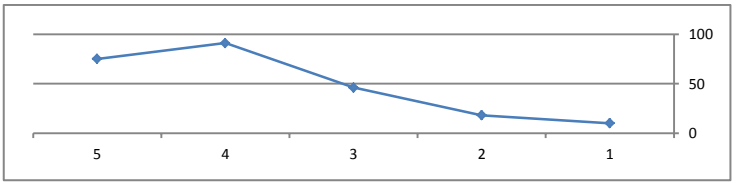

Figure 3. Desire

With regard to this figure we understand that only 4 percent of academic staff hasn't sufficient desire to change the quality.Employers that have sense of ability to do works with excitement, honor, and ownership sense work in organization; and in addition to responsibility have innovation and creativity in organization and preferred organizational interests on personal interests. To have enabler work force is an organizational preference and if this ability utilized in organization could be one source for many organizational

preferences. In this research academic staff of UT has ability sense to change the quality of university.

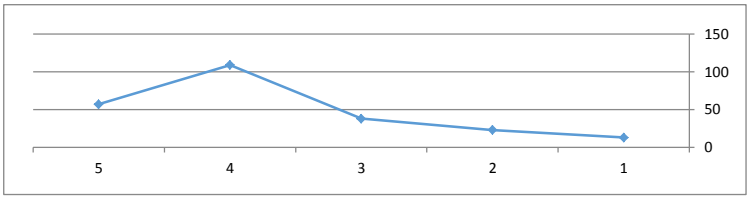

Figure 4. ability

This figure shows that research sample have very high ability for change in quality of university. Grasp updated knowledge is one of the effective factors that impact on success of change management. If we have been needed knowledge for change we could better deal with change and probability for successful is higher than when we haven't needed knowledge. In this research we understand that academic staff of UT has needed knowledge for change in quality of university.

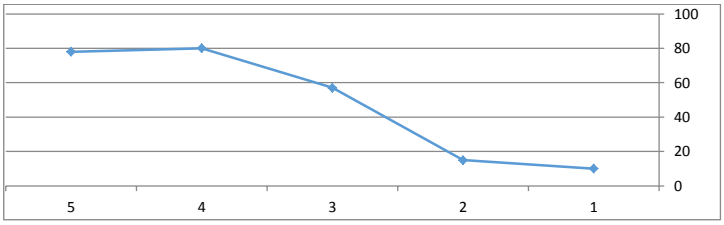

Figure 5. Knowledge

With regard to number four graph we see that sample have needed knowledge for change in quality of university. In addition to all factors that presented above for successful change management university systems must support changes. In other words if personal efforts that utilized for change didn't appreciate we couldn't have any expectation for successful and effective change process. In this research UT system don't efficient support for changes. Figure 5 show this matter.

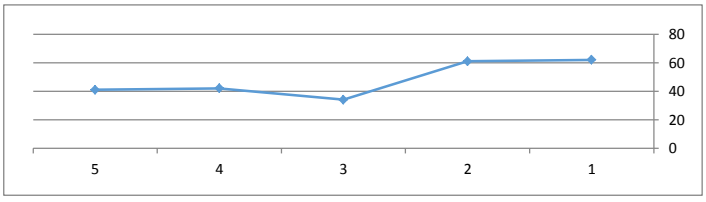

Figure 6. reinforcement

Graph number 6 show combinative figure of these five main elements. This figure shows that only university systems aren't supporter for university change process. But other factors are sufficient for change in quality of UT. Humanistic factors that related to academic staffs of university are completely prepare to change in quality process. Figure 6 shows this matter clearly. If UT want to successes in quality change should use this capacity.

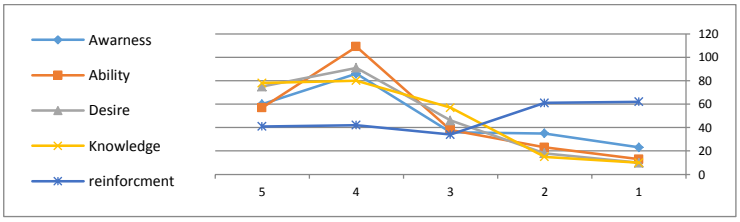

Figure 7.

Other dimension of change management process refers to work systems and process. Graph (7) shows statues of these variables. Must be told that besides of efficient workforce for successful in managing change process effectively, it is important that these changes be about organizations needs and opportunities, goals and boundaries of change must be defined, well developed organizations process and systems, provide well solutions and implementation of this solutions. Finally these solutions must be evaluated to show weaknesses and strengths. Figure (7) show statues of these factors in UT quality change process. This figure show that process and systems to do duties in UT don't developed suitably, needs and opportunities don't defined completely, goal of change in quality don't set clearly, and many solutions are in plan level only.

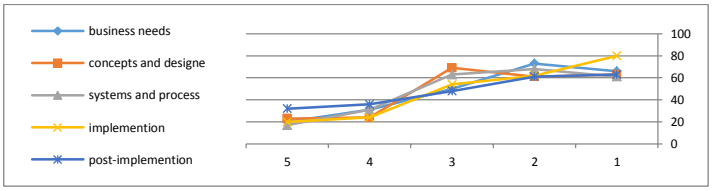

Figure 8. work dimension

4. Conclusion

Motwani (1995) cites that educational institutions have started to feel the pressure to change and reform. Furthermore, there is a belief that academic institutions that are slow to embrace TQM, at best, miss the opportunity to lead change and, at worst, run the risk of becoming less relevant to the business world. Nowadays all universities in all over the world oriented to quality and TQM. Lozier and Teeter (1996) reported that there are over 300 colleges and universities in US that are actively pursuing total quality principles. For

success in this process universities utilize different policies. Moreland and Clark (1998) stated that teamwork, finding better ways to do things, sharing responsibility that are value set of many modern universities and their faculties are outcome of TQM orientation .

UT as an Iranian pioneer university tries in this field. In this paper we see that, change process (transformational or planned) need to have some circumstances. In this paper based on ADKAR model 2 set of factors were attended. UT should provide better support for change in quality, because other factors in the humanistic dimension are ready for change in quality. On the other hand university systems and process must be overview to successful in change process. This research proposed that, with regard to readiness of academic staff of UT for change in quality, University managers must provide other factors to successful change in quality of university.

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How academic reforms change the organizational design of universities

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Abstract

The academic landscape is changing in the course of New Public Management (NPM). More duties are assigned to universities and as a result transferred to their faculties. Management knowledge is needed for solving the problem of higher requirements for deans in terms of distribution of resources, responsibility for personal and finances. Until now, deans do not necessarily have this knowledge. One crucial approach for this problem is professionalization, which can take shape in various forms, e. g. in establishing positions for a new occupational group of academia professionals. To reach the organization's objective in an effective and efficient way, there is no best solution corresponding to the contingency approach, it rather depends on the framework requirements.

The results of an empiric inquiry of framework requirements and deanery attributes on four German universities show that the infrastructures of the faculties as decentral units depend less on the size of the faculty, but very strong on university's organizational setting. This becomes apparent by the fact that at an elite university with strong research activities and with the profile of an entrepreneurial university, but with small framework requirements in the faculties has established many positions of academia professionals. Smaller universities, but also big multi-discipline universities with scientific excellence don't reach as many academia professionals in spite of having big framework requirements.

Keywords: *New Public Management; Higher Education Organization; Organizational Design.*

1. Introduction

Nowadays higher education systems which are mostly financed by the public are affected by a change of gouvernance structures. There are new mechanisms of regulation based on the concepts of the New Public Management: a model of effective and efficient decision structures. Problems like the reduction of public finances for higher education and higher requirements on the benefit of research and teaching outside of science should be solved this way. (Lange & Schimank, 2007, p. 523). The „greatest reform on higher education since decades“ (Bundesministerium für Bildung und Forschung [BMBF], 2010) was triggered by abolishing the Hochschulrahmengesetz (Framework Act for Higher Education) in 1998 and the beginning of the Bologna process in 1999 (Scherm, 2012, p. 7), which resulted in the introduction of Europe-wide homogeneous structured degree programs was determined. They should lead to more internationalization, mobility and worldwide attractiveness (Teichler, 2005, p. 81).

From this reforms one might wonder, how universities manage the pressure within this. Until now there is a lack of empirical studies on the implementation and design of the new governance instruments. It is not clear, how far the traditional self-administration model is actually replaced with a new management model (Bogumil, 2013, p. 12). The changes lead to a higher burden for the management of the university, which especially addresses the central and decentral management levels of chairmanship and deanship. Deans must accomplish more and more complex challenges. Therefore there is a gap between the increased profile of qualification and the existing qualifications, which can be closed by establishing positions for academia professionals, a new group of employees working in the field between science, management and administration. The objective of this research is to show organizational solutions for this depending on different framework requirements. Moreover, the effects of the reforms on the situation of the employees are investigated, which gives the problem a special societal relevance.

2. Foundation

To get a theoretical foundation for the change caused by these reforms, the ‘governance equalizer’ is an appropriate analytical instrument. It helps to categorize the change and comparison of governance-regimes close to the state (Schimank, 2007, p. 239). It consists of five dimensions: state regulation, pressure of competition, hierarchic self-regulatory, academic self-organization and external regulation, which represent a typology of governance-regimes related to the higher education sector. The dimension *regulation of the state* measures characteristics of the public top down regulation. *External regulation* covers the involvement of external stakeholders, for instance from the industry. *Academic self-regulation* means the classic functionality of the self-administration of universities with

their interest in autonomous science. *Hierarchic self-organization* stands for hierarchies within university like presidents and deans. Especially this dimension forms university into an organization that is capable of acting. *Pressure of competition* for students, academics, financial resources and reputation predominates within and between universities on quasi-markets by evaluations (Schimank, 2009, p. 125). Pressure of competition, hierarchic self-regulation and external regulation are developed strongly at NPM but weakly at the traditional model, on the contrary academic self-regulation and state-regulation are developed weakly at NPM and strongly at the traditional model (Schimank, 2007, p 242).

The responsibility to implement these reforms was transferred to the universities, so that ability to compete and profile formation shall be facilitated (Hochschulrektorenkonferenz, 2011, p. 8). The state withdrawal from the micro management leads to a wider autonomy of universities (Lange & Schimank, 2007, p. 524). This concerns particularly organizational, personal and financial autonomy (Ziegele, 2005, pp. 109-110).

As a new societal requirement this development results in the exploitation of new scopes like selection processes, marketing or quality management. Also the strengthening of institutional management and the introduction of economic management instruments are parts of this profound organizational change (Lange & Schimank, 2007, pp. 539-541; Blümel, Kloke & Krücken, 2011, p. 105).

Achievement-oriented public grantings of funds, performance evaluations and rankings are instruments for boosting competition between universities to provide information to prospective students, external capital providers and professors, to strengthen the perception as a complete organization and to produce comparability (Meier, 2009, pp. 160-162). External regulation is effected by external staffed boards like the board of trustees (Hochschulrat), by contractual elements like objective agreements and the impact of accreditation agencies (Meier, 2009, pp. 135-138). The development of the dimensions vary in different countries, e. g. in Great Britain or Australia NPM is pronounced much stronger than in Germany. The traditional German governance system speaks against the conception of universities as actors. Hence there are doubts about their status as an actor, which can be summarized in describing universities more as a loose than a determined organization (Meier, 2009, p. 114). The profound transformation of universities leads to a stronger development as a managing actor with rationalized decision structures (Krücken & Meier, 2006, p. 241-242).

3. Method

The contingency approach as an organizational theory is the basis for this study. For adapting the new needs, universities must be capable of acting more flexible and be

designed efficiently depending on environmental variables. The contingency approach allows a view on efficient organizational structures depending on situational framework requirements and is therefore suitable for further approaches. As there are no universal efficient organizational structures, organizations must rather adapt their structure to situational framework requirements for being efficient. The interrelation between organizational structure, situational context and success of the organization is interpreted by the fit, which terms the compatibility between variables of structure and situation. That means as much as their coherence concerning specific objectives (Scholz, 1992, para. 543). The ambition of this approach is to explain the attributes of organizational structure by concrete situational framework requirements and to deduce design recommendations so that the organizational structure is assimilated to the situation and the organization is efficient (Kieser, 2006, p. 215). Means to reach that goal are instruments of the empiric-comparative organizational research: the empirical collection of organizational structures and their explanation depending on different situational parameters and the determination of impacts of organizational structures on success (Scherm & Pietsch, 2007, p. 36).

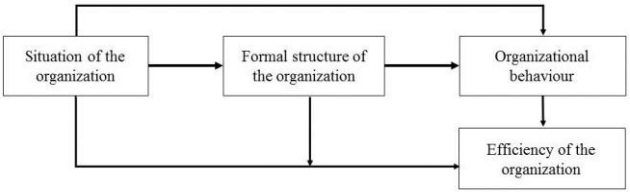

Figure 1. Research program of the contingency approach. Source: Kieser & Kubicek (1992).

From these four constructs pictured in Figure 1, this work focusses initially on the influence of the situation on organizational structures.

The situational framework requirements of the four selected universities are measured and analyzed. Variables are *type of university*, *profile*, *size* measured in *number of students* and *product mix* measured in *number of degree programs*. The framework requirements of all faculties are measured in *number of students* and *number of degree programs*. The attributes of the organizational structure of deaneries are measured using the variables *function of dean* with the values *full time* or *part time*, number of functions of *pro-deans*, *deans of students* and *deans of research* (electoral offices). Relating to the support of academia professionals the *type of position*, qualification is measured in *level of education* and finally the *number of positions for academia professionals*.

The empirical method is a systematic analysis of the homepages of all faculties in the course of a complete survey to find out, which positions are established. The selection of the universities took place within the German state Bavaria in order to get comparability

regarding the framework requirements and the state law. For a better differentiation 4 of 13 existing universities were chosen that vary in as many values of variables as possible.

Table 1. Chosen universities.

	LMU	**TU**	**University of Regensburg**	**University of Passau**
Number of students	~ 50000	~ 33000	~ 20400	~ 10000
Number of degree programs	1083	182	177	35
Number of faculties	18	13	11	4

Source: own research.

4. Results

The Technische Universität München (TUM) and Ludwig-Maximilians-Universität München (LMU) represent universities with scientific excellence. The former has a technical focus, the latter is a multi-discipline university with a big number of students and a wide range of degree programs.

On the contrary University of Passau is small, young and modern having an interdisciplinary, international profile with focus on languages, media and globalization. There are only four faculties. The University of Regensburg stands in the middle as a young, medium-sized multi-discipline university with many degree programs also including natural sciences in contrast to University of Passau.

Regarding **LMU** it is to state that there is no affinity to many academia professionals. The framework requirements don't seem to influence the number of academia professionals strongly. Faculties with minimal framework requirements also have few academia professionals, but medium-sized or large faculties bring few or medium number of electoral offices and of academia professionals as well. It is conspicuous that most faculties of LMU have a dean of research, which deals with tasks correspondent to the strong research profile.

At the faculties of **TUM**, which has strong research activities and the profile of an entrepreneurial university, already small framework requirements on the faculties lead to many positions of academia professionals. In opposition to the LMU there is no dean of research in any faculty. Considering the large amount of academia professionals, that could mean that they manage the respective tasks.

The medium-sized **University of Regensburg** is equipped with a medium number of academia professionals and electoral offices.

At the **University of Passau** the number of academia professionals never becomes big independent of the faculty related framework requirements, but the number is small, if the framework requirements are minimal. The four faculties have no dean of research, which leads to the conclusion that the profile in research competition is minor.

The values of variables from respectively two faculties of each university, which are particularely demonstrative, are pictured in Table 1.

Table 2. Results of exemplary faculty related framework requirements and attributes of deaneries

LMU	**Psychology**	**Biology**
Number of students	10397	1901
Number of degree programs	27	8
Number of pro-deans	1	1
Number of deans of students	1	1
Number of deans of research	1	-
Number of positions for academia professionals	1	1
TUM	**Sport Science**	**Architecture**
Number of students	1640	1234
Number of degree programs	5	8
Number of pro-deans	1	1
Number of deans of students	2	1
Number of deans of research	-	-
Number of positions for academia professionals	32	12
University of Regensburg	**Philology, Literary Studies, Cultural Science**	**Mathematics**
Number of students	3877	239
Number of degree programs	39	3
Number of pro-deans	1	1
Number of deans of students	1	1
Number of deans of research	1	1
Number of positions for academia professionals	4	5
University of Passau	**Philosophy**	**Informatics and Mathematics**
Number of students	5783	469

Number of degree programs	24	4
Number of pro-deans	1	1
Number of deans of students	1	1
Number of deans of research	-	-
Number of positions for academia professionals	5	3

Source: own research.

5. Conclusion

The results of the empiric inquiry of framework requirements and deanery attributes show that by trend the infrastructure of the faculties as decentral units depends less on the size of the faculty, but very strong on the organizational setting of the university.

Especially at the LMU with the largest offer of study courses and the largest amount of students but not maximum positions for academia professionals, the divergency between framework requirements and deanery attributes is striking.

These investigations pose the question, if design recommendations can be given according to an ideal deanery-situation-fit. The organizational attributes of deaneries should be optimally harmonized to allow a better deanery-situation-fit. Maximum framework requirements of university and faculty should determine a maximum amount of positions for academia professionals, so that they lead to organizational success.

There is no fit at Bavarian universities so far. The contingency approach says that the TUM with maximum deanery attributes must have the best organizational success, which means to fulfill the core processes better than LMU, because here is a bigger fit.

Do organizations design the best structures by themselves? Or is it possible that the predominant typologies do not optimally fit to the environmental requirements? Align universities themselves accordingly to their specific situation up to their core processes? Or has the assimilation process only points of contact to the administrative frontage? Is a more effective and efficient university possible by using an adequate organizational design?

It has to be investigated if universities can better adapt themselves to their environment by an adequate organizational design and fulfill their state as an actor in a better way.

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DELAROSE: A Case Example of the Value of Embedded Course Content and Assessment in the Workplace

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Abstract

In recent years there has been a significant growth in online learning and the delivery of joint programmes of education involving collaborative partnerships between higher education institutions in different jurisdictions. This paper details a case-study of the pilot delivery and assessment of a new online learning programme 'Certificate in the Management of Work-Related Stress'. This programme was developed as part of an innovative partnership between four European Higher Education Institutions (HEIs) located in Austria, Ireland, Switzerland and the United Kingdom to develop and deliver an accredited online learning programme, as part of a wider EU funded project called DELAROSE, on the management of work-related stress for workers in the health and social care sector across Europe. It describes the nature of the online course, with particular attention given to, the assessment activities undertaken by learners throughout the course, and the collection and analysis of learner feedback as this relates to feasibility and impact of the programme of learning. This case-study highlights the positive benefits to learners of embedding course content and assessment experiences within a real-life workplace context.

Keywords: *Work-based learning, embedded assessment, innovation, collaboration.*

1. Introduction

The DELAROSE project brought together three European HEI's - Waterford Institute of Technology in Ireland, University of Graz in Austria and the University of Applied Sciences and Arts of Southern Switzerland - in a collaborative partnership to develop and deliver an accredited online learning programme: the 'Certificate in the Management of Work-Related Stress'. This programme was delivered in pilot form to a sample of learners from the health and social care sector by these three HEIs in the English, German and Italian languages respectively. A fourth HEI, King's College London in the UK, collaborated in the development of the course material but at present does not deliver the programme to learners.

The DELAROSE project derived from the findings of a previous project, ROSE, which explored work related stress across Europe in the health and social care sector (Wells, Denny, & Cunningham, 2011; Ridge et al., 2011). Stress at work is a considerable public health challenge across Europe (European Commission, 2011), with nearly 80% of managers in Europe concerned about stress in their workplace (ESENER Survey, EASHW 2010). A recent EU Framework Directive 89/391 now places a legal obligation on employers to protect workers by anticipating, evaluating and combating health and safety risks in the workplace. Furthermore, several other policy initiatives such as the 2008 European Pact for Mental Health and Well-being encourage employers to promote positive mental well-being in the workplace. However, the impact of these measures appears to be limited. For example, less than 30% of European workplaces currently have procedures in place to combat occupational stress, while 42% of managers' report dealing with psycho-social risks to be more challenging than other risks in the work-place (EASHW, 2010).

Health and social care have consistently been ranked as amongst some of the most stressful fields in which to work (Wells, 2011). Those working in these fields experience the highest rates of work-related anxiety, stress and depression in any field (Health and Safety Executive, 2014). Recent trends in the health and social care sector in Ireland, such as an employment moratorium, salary cuts and increased working hours have contributed an increasingly stressful and demanding work environment and a high level of staff turnover (Wells & White, 2014).

The following paper presents a case-study of the delivery and assessment of the pilot online learning programme 'Certificate in the Management of Work-Related Stress'. It describes the nature of the online course, with particular attention given to the development of the assessment activities undertaken by learners throughout the course and the collection and analysis of learner feedback as this relates to feasibility and impact of the programme of learning. This case-study highlights the positive deep learning impact that can be made

upon learners by locating their assessment experience within a real-life context that is relevant to their day to day experience.

2. 'Certificate in the Management of Work-Related Stress'

The DELAROSE online learning programme was piloted with a small sample of learners from the health and social care sector between June and September 2015. A total of 15 learners completed the pilot of the DELAROSE online learning programme across the three partner institutions. 7 learners completed the programme with WIT, while 3 learners completed the programme with SUPSI and 5 with the University of Graz.

The content of the programme consisted of Units of Learning Outcomes divided across two modules. Each module was worth ten ECTS credits. The first module, Person-Centred Management of Work-Related Stress, aimed to equip learners with the requisite skills, knowledge and competences to manage their own personal levels of work-related stress; while the second module, Environment-Centred Management of Work-Related Stress, was tailored towards helping learners create an ergonomically less-stressful working environment.

The course was hosted on a Moodle platform and delivered entirely asynchronously. As such, upon registration, learners were provided with access to a series of interactive slide presentations, additional support material and a link to submit their completed assessment activities. Learners also had access to a dedicated tutor and weekly skype meetings should they require additional synchronous learning support. The programme was underpinned by a philosophy of learner-centredness. As such, asynchronous nature of the programme meant that learners could progress through the programme at their own pace and submit their assessments as and when they completed them.

A specific pedagogical approach - Multiple Intelligence Teaching Approaches (MITA) – was integrated into the programme design to address different learner abilities and intellectual dispositions (Denny et al., 2008). The approach encompasses a wide variety of teaching strategies which were integrated into both the learning material presentation and the learning activities. For example, inter and intra personal skills were targeted by encouraging learners to reflect on and evaluate the impact of the programme content on their personal circumstances and discuss this with others in the workplace, while visual-spatial skills were targeted through visual presentations, graphs, mind-mapping and visualisation. Utilising MITA as the pedagogical framework was particularly suited to a

European context as it takes account of both individual and cultural learning differences to achieve a shared outcome (Weber, 2005). The MITA approach facilitated the concurrent assessment of several work based competences through problem-based work integrated activity.

3. Programme Assessment

Achievement of the programme learning outcomes was assessed through the submission of a series of work-based activities contained within a personal portfolio of achievement. These activities were completed incrementally as the learner progressed through each Unit of Learning Outcomes and could be submitted at any time following course registration up until the closing date.

This approach, building upon learners previous experiences, engaged them in a series of tasks and activities associated with the units of learning. Learners were encouraged to reflect upon what they had learned, with reference to their own previous experiences. In this context, learners were required to submit evidence that they had carried out specific tasks or activities within their workplace, and reflect upon the suitability, sustainability and impact of these tasks on both their personal levels of work-related stress and the level of ergonomic stress within their own workplace.

For example, as part of the Unit of Learning 'The Organisation and Stress' learners were required to complete the 'Ten Category' assessment framework to evaluate the extent to which the organisational structures and policies contributed to work-related stress. Engaging with this assessment framework enabled learners to demonstrate that they had achieved several key specified learning outcomes within their own real-world context, relating to Knowledge: e.g., 'Knowledge of a framework to identify causes of stress at your workplace; Skills: e.g., 'Application of the 'Ten Category Framework'; and Competences: e.g., 'Identify the different categories of stress in your workplace'. Similarly, as part of the Unit of Learning 'Learning How to Relax', learners were required to complete and submit a log of their experiences of trialling series of relaxation exercises. The completion of this activity log enabled learners to demonstrate that had achieved the requisite learning outcomes for the Unit as these relate to Knowledge: e.g., ' Identify different relaxation methods'; Skills: e.g., 'Be able to use guided relaxation', and Competences: e.g., 'Adapt relaxation techniques to be utilised in the workplace'.

4. Learner Feedback

Feedback relating to the perceived quality and utility of the DELAROSE programme was collected from all 15 learners. This feedback was provided both quantitatively (through the completion of pre and post course questionnaires) and qualitatively (through the submission of written responses to a series of open-ended questions).

4.1 Quantitative Measures

All learners completed questionnaires before commencing the online learning programme (T1) and after they had completed the programme (T2). The first questionnaire included measures to ascertain participants' knowledge and confidence in managing their own stress in the workplace and other people's' stress. The second questionnaire included these measures plus additional measures to ascertain the degree to which people found the different modules helpful in increasing their knowledge of these areas of stress management, and the degree to which they had implemented their knowledge in the workplace; as well as the degree to which they found the programme to be a useful and worthwhile learning experience.

4.2 Qualitative Insights

Learners were also asked to submit written feedback upon completion of the pilot course. This feedback was submitted electronically by the learners, and guided by the following statements:

1. Please tell us about the positive aspects of the course
2. Please tell us about the aspects of the course you thought could be improved
3. If you have found the course to be useful, please describe how you have used the knowledge you have gained in the course, in your workplace

5. Results

The quantitative data overall revealed a high degree of satisfaction. For example, there were significant increases in learner's knowledge ($p=.022$) and in their in confidence in managing other people's workplace stress ($p<0.001$).

Table 1. Impact of Pilot Programme of Learner Knowledge and Confidence

Measure	Mean before pilot (SD)	Mean after pilot (SD)	t	P value	95% CI
Knowledge	8.1 (1.0)	8.7 (1.0)	-2.59	.022	-1.2 to – 0.1
Confidence in managing own workplace stress	5.6 (1.1)	5.8 (0.9)	-1.00	.334	-.6 to 0.2
Confidence in managing others' workplace stress	4.6 (1.0)	5.8 (0.9)	-6.00	.000	-1.6 to -0.8

5.1 Satisfaction with the Course

Content & Format of Course

86.7% of participants reported satisfaction with the course (n= 13), rating it >=5 on a scale of 1 to 7. The lowest rating of satisfaction was a score of 4 as rated by 2 participants.

93.3% of participants agreed that they found the course helpful for learning techniques to manage their own stress (n=14). The lowest rating of agreement with the utility of this aspect of the course was 4, as rated by 1 participant (also on a scale of 1 to 7).

5.2 Qualitative Feedback

Learners identified several positive aspects of the course. In particular, increased self-awareness of stress, both in terms of the nature of stress and its impact; flexibility and ease of access, and the comprehensive range of information provided were identified as key positive aspects of the course.

> *"Interesting content for a wide range of professionals; to learn more about the influences of stress"*
>
> *"Perfect prepared course material and comprehensive tasks"*
>
> *"Learning material helpful and easy to understand"*

Learners also identified aspects of the learning programme which could be improved. These related to timeframe of course completion (e.g. a loosely structured "guide" timeframe for completion of the different aspects of the course may be helpful), a reorganisation of course material and changes in format with regard to feedback:

> *"More interaction/discussion with students"*

> *"To provide learning material in a different way, with Powerpoint slides and additional learning material in one file and more graphically with more pictures and graphs."*
>
> *"Feedback after completing tasks would be helpful and motivating - to know what needs to be improved."*

In addition to this, we requested learner feedback as this relates to the application of knowledge for managing the learners personal levels of stress in the workplace stress, and in creating a less stress working environment.

With regard to the application to self, learners identified various positive personal benefits, including a deeper understanding of leadership styles within the workplace and the importance of accurate and effective appraisal of stressors:

> *"The person-centred modules provided me with more reflective opportunity and.... gave me an insight into, for example, management/leadership styles and I am now more aware of this and can see it in myself, my peers and management. I feel it has helped manage situations better when dealing with people, opened my eyes in a away"*
>
> *"Owning stress and taking responsibility for it; able to stand back, analyse and respond more effectively."*
>
> *"Become more proactive in managing stress, identifying triggers and putting action into place"*

With regard to the application to others, learners highlighted improved communication with colleagues and the sharing of coping techniques**:**

> *"Encouraging staff teams to address stress in a supportive and open manner"*
>
> *"Discussion with colleagues and proposing the use of relaxation exercises to reduce stress"*
>
> *"Ergonomics - more aware of them and encouraging others to use good ergonomic practice."*
>
> *"Staff member appeared very withdrawn and under pressure, due to take leave and requested at late notice to add an additional 2 days to end of their leave.*

> *Normally not permitted. Aspects of stress and effects was at forefront of mind, so took decision to grant additional leave and worked around this with other staff"*
>
> *"In our organisation, we have improved our communication to staff with memo's, staff updates and meetings frequency increased."*

Conclusion

The results from the student feedback would suggest that learners greatly benefitted from the location of assessment activity within their own day to day working context. This made assessment more relevant to them and also impacted upon their own sense of achievement beyond the theoretical. It is interesting to note that where they critique the programme this related more to a desire for more structured guidance on when to submit assignments and greater interactivity with other learners. As a consequence the course has been adjusted to incorporate this critique for change.

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Peer review and critical thinking in nursing students

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Abstract

Different models are available to help engage and motivate students as well as to model professional thinking and action. Their effect increases when regularly used, particularly when supplemented with feedback. Among them, the Paul-Elder´s Elements of Thought, or the Ennis´s FRISCO guidelines may be used for develop clinical skills. The objective of this study is describe the effect of educational intervention on critical thinking, in nursing students of the 2nd year, based on the peer review, using the Cornell test (Level X) before and after the activity. Of the 74 students who participated in the study, 75.7% were female with an average age of 20.8 years. The average scores of critical thinking before intervention was 21.3 and after was 28.5, the average was statistically significant different between the two time points (p <0.01).

Keywords: *Critical thinking, Cornell test, nursing student.*

1. Introduction

Critical thinking is one of the basic skills in clinical reasoning process in health (CrosKerry, 2012), and therefore essential to its development in the nursing students during the academic course (Facione & Facione, 2008). It considers that competent nurses based on their professional activity in philosophy and thinking, rooted in concepts of critical thinking. In an attempt to define critical thinking, we find different approaches, from which we highlight two: a first focused on activities associated with critical thinking, and other skills or sub-competencies associated with this construct. Critical thinking is multidimensional, covering the cognitive (logical, rational), psychology (self-awareness, empathy), sociological (in terms of socio-historical context), ethics (standards and moral evaluation) and philosophical (meaning of human nature and life) (Paul, Elder & Bartell, 1997).

Critical thinking is defined as the intellectually disciplined process of actively and skilfully conceptualizing, applying, analysing, synthesizing, in which the individuals develop the following characteristics: open to new ideas, flexible, willing to change, innovative, creative, analytical, communicators, assertive, observant, intuitive (Elder and Paul 2008; Ignatavicius, 2001).

Critical thinking in nursing is directed to clinical decision-making corresponding to the ability to think in a systematic and logical manner, open to the questioning of the thought process. This way of thinking, rigorous, rational, critical, based on scientific evidence, it is fundamental to nursing care. The studies emphasize the need for greater investment in promoting development strategies and evaluation of critical thinking, both in academic training as a professional (Amorim & Silva, 2014). The practice of nursing is developing gradually of a paradigm based on experience for reflective and analytical practice that has allowed the affirmation of autonomous intervention of the profession and the development of a body of knowledge itself of the nursing discipline. Because its object is the care, recognizes the interdisciplinary responses to the needs of people in health care.

2. Objectives

This study aims to describe the effect of educational intervention on critical thinking, in nursing students of the 2nd year, based on the peer review, using the Cornell test (Level X) before and after the activity.

3. Methods

This is a quantitative study, longitudinal and of the 84 students of Nursing Degree attending the subject Introduction to Health Research, 74 agreed to participate in the study. All students were invited to participate, after explaining the objectives of the study, after obtaining informed consent.

Different activities were developed between the two moments of data collection. A training activity at the beginning of the intervention through which we intend to sensitize students to the importance of peer review and feedback to improve learning. The intervention consists of peer review, in which groups of four students were authors and reviewers of a scientific paper, using the strategy of a cycle author/reviewer to develop written communication skills and critical thinking, according to the taxonomy proposed by Ennis (1985, 1987).

The FRISCO guidelines were developed by Ennis (1996) as standard criteria to support the critical thinking process, providing guidance for structured reasoning and problem analysis; it is used also for fostering individual's learning abilities under structured pedagogical situations (Dominguez et al., 2014). The acronym stands for Focus, Reasons, Inferences, Situation, Clarity and Overview.

The Cornell Critical Thinking Test (Level X) is based on critical thinking design defined by Ennis (1985). The Portuguese version of Cornell Test Critical Thinking (Level X) was apllied (Oliveira, 1992; Tenreiro-Vieira, 1994; Vieira, 1995, as cited in Tenreiro-Vieira, 2004). The test consists of 76 items and measures different aspects of critical thinking as: induction; credibility; deduction and identification of assumptions. This test was applied before the intervention student author – reviewer (moment 1). Once completed the tasks of student author – reviewer, the Cornell test (Level X), was again applied (moment 2), in order to check whether there was any change in developing some skills of critical thinking. Higher score after the process represents an increase of the level of critical thinking.

The activity was supported by an online environment (Google Drive), to provide the scientific paper, a template to write the work and a document that guide the students. The strategy reviewer/author of the paper as shown in Figure 1.

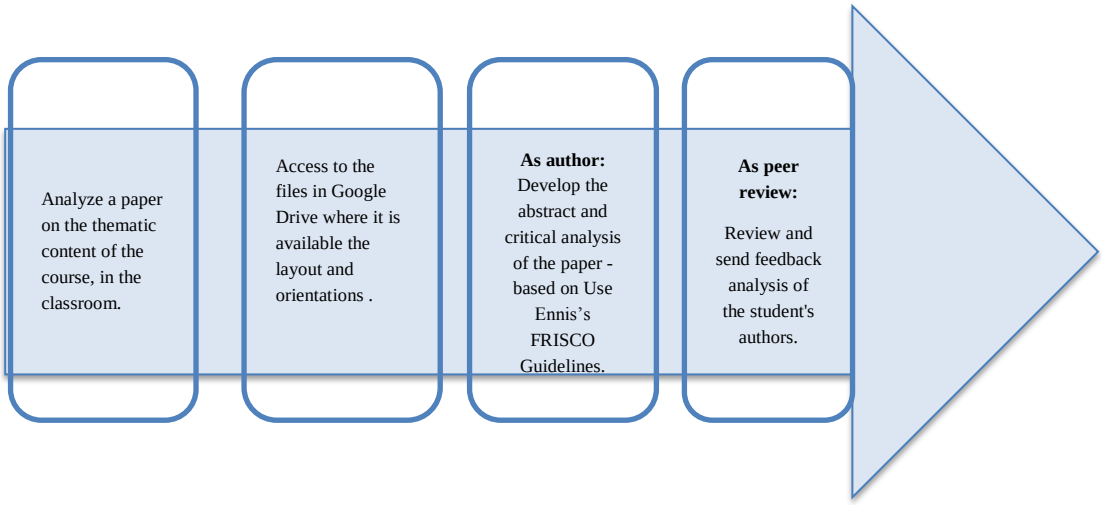

Figure1. Scheme of tasks to be performed by student author – reviewer**.** *Source: Adapted from – Payan-Carreira, Dominguez and Nascimento, 2014.*

The work took place anonymously, not being revealed the author and reviewer groups; the wording of the text was not rigid, depending on personal preferences and styles; It was recommended bettween 500 e 1500 words.

For the statistical analysis we used the Statistical Package for Social Sciences (SPSS) version 22. We used descriptive statistics to characterize the group of students and effect evaluation of the intervention was based on the model proposed by Cohen (1992) for determining the magnitude of impact in groups of students, through Effect Size d Cohen test.

4. Results

Of the 74 students who participated in the study, 75.7% were female, and the average of age was 20.8 years. The average scores of critical thinking before intervention was 21.3 and after was 28.5, the average was statistically significant different between the two time points ($p < 0.01$).

Cornell test results show that on average each competency of critical thinking, increases the momento1 for the moment 2 (after intervention), as shown in table 1.

Table 1. Means in the two moments (Cornell Test X)

Variable	Mean (moment 1)	Mean (moment 2)
Induction	8,622	9,432
Deduction	7,034	11,676
Credibility	5,804	7,196
Identification of Assumptions	1,041	3,8378
Total Score	21,304	28,493

However only the statistically significant differences ($p < 0.01$) were observed in relation to the size deduction (dCohen 0.95) and identification of assumptions (dCohen 1.16). The effect size is great for these two dimensions. The Percentile Gain for deduction is 33 and for identification of assumptions is 38. The effect size indicates to what extent it was found or not the acquisition of critical thinking skills, in students sample.

5. Conclusions

The results obtained in the Cornell test, before and after the intervention student author - reviewer, in order to determine the effect on the level of critical thinking of nursing students revealed an increase in critical thinking skills when it comes to dimensions, deduction and identification of assumptions. Regarding the induction and credibility dimensions, although the results were positive, the averages were not statistically different, by suggesting the continuity of the study, replicating it in other student groups and possibly using other pedagogical strategies.

The peer review strategy is described in the literature as important to nursing, because facilitate and promote active learning, help clinical problem solving, and encourage the development of critical thinking skills. n the future "Nurses must think critically to provide effective care whilst coping with the expansion in role associated with the complexities of current health care systems" (Simpson and Courtney , 2002, p.89).

The results lead us to suggest that the anonymous peer review (author - reviewer) was welcomed by the students, analysis of the article led to the development of analytical capacity and promoted the exchange of views and joint progress in the presentation and

defence of different perspectives on an epidemiological study, verifying a positive development especially in regard to the deduction of dimensions and assumptions.

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Critical thinking in college students: evaluation of their beliefs in popular psychological myths

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Abstract

The purpose of this study was to evaluate the degree of acceptance of psychological myths in undergraduate students in Health Sciences. Our results showed that first-year Psychology students believed more myths than did the other first-year Health Sciences students (Medicine, Dentistry, and Optics and Optometry). Third-year Psychology students drastically reduced their beliefs in myths in comparison with first-year Psychology students (Cohen's d=1.7). Overall, we found a gender effect, being women less gullible than men in believing in myths. Age did not account for differences in myth acceptance. All in all, these results suggest that beginning Psychology students seem to accept more myths than other first-year Health Sciences students regarding psychological misconceptions. However, college exposure in Psychology students may favor critical thinking by diminishing myth beliefs.

Keywords: *Critical thinking, psychological myths, college students*

1. Introduction

College students often arrive at their first introductory Psychology course with plenty of misconceptions and lack of critical thinking concerning the human mind (Lilienfeld et al, 2011). After all, the media and Internet at times present psychological information in an inaccurate and confusing way (Furnham & Hughes, 2004), leading into widespread beliefs held contrary to known evidence, i.e., myths (Taylor & Kowalski, 2004).
In this study, we set out to investigate whether the degree of acceptance of psychological myths varies in undergraduates students in Health Sciences, while controlling for possible confounding variables (gender and age). We also explored the resistance to modify psychological misconceptions by comparing first- and third-year Psychology students.

2. Methods and Results

2.1. Methods

One hundred and fourteen first-year undergraduate students in Medicine (n=56), Dentistry (n=50), and Optics and Optometry (n=8) students at European University of Madrid were employed as volunteer subjects, chosen on the basis that they were taking at least one Introduction to Psychology course. An extra sample of forty-seven psychology majors was used, first- (n=35) and third-year (n=12) students. Our data consisted of 30.8% men and 69.2% women, ranged in age from 17 to 28.
We chose a wide range of myths from all areas of psychology that are usually propagated in pop psychology but still present in the world of education in general. For this purpose, we adapted the questionnaire by Kowalski & Taylor (2009) by employing a 7-point rating scale ranged from (1) strongly disagree to (7) strongly agree (see Table 1).
Statistics tests such as Pearson correlation, student t-test and ANOVA were performed when appropriated with the statistical program SPSS (version 20).

Table 1. Items of the questionnaire (note that we eliminated items #21 and #35 in our statistitical analysis for not being psychology myths in the original test)

1. If you're unsure of your answer while taking a test, it's best to stick with your initial hunch.
2. There are striking stylistic differences between the two hemispheres of the brain, with the left being "analytic" and the right "holistic."
3. Most people use only 10% of their brains.
4. Most "crack babies" end up with serious neurological deficits.
5. Subliminal messages can be used to persuade others to purchase products.
6. Taste areas for sweet, sour, salty and bitter are well defined on the tongue.
7. ESP (extrasensory perception) has been empirically documented.
8. During "out of body" experiences, individuals can observe themselves from above.
9. Drug education programs (i.e., DARE) are effective in deterring drug use among teenagers.
10. Individuals can learn information (e.g., new languages) while asleep.
11. During sleep, your brain rests.
12. Most people who use heroin become addicted to it.
13. Human memory works like a tape recorder or video camera, and accurately records the events we have experienced.
14. Eyewitness testimony is usually reliable.
15. Many adults were abused as children but do not remember the abuse.
16. Hypnosis is useful for retrieving memories of forgotten events.

17. In criminal eyewitnesses, confidence is closely related to accuracy.
18. Playing classical music (e.g., Mozart) to infants and children increases their intelligence.
19. Too much sugar causes hyperactivity in children.
20. Babies who learned sign language as infants have a higher overall IQ.
21. Immediate contact between a mother and infant after birth is critical for bonding.
22. You can "spoil" a baby if you respond to its demands too quickly.
23. A baby's attachment for its mother is based on mom's filling the physiological need for food.
24. If you live long enough, you will eventually develop dementia.
25. The defining feature of dyslexia is seeing words backwards (e.g., "pal" instead of "lap").
26. The polygraph ("lie detector") test is a highly accurate means of detecting dishonesty.
27. It is generally better to express anger openly than to hold it in.
28. Most women experience a marked worsening of their moods during the premenstrual period.
29. Raising children similarly leads to similarities in their adult personalities.
30. High self-esteem is necessary for high achievement.
31. Astrologers can predict your personality from the arrangement of stars and planets at your birth.
32. People's responses to inkblots tell us a great deal about their personalities and propensities toward mental disorders.
33. People diagnosed with schizophrenia have a split personality.
34. People who attempt to commit suicide do not talk about it.
35. We experience stress even when good things happen to us.
36. "Psychological profiling" has been shown to be an effective means of identifying criminals.
37. The suicide rate is higher among the elderly than among adolescents.
38. A large proportion of criminals are acquitted on the basis of the insanity defense.
39. Clinical judgment and intuition are the best means of combining information to reach a diagnosis for a patient.
40. A well-trained psychotherapist can establish a person's true thoughts and problems by analyzing dreams.
41. All effective psychotherapies force individuals to confront the "root" causes of their problems in childhood.
42. Electroconvulsive ("shock") therapy is a physically dangerous treatment.
43. Opposites attract: People tend to have relationships with individuals who differ from them in their personality, interests, and attitudes.
44. There's safety in numbers: The more people present at an emergency, the greater the chance that someone will intervene.
45. Women talk more than men ("Men are from Mars, women are from Venus").

2.2. Results

In general, our students demonstrated a high number of erroneous beliefs about psychology (Grand mean=4.58 out of 7), irrespective of their studies. However, as can be seen in Figure 1, first-year Psychology students (Total test score=220.57 out of 301) believed more myths than did the other first-year Health Sciences students (Medicine: 199.25; Dentistry: 191.60; Optics and Optometry: 191.00). Indeed, the ANOVA analysis showed that the groups differed in their mean ($F=11.919$, $p<0.001$) and that Psychology students differed significatively from any other group of students (Bonferroni post-hoc analysis, $p<0.001$). No significant differences were found between the rest of degrees, excluding Psychology ($p=NS$).

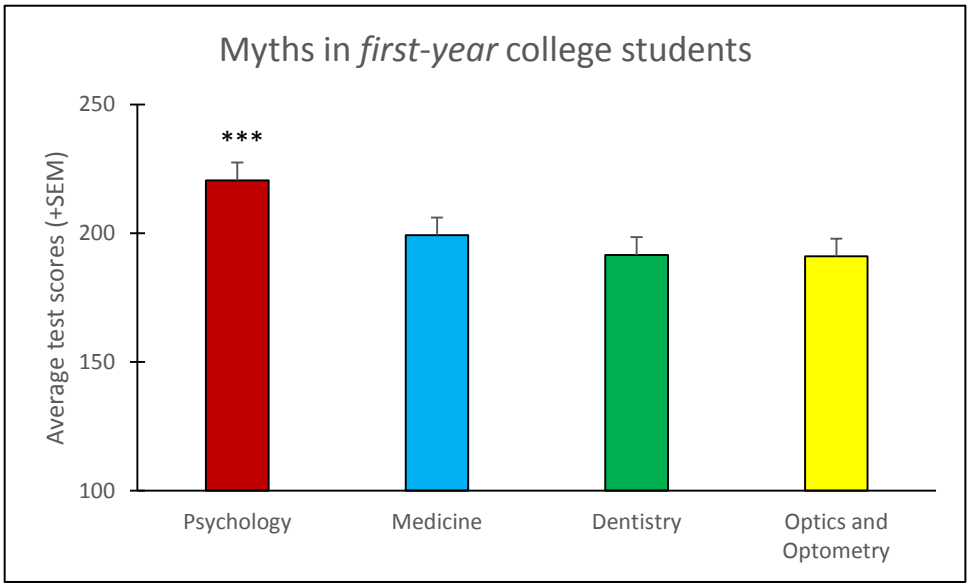

*Figure 1. Believed myths in first-year college students (in average test scores). Psychology undergraduate students show significantly more beliefs in psychological myths than the other degrees (Medicine, Dentistry, as well as Optics and Optometry). No significant differences were found between the rest of degrees, excluding Psychology. *** p<0.001 (Psychology vs. any other degree)*

As can be seen in Figure 2, Psychology undergraduate students in their first year show significantly more beliefs in psychological myths than in their third year (t=4.68, *p<0.001*). Cohen's d=1.7 indicated a strong effect size.

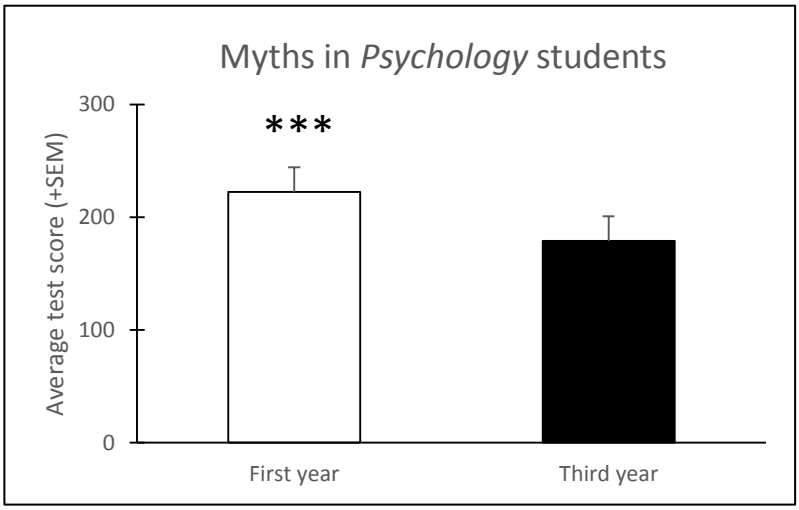

*Figure 2. Believed myths in Psychology college students (in average test scores). Psychology undergraduate students in their first year show significantly more beliefs in psychological myths than in their third year. *** p<0.001 (First-year vs. Third-year)*

Our results also showed that male Psychology undergraduate students show significantly more beliefs in psychological myths than females (t=2.56, $p<0.05$).

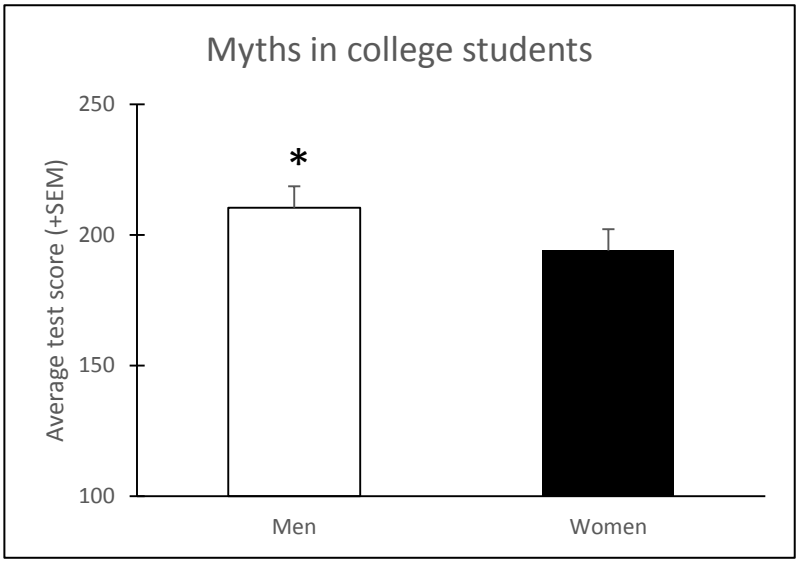

*Figure 3. Believed myths in men and women college students (in average test scores). Male Psychology undergraduate students show significantly more beliefs in psychological myths than females. * p<0.05 (Men vs. women).*

Age, a potential confounding variable, was not related to myth acceptance, as demonstrated by a non-significant Pearson correlation analysis between the two variables (r=0.03, p=NS). In table 2, we present the most common (top 3) and less common (bottom 3) myths grouped by studies. Interestingly, the most common (myth #12) and less common (myth #31) were, respectively, "Most people who use heroin become addicted to it" and "Astrologers can predict your personality from the arrangement of stars and planets at your birth".

Table 2. More common (top 3) and less common (bottom 3) myths in college students. The most common (myth #12) and less common (myth #31) were, respectively, "Most people who use heroin become addicted to it" and "Astrologers can predict your personality from the arrangement of stars and planets at your birth".

	Psychology (first year)		Psychology (third year)		Medicine		Dentistry		Optics and Optometry	
	Myth #	Mean	Myth #	Mean	Myth #	Mean	Myth #	Mean	Myth #	Mean
Top 3	12	6.63	12	6.45	12	6.39	12	6.14	4	6.13
	5	6.49	42	6.18	5	6.09	5	5.64	12	5.88
	16	6.18	4	6.09	6	5.89	6	5.56	34	5.75
Bottom 3	14	3.80	43	2.91	15	3.55	15	3.26	18	3.00
	37	3.77	11	2.09	37	3.36	37	2.68	15	2.88
	31	3.40	31	1.55	31	1.77	31	2.42	31	2.13

3. Conclusions

Our results revealed the existence of an alarmingly widespread high number of erroneous beliefs held by undergraduate Health Sciences students about psychology, irrespective of their particular studies; however, first-year Psychology students believed significatively more myths than did the other first-year Health Sciences students (Medicine, Dentistry, and Optics and Optometry). In this sense, beginning psychology students may be more prone to these erroneous beliefs than their counterparts due to an increased interest in psychological topics leading to an overexposure of psychological misconceptions on the media, Internet, popular psychology industry, self-help books, etc (Lilienfeld, 2005). Unfortunately, some of these students may still lack the fundamental knowledge for critical thinking thaught at university-level courses.

Third-year Psychology students drastically reduced their beliefs in myths in comparison with first-year Psychology students (Cohen's d=1.7). Although evidence for resistence to changes in psychological misconceptions may be strong (e.g., see Lokke & Lokke, 2010), our encouraging finding is in agreement with Standing & Huber (2003) in that the number of student misconceptions may, in part, reflect differences in the number of psychology courses taken, especially related to psychological methodologies.

Overall, we found a gender effect, being men more gullible than women into believing in myths. However, it should be kept in mind that the majority of undergraduates in health science programs are women. Furthermore, age did not account for differences in myth acceptance. All in all, these results suggest that beginning Psychology students seem to be

in greater need of developing critical thinking skills than other first-year Health Sciences students regarding psychological misconceptions. Accordingly, college exposure in Psychology students may favor critical thinking by diminishing myth beliefs.

Importantly, undergradute students should evaluate claims in such a way that explicitly integrates basic principals of critical thinking (Lawson, 1999). Interestingly, critical thinking could be incorporated into undergraduate courses in multiple ways from problem-based learning activities to solid understanding of research methods and tasks intented to "hunt" for myths. As the influential philosopher of science Karl Popper (1963) once wrote, "science must begin with myths, and with the criticism of myths."

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Video-based focus group for chemistry knowledge construction by secondary preservice teachers

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Abstract

The present work analyzes the relavance of using video for promoting reflection about chemical contents and their learning, in the context of the Spanish Master's in Secondary Education. The used video clips were edited from the recordings of two cooperative groups of Master's students who were solving an open-ended problem about chemistry. This problem was stated as follows: «What might happen when two substances are placed into contact with each other?» These clips contained some alternative conceptions in chemistry, together with some theoretical and practical difficulties arisen in the solving process. Later, the video was shown in the framework of a focus group, where a free debate between the participants was stimulated. The transcriptions of this session gave rise to a group of categories of analysis related to different stages of problem resolution, and emotional aspects as well. These results make us conclude that using video is an appropriate way of promoting learning about physical and chemical changes through cognitive conflict. Moreover, the necessity of considering emotional, individual and group aspects in conceptual change is supported.

Keywords: *Video; focus group; problem-based learning (PBL); initial teacher training; alternative conceptions in chemistry; cognitive conflict.*

1. Introduction and theoretical framework

Nowadays there is a general consensus about the convenience of using *problem-based learning* methodologies (PBL) for overcoming the problem of lack of motivation in the subject of science, and promoting the students' reasoning skills (Abd-El-Khalick *et al.*, 2004). This method has its origin in medical education programs in Canada in the 1970's (Savery, 2006). From then on, its use has been extended to other university studies and, in particular, to the educational ones (Hmelo-Silver, 2012). However, its application to other education levels has been less frequent, probably because of the difficulties which arise when implementing this methodology. In this sense, the main challenge is related to the revision of the traditional roles of both teachers and students in the learning process (the teacher acts as a guide and the students must be responsible for their own learning, defining by themselves what they need to know to solve complex problems) (Prince & Felder, 2007). In order to overcome these issues, we believe that PBL methods should form an active part of teacher training programs, in order to favour a necessary update of scientific education. As such, 'explaining' the characteristics of these methodologies is not enough, but the training programs should provide science learning experiences through PBL methods.

Our 'PBL-choice' for the Spanish Master's in Secondary Education (MSE) –a requirement for working as a teacher in these levels– is the *Methodology of Problem-Solving as an Investigation* (MPSI), which is one of the main research lines of our group. Our previous studies about the MPSI gave us very good results in terms of the conceptual and procedural change of students (Ibáñez & Martínez, 2005; Pavón & Martínez, 2014), and showed the effectiveness of the method for increasing students' motivation in different contexts (Pavón & Martínez, 2014).

The MPSI has five stages which resemble the ways of working of a novice researcher in a research team, in accordance with the *scientific competencies* of the educational curricula. These stages, which should be understood as s cyclical process, are explained in Table 1. One of the essential features of the MPSI (shared by all PBL methods) is that it is a student-centered approach, since they have to regulate their knowledge construction (Pecore, 2013) by working in cooperative groups (English & Kitsantas, 2013). For these reasons, we believe that using *video* with the intention of stimulating reflection about the students' problem-solving processes (either by themselves or by other students) can be a very beneficial tool. As such, it could help to promote conceptual knowledge construction through conflicts arisen from the interactions between students –where emotional aspects are relevant– (Pintrich *et al.*, 1993).

Table 1. Stages and characteristics of the Methodology of Problem-Solving as an Investigation (MPSI).

Competence Dimension (CD) / Stage	Some tasks implied in the stage
CD1: Qualitative analysis	Understanding and representation of the problem Reformulation of the problem (operative terms) / Restrictions
CD2: Formulation of hypotheses	Formulation of conjectures to guide the problem-solving
CD3: Design of resolution strategies	Variable identification and control / Magnitudes, materials… Decision-making for the resolution
CD4: Resolution of the problem	Carrying out the designs Description of the process, observations, data… / Getting results
CD5: Analysis of results	Obtaining regularities Reference to hypotheses and theoretical framework

2. Objective

The research question that guided this follow-up study was:

«¿Does the reflection arisen from a focus group with the projection of a video –where future teachers reveal some alternative conceptions– favour their chemistry knowledge construction?»

3. Development of the reseach

This descriptive and qualitative case study considers *video* as a tool for promoting reflection and conceptual change in chemistry.

The research took place in the *Chemistry Education* subject of the Master's in Secondary Education (MSE), corresponding to its 'physics and chemistry' specialization (school year 2013/14, Universidad Complutense de Madrid). In this subject, the students had to solve a series of professional problems such as content selection, design and implementation of learning activities and assessment of the educational process (Martínez *et al.*, 2013). Concerning the analysis of the different kinds of learning activities, the MSE students were introduced to the MPSI –the previously described PBL methodology– (Ibáñez & Martínez, 2005). With the goal of promoting a later use of the MPSI in secondary schools, the chemistry education subject provided learning opportunities through this methodology, and MSE students were asked to solve a proposed sequence of school chemistry open-ended

problems, working in heterogeneous cooperative groups. In that way, future teachers could personally experience how learning through the MPSI takes place.

In this paper, we will consider the following experimental problem: *'What might happen when two substances are placed into contact with each other?'* The problem deals with a fundamental content of secondary school chemistry, which is the distinction between physical and chemical changes. In order to develop the focus-group activity analyzed in Section 4, the problem-solving processes of two independent cooperative groups were recorded on video and audio, and latter transcribed. Then, a series of video segments about their resolution were selected and edited, considering both groups in an equitable way. The consensus of the two researchers was required for this edition process.

Finally, these video clips were shown to the implied MSE students, with the intention of promoting their reflection and knowledge construction (Martin & Siry, 2012) –and from a research perspective, in order to test the usefulness of the clips–. The characteristics of the members of the two cooperative groups who took place in the activity are shown in Table 2 (description of the *sample*).

Table 2. Characteristics of the study sample. The cooperative groups require at least one chemistry graduate and one physics graduate.

Group	Student	Gender	Age	Initial studies
Group 1	S1	Female	24	Chemistry graduate
	S2	Male	26	Physics graduate
	S3	Male	35	Engineer
Group 2	S4	Male	29	Engineer
	S5	Female	30	Physics graduate
	S6	Male	23	Chemistry graduate

3.1. Video segment considered for the present study

In this paper we will focus on the future teachers' debate arisen from the view of 1 of the 9 video clips which were prepared for a focus group. In particular, the clip chosen for this article showed how the MSE students from the two groups expressed some alternative conceptions related to physical and chemical changes during the problem-solving. These alternative conceptions were the following ones: identifying distillation as a chemical change; considering that chemical substances react 'atom by atom', talking about 'physical reactions'; and considering the possibility of reverting a complete chemical reaction. The total length of time of the segment was about 1 minute.

3.2. Video-based focus group

The previously mentioned video watching session was organized in the framework of a focus group, where the 6 students of Table 2 participated together. The *focus group* is a qualitative technique (set in the context of group interviews) which allows for knowing in depth the participants' reflections about the debated issue. As such, it has an advantage over other techniques, meaning that their opinions are not limited by the researchers' previous conceptions (Stewart *et al.*, 2006).

The focus-group session had a total length of time of 50 minutes and it was also recorded on video and audio (there were 9 video clips in total). However, the participants' responses to the video segment described in Section 3.1 lasted about 7 minutes. The moderator (a member of the research team) was responsible for introducing the debate without intervening, but trying to create a climate of confidence. In addition, the moderator asked for precision when necessary, without expressing agreement or disagreement (Stewart *et al.*, 2006).

3.3. Data analysis techniques

In order to analyze the verbal interactions in the focus group, the session was transcribed and divided into analysis units. Later, they were classified in categories, with the requirement of consensus between the two researchers. In this work we will consider as 'categories' what MSE students expressed about the 5 competence dimensions of the MPSI (its 5 stages of Table 1). Moreover, the sixth category corresponds to the future teachers' emotions, a dimension which is reasonable to consider because of the constructivist nature of PBL methods (Prince & Felder, 2007). In all these cases, we will distinguish between *direct* reflections about their practical resolutions, and *indirect* reflections which arose from the focus group (not directly related to what they did in the laboratory).

4. Results

The view of the video clip about the students' own alternative conceptions promoted a debate of approximately 7 minutes. In order to have a picture of these interactions, Figure 1 connects the information units arisen to the previously described categories of analysis. These units are represented as a function of the time from the beginning of the debate. In addition, each student's reflections are represented with different colours (S1-S6 students from Table 2). Four out of the five competence dimensions of the MPSI appeared in the debate (all except the formulation of hypotheses, CD2), in addition to some future teachers' emotions. Moreover, Figure 1 shows that indirect reflections, marked with a letter (*i*), were majority in the focus group (75% of the information units).

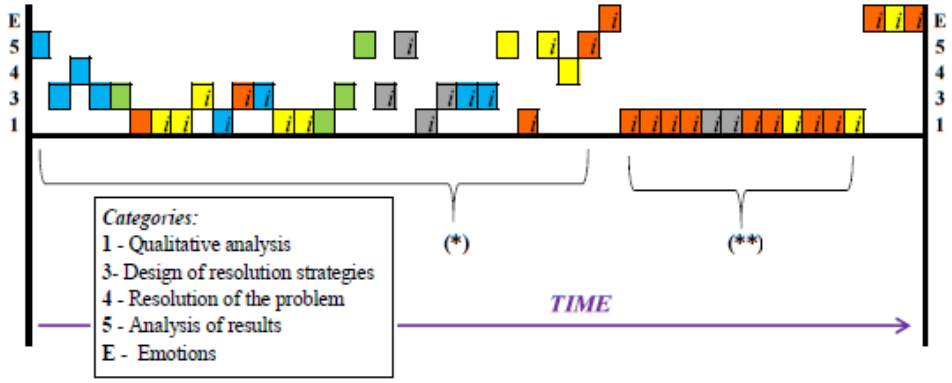

Figure 1. Categories for the information units as a function of time. Indirect reflections are indicated with "i". The corresponding students from the sample are: S1-orange, S2-yellow, S4-green, S5-blue, S6-grey (S3 did not make any reflection for this clip). The asterisks distinguish two parts of the debate, as explained in the text.

Figure 1 also suggests that the future teachers' reflections dealt with two main topics. In the first part of the debate –marked with (*)– the MSE students' discussed about how to distinguish physical and chemical changes, taking into account what they did in the laboratory. As such, by means of 11 direct statements and 17 indirect ones, future teachers reflected on their problem-solving process. In this way, some doubts arose about the theoretical framework and the resolution strategies, which gave rise to the addition of information in order to support their reasoning. Table 3 contains some examples of reflections on the different categories of analysis.

Table 3. Examples of future teachers' direct and indirect reflections in the first part of the debate, (*). The corresponding students S1-S6 are indicated.

Category	Example of reflection
CD1, *indirect*: theoretical framework to distinguish physical and chemical changes	"I had always thought more in the properties: the changes in solubility, colour… melting and boiling points… Well, don't know… the reversibility and irreversibility [criterion] is not clear to me." (S2, information unit #13)
CD3, *direct*: laboratory-strategies	"During the whole [practical] process we didn't consider the temperature variable." (S4, information unit #16)
CD4, *direct*: practical resolution of the problem	"We had two [water] soluble substances, we placed them into contact and we obtained a precipitate." (S2, information unit #27)
CD5, *indirect*: analysis of results, taking information from the debate	"I see… You mean it is a [chemical] reaction, isn't it? (…) I think there's no need for other [mentioned] studies." (S1, information unit #28)

On the other hand, starting from an emotional reflection where S1 said *"I'm completely confused"* –reflection number 29 in Figure 1–, she began to question that a chemical reaction could take place in a non-aqueous medium. Due to her contribution, another phase of the debate began, marked with (**). Here, S1 talked about the necessity of rearrangement of the ions for producing a chemical reaction, and also compared the physical changes of 'dissolving' and 'melting'. These arguments gave rise to a variety of *indirect* reflections about the theoretical framework of the problem, where opposing understanding of the concepts where found, as can be seen in Table 4.

Table 4. Examples of future teachers' indirect reflections in the second part of the debate, (**). The corresponding students S1-S6 are indicated.

Category	Example of reflection
CD1, *indirect*: understanding of the melting process	"If you melt a substance, you don't separate the charges [it is different from 'dissolving']." (S6, information unit #35)
CD1, *indirect*: understanding of the melting process	"You do separate the charges [in a melting process]. This is why [salts] are conductors in liquid state." (S1, information unit #36)

Finally, the debate arisen from the video segment ended with some other emotional statements. This fact reveals that a teacher should not ignore students' emotional and affective aspects, since they may limit conceptual change (Duit & Treagust, 2003).

5. Conclusions

The study carried out has allowed us to test the effectiveness of a video-based technique in order to promote chemistry knowledge construction. As such, although some alternative conceptions shown in the video segment were not identified by preservice teachers, the debate between the participants gave rise to cognitive conflicts on the topic (*e.g.*, about inter- and intramolecular forces, see Table 4). Moreover, the fact that most of the reflections were *indirect* ones tells us about the potentiality of the technique (the information that can be obtained is not limited by the researchers' beliefs). The analyzed results also suggest that emotional and group aspects play an important role in this process.

Finally, it is worth emphasising that the obtained video segment seems to be a useful resource for physics and chemistry teacher training programs. It is our plan to use it in the future, not only for analyzing preservice teachers' own resolutions, but also for assessing other students' problem-solving processes.

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D-Move: A sociotechnical environment to provide experience-based learning to digital natives

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Abstract

Digital natives grew up in the world of digital media and live in it. They have different learning styles, call for other teaching methods, and are using different means of communication in their learning processes. In this paper the D-Move learning environment is presented and evaluated. It is a methodology as an extension of the Delphi method together with a software system to implement this methodology. It offers digital natives an experienced-based learning environment and is perceived by the learners as superior to traditional learning based on case studies with regard to activation, satisfaction with the learning process, and satisfaction with the learning environment. At the same time D-Move is used as a research environment to better understand disruptive innovations in the world of digital. The underlying assumption is that a better understanding of already existing differences between digital natives and their parent generation will bring insights into future large scale transformation processes. The main two components of D-Move are a module to support Delphi studies with online and offline components as well as a module to capture, annotate and structure real world experiences to support the Delphi contributions.

Keywords: *Field learning; ethnographic studies; case study learning; Delphi study, experience-based learning, digital natives.*

1. Introduction - Aims of *D-Move*, the proposed experienced-based learning environment

D-Move pursue two main aims: Firstly, digital natives ask for different learning environments and use different means of communication in their daily life. Secondly, *D-Move* should help at the same time to gain insights into disruptive innovations in the world of digital and in future large scale transformations based on them. Thus, the benefit of *D-Move* is to have a software system and a methodology based on the Delphi method considering and exploiting the changed communication behavior of Digital natives.

Digital media is an essential component for the communication of digital natives (Thompson, 2013); (Friedl & Verčič, 2011). This change in the social and technological behavior has a major impact on the learning and information seeking environments of young students (Purcell et al., 2012). In times of increasing information sources, the uncertainties about the authenticity of content grows and students need a proof for them (Purcell et al., 2012). So information based on self-developed knowledge within real-life experiences become more important (Kong et al., 2014). As a consequence, digital natives call for different sociotechnical learning environments.

The first aim of D-Move, the experienced-based learning environment proposed and evaluate in this paper, is to fulfill those new requirements of learners better than traditional classroom teaching based on case studies.

Traditional expert-based trend research encounters noteworthy difficulties in dealing with disruptive innovations. Those are mainly characterized by generating new markets and changing existing ones radically. As a consequence they have a high social impact. Examples of this are the mass production in the automotive industry or the strong spread of smartphones. The driving force of disruptive innovations are usually not existing market leaders because these allocate their resources on hitherto successful business models based on traditional ways of thinking. Digital natives are characterized by the fact that they grew up in the world of digital and live in it. They are not immigrant into this world like digital immigrants or have to approach the world of digital mainly by use of scientific methods. When using digital immigrants as experts in trend research there is a danger that thinking based on incremental innovations leads to the optimization of existing business models but not to the development of new ones.

The basic assumption of *D-Move* is, that digital natives are trendsetters for as well as early adopters of disruptive innovations in the world of digital. Thus, the main aim is to understand their current behavior as an indicator for future large scale transformation processes. *D-Move* is mainly used as a sensor into the current behavior of digital natives to find future large scale transformations and not primary as a platform to collect expert opinions on future developments. Within the *D-Move learning environment* digital natives

are therefore considered to be experts about transformation processes already taking place. To implement this modified Delphi method they are supported by the Review board, which brings comprehensive knowledge of methods into the process.

The second aim of D-Move is to act as a research environment to gain insights into disruptive innovations in the world of digital and in future large scale transformations based on them.

2. Elements and characteristics of the *D-Move* learning environment

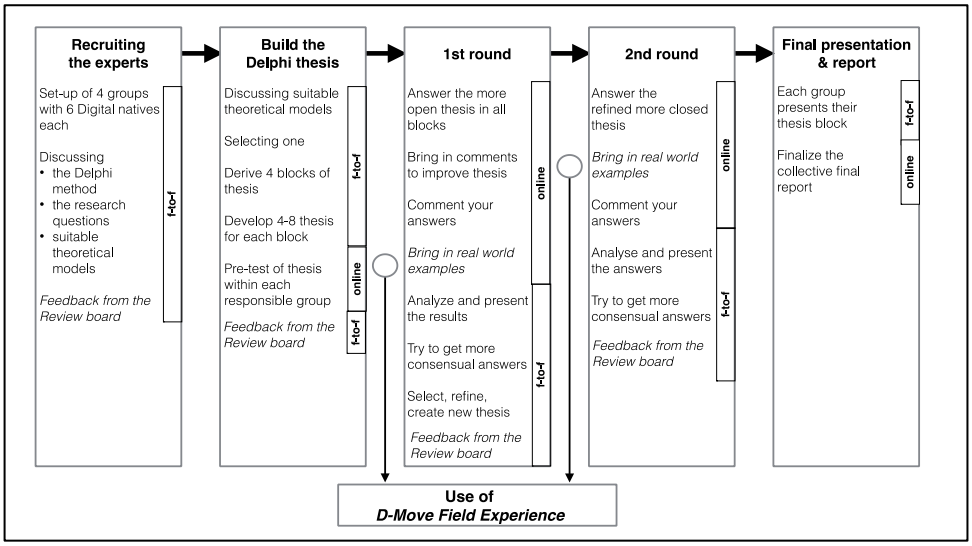

Figure. 1 Implementation of D-Move Delphi as part of an experience-based learning environment

The implementation of the *D-Move Delphi learning environment* offers four main characteristics: support of experienced-based learning, facilitation of interaction with peers, usage of familiar means of communication, an give learners the role of experts. To fulfill those four goals a modified Delphi method is implemented with face-to-face as well as asynchronous-dispersed forms of communication. The first goal, enable experienced-based learning, should be reached by two characteristics of *D-Move*. Firstly, the students are actively engaged in the learning domains by their role as participants in the Delphi instead of being in a traditional classroom situation. Secondly, by using real world experiences to explain their positions supported by the *Field Experience Module* of the *D-Move learning environment* experienced-based learning is further facilitated. The second goal, the interaction with peers, is supported by strong interaction with other digital natives in the Delphi group, e.g. in discussing the research questions, building the Delphi thesis, trying to get more consensual answers, and preparing the final report jointly. The third goal, use of

familiar forms of communication, is fulfilled by using online questionnaires to answer the Delphi thesis and shared digital spaces to communicate and share documents within and between the groups as well as to interact with the Review board. The use of the *D-Move Field Experience Software* further supports this goal by functions like capturing and posting videos, pictures and textual description from their smartphones directly to domain specific video blogs in a structural form.

The fourth goal, learners become the role of experts, is fulfilled by engage them within the Delphi as experts for the Delphi thesis. Thus, they can bring in their real world expertise as digital natives to improve the quality of the Delphi outcomes dealing mainly with disruptive innovations as described above. Secondly, the engagement will improve the motivation of the students, as their expertise is really needed in contrast to traditional learning forms based on case studies.

As Fig. 1 shows, the *D-Move Delphi* consists of five main components. In each one the students act as the experts for the content of the Delphi thesis and the Review board, faculty members responsible for the course, supports them with methodological advice. Components 2 to 5 have face-to-face as well as online elements and the 1st and 2nd Delphi round is using a direct link to the *D-Move Field Experience Software* to support the positions regarding the Delphi thesis with real world experiences.

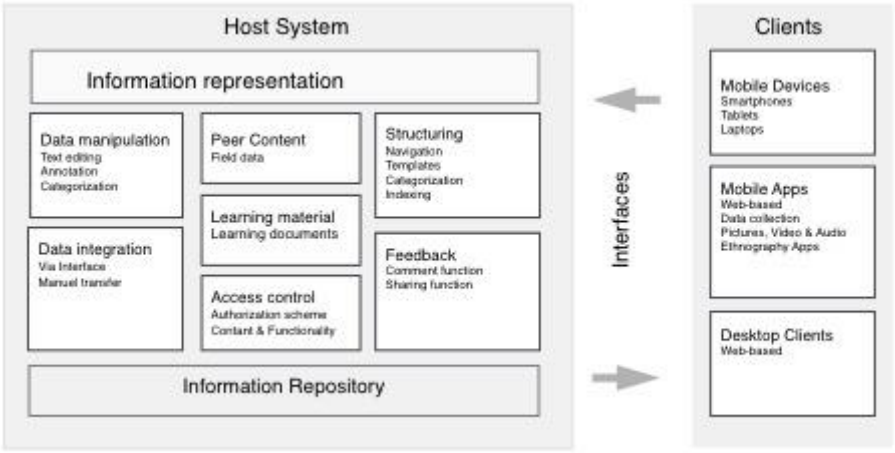

Figure 2. Functional design of D-Move Field Experience

As shown in Fig. 2 the technical implementation of the learning environment is based on a client-server architecture. The clients can be smartphones as well as desktop PCs using a standard web browser. Beside that, the integration of mobile applications for ethnographic research is implemented by software interfaces (Petrovic, 2009). Learners can upload text,

pictures and videos from their field experiences directly from the clients into the learning environment at the host-system. This environment provides all necessary functions and data for the different clients and includes the main application logic, which allows the use of standard web-based clients.

3. Evaluation of using the *D-Move learning environment* in comparison to traditional learning based on case studies

D-Move as a sociotechnical environment to provide experience-based learning incorporates the modules *D-Move Delphi* and *D-Move Field Experience*. Both have been used by participants of a master class in information systems to teach certain course objectives as well as to evaluate the perceived differences to traditional learning in the classroom using case studies. The students of this master course, have been considered as digital natives, because of their age and their affinity to information. One group used the *Delphi* and the other one the *Field Experience* module. Both groups embraced 25 participants each with the same demographic characteristics. This *Field Experience* took about a semester and the interaction between the students and the teacher during the implementation of the *Delphi* has been online and during five course-meetings under the semester. The participants were asked to compare the use of *D-Move* with traditional learning in the classroom using case studies with regard to activation, emotion, satisfaction with the learning process, perceived learning success, and satisfaction with the learning environment. To measure those constructs well proofed items and scales were used together with a five stepped Likert scale. A one means that the attribute is perceived much better, a five means that it is perceived much inferior compared with a traditional learning environment based on case studies. The questions were answered anonymously using a web based questionnaire after finishing the course. The response rate in both groups was more than 98%.

Construct	Item	Delphi		Real World Insights		Scale
		α*	μ**	α*	μ**	
Activation	Energetic activation	0,8	1,3	0,84	1,7	Activation-Deactivation-Check-List (AD-ACLS) Imhof (1998)
Emotion	Interest	0,74	2,19	0,58	2,0	Differential Emotion Scale, Merten and Krause (1993)
	Surprise		2,28	0,95	2,5	
Satisfaction with the learning process	Free space	0,87	2,0	0,74	1,7	Hoover and Whitehead (1979)
	Personal judgment		1,7		1,7	
	Reflection		2,1		1,6	
	Personal initiative		1,6		1,4	
	Involvement		1,5		1,6	
Perceived learning success	Correlations	0,81	2,0	0,55	2,1	Likert (1932)
	Practical application		2,0		2,1	
	Know How		2,0		2,4	
	New knowledge		1,9		2,2	
	Media competence		2,4		1,7	
Satisfaction with the learning environment	Sharing options	0,85	1,9	0,78	1,4	Likert (1932)
	Location independence		1,6		1,7	
	Traceability		2,3		1,4	
	Usefulness		2,4		1,4	
	Transferability		2,2		1,4	

* α = Cronbach's Alpha

** *μ = Mean value*

Figure 4: Perceived differences after using the two D-Move components compared to traditional learning based on case studies (1.. much better, 5 .. much inferior)

In summary both components of the *D-Move learning environment* are perceived superior in all analyzed constructs to traditional learning in the classroom based on case studies. The strongest perceived advantages are activation, satisfaction with the learning process, and satisfaction with the learning environment. The improved activation can be attributed to the use of interactive digital media instead of traditional paper based methods (Petrovic, Edegger F., Kittl, Edegger B., 2008). That leads to a more ‚lean forward' learning style (Kroeber-Riel & Weinberg, 2003). It allows also more active search strategies within the digital universe for information about the learning topics as digital natives are familiar with. The strong support of communication within the own peer groups leads to more activation in the learning process as it allows bi-directional communication within the own network of peers. Furthermore, the confrontation with real world phenomena related to the learning topic which are selected, analyzed, and communicated by the learners themselves also increases the level of activation (Platzer & Petrovic, 2011). Finally, participant's role as

experts in the Delphi process increases own responsibility as well as recognition by others, both can lead to a higher degree of activation (Kolb, 1984). The very high amount of perceived superiority regarding activation is surprising as the *D-Move learning environment* was not compared to lectures in the classroom but to paper-based case study learning which incorporates a higher degree of activation than lectures.

The perceived superiority regarding satisfaction with learning process and learning environment can be attributed to the general design of D-Move. This is very close to the ‚normal' every day environment of the students incorporating digital communication means like smartphones, blogs, search strategies in the world wide web, and communication with peers in an interactive way using text, pictures, and videos (Garret, 2010). As a consequence, learning is not any longer a dedicated activity which takes place in an environment perceived as artificially by learners (Siemens, 2005). Much more it will become part of the daily live. That conclusion does not mean that this kind of learning is superior to traditional lectures concerning all different learning objectives. But it can explain the high degree of satisfaction of learners with the process and environment.

4. Limitations and further research questions

A first limitation of the presented research is that the learners have been used the experience-based learning environment for the first time whereas they are familiar with learning based on case studies for many years. Some of the positive results regarding activation, satisfaction with the learning process, and satisfaction with the learning environment could be attributed to the pleasant surprise of innovation in learning environments. Further research should analyzed this effect by conducting repeated measurements within the same learners as part of a long-run study. Secondly, in further iterations of using *D-Move* a stronger focus should be on reasoning of the attitude and actual behavior of the digital natives utilizing this methodological advantages of the Delphi method as well as of the whole experienced based learning setting.

Further research could use *D-Move* for different learning objectives, not only comparing constructs perceived by the learners but also objective outcomes e.g. correct memorizing and understanding of certain facts. Finally, disregarding that the present learning environment is already much closer to the familiar daily life environment of digital natives than traditional learning setting, a closer integration to that daily life environment should be a next step in further development of *D-Move*. That means that the ability to select, capture, annotate, and share real world experiences as well as the participation on the Delphi should be integrated more seamlessly in the information and communication means already used by the learners.

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Training school teachers to the use of ICT – a preliminary study on motivation and attitude to innovation

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Abstract

As part of an innovation project for the public schools of an Italian municipality, the whole body of teachers was enrolled in a training course on the use of ICT in didactic. Before the training, data on ICT expertise, attitude towards teaching and attitude towards training on the use of ICT were collected, to identify factors facilitating and preventing a successful exit of the training, in order to better customize it.

A total of 456 questionnaires were analyzed. The interviewed showed an average level of ICT competence, but relevant gaps on some useful teaching tool. Teachers expressed a good inclination towards the more creative aspects of their profession, an element evaluated as congruent with the adoption of more student-centered pedagogical practice, but conflicting attitudes were expressed on the whole idea of entering a training process.

Results suggest that an effective training program needs to address the change of pedagogical approach adopted from the teachers, the use of online communication tools and spaces as well as educational apps and tool and the reinforcement of a virtuous circle of feedback reception from the students that contribute to motivate the teachers actively involved in the process of change.

Keywords*: ICT for learning; teacher's training; training planning, motivation.*

1. Introduction

The introduction of the ICT in the educational system is quite recent, with the first experiences generally taking place in the Eighties (White 2008).

The first investigations evaluating the impact of the ICT introduction into the educational system have given mixed results: the outcomes are unclear, contradictory, quite often a major investment in technology innovation is followed by minor changes in the didactic and underuse of its potentials. Research found that the use of ICT is often sporadic and superficial, tending more toward reinforcement of traditional practice than enablement of curricular transformation (Eteokleous, 2008; Lai and Pratt 2008).

Other studies (Livigstone 2012, Vanderline and van Braak, 2010) have highlighted the lack of comparable data and validated scales in the description of innovative projects outcomes, an issue that makes it all the more harder to effectively analyze the reasons of success (and of failure). In her review of the difficult relationship between ICT innovation and classroom practice, Livingstone provides possible explanations. On one hand there is a lack of convincing evidence of improved learning outcomes, which may provide stimulus to a quicker, more effective change. Moreover, it is suggested that this difficulty in establishing traditional benefits, combined with "the uncertainty over pursuing alternative benefits, raises fundamental questions over whether society really desires a transformed, technologically-mediated relation between teacher and learner", and point out how the debate "over whether ICT should be conceived of as supporting delivery of a traditional or a radically different vision of pedagogy based on soft skills and new digital literacies" is still open.

A common reflection stemming from different research results in the field of ICT use for educational purpose point out that the integration of computer technology is a complex concern that requires sensitivity to individual and contextual variables (Mueller, Wood, 2012). Consistently, investigations have looked into teachers related variables (Ranjit Singh, T. K., & Muniandi, 2012) and role played by school principals (Polizzi 2011), but also into dimensions such as the design and implementation of ICT in educational settings; the evaluation of its impact; the scaling up of these kinds of innovations; and the cost-effectiveness of technology-enhanced learning environments (Rodriguez et al. 2012).

The first, more relevant reflection arising from these studies is that all the components of the educational system should be involved in the process of change in order to achieve success.

Among the other factors influencing the fruitful integration of ICT in education we found, for example, the attitude towards the use of ICT in education (Player-Koro, 2012), the

teachers' level of confidence in ICT use, the amount of technical support and of training that combines ICT and pedagogical aspects (BECTA , 2004).

It is then important to reflect upon how these variables are represented among the teachers, and how they can be used to improve the training on the use of ICT in order to maximize the changes that should follow. What is, among the teachers, the disposition to a deep change in their didactic? How much are they willing to invest in their training, what do they expect to achieve and what they value most about ICT? What are the aspects of their profession that they value as more relevant and how this impact on their attitude to training and ICT?

2. The research

2.1. Aim of the research

The investigation carried out intended to detect the attitudes towards the integration of ICT in the classroom among a group of middle school teachers involved in an extensive program of training and innovation of their school technological infrastructure. Considering the relevance that meta-cognition (Phelps, Graham, 2008) assume when the ICT enter the classroom, it seems extremely important to understand the vision that the teachers are adopting towards these new tools in order to improve their integration. Our initial interest stems from the consideration that such integration is quite often difficult, and that the attitude of teachers plays a key role in the final outcome of any innovation program (Diamantini 2014). The final scope of the research is to gain an accurate description of the representations of a group of teachers training in the use of ICT, and consequently provide suggestion on how such training could be improved.

2.2. The questionnaire

To collect the information a questionnaire of 26 items was created. The questions (single choice, multiple choice and Likert scales) included in this analysis investigated the following areas:

- ICT skills (13 items detecting the auto evaluation of ICT expertise and the specific uses of ICT among the respondents).
- Attitudes to teaching (2 items detecting what motivate the respondents in their work experience).
- Attitudes towards training and didactic use of ICT (11 items investigating preferences and representations of ICT and training)

The questionnaire was submitted at the beginning of a training program on ICT, which was organized by the schools where the teachers worked as part of a wider project of innovation that included as well a massive renovation of the technological infrastructures.

2.3. The sample

The sample includes 456 teachers, mainly women (87,5% women; 8,1% man, 4,4% not answered) between 22 and 66 years old (average age: 49 years). They are mainly primary school teachers (54,8%), but there is a group of middle school teachers (28,5%), and a smaller group of kindergarten teachers (16,4%) . In average, teachers have been employed for 24 years. The 60,9% of them teach human science subjects, while 37,5% teach scientific subjects.

3. Main results

3.1 ICT skills

The sample show a good level of familiarity with the information technology, and the correlation between their auto-evaluation and the scale of ICT use (number of ICT function used by the respondents) is quite high (Kendall's tau b = ,458; p < ,001). While the more basic functions, such as the search for information (especially for school) and Office tools are used by the vast majority of the sample, activities such as buying things online or participating to online forums, groups or discussions are far less common. Also the communication via SNS and chats is not very diffused.

Table 1. Online/offline activities of the respondents.

Activity	N	%	Activity	N	%
Email at home	417	91,4	Chat	160	35,1
Email at school	120	26,3	Facebook	194	42,5
Internet at home	416	91,2	Online game/leisure activities	98	21,5
Internet at school	155	34	Home banking	194	42,5
School projects	303	66,4	E-commerce	166	36,4
One own training	300	65,8	E-governance	180	39,5
Research for school	420	92,1	Word	438	96,1
Research for personal interests	382	83,8	Excel	247	54,2
News	317	69,5	Power Point	282	61,8
Online discussion/forum	99	21,7	Photoshop	102	22,4

Almost half of the sample has already used technology in the classroom (49,8%), mainly to show already prepared contents (cd's that come with the text book have been used by 58,3% of the sample, Lim's by the 40,6%, mobile devices by the 38,2% and software for the creation of texts or presentations by the 35,5%). The use of ICT in the classroom positively correlate with the previous participation to training sessions on the same topic (Phi = ,257; p < ,001). Moreover, having attended training positively correlate with the use of more creative tools, while does not impact the use of CD-ROMs.

Table 2. Correlation between previous training in the didactic use of ICT and use of ICT in the classroom

		Φ (p)
Previous training in didactic use of ICT	Use of ICT with the students	.257 (.000)
	Software for creation of text and presentation	.223 (.000)
	LIM	.237 (.000)
	CD rom	Not sig.
	Mobile devices	Not sig.

3.2 Attitude to teaching

Respondents were attracted to the teaching profession because it gives them the possibility to relate to others, especially young people (78,9%) and the opportunity of study and constantly improve their knowledge (41,7%), while 23,7% choose the job for the gratification it would give them and 11.2% appreciate especially the possibility of autonomy in the management of the free time. Accordingly, the most relevant aspects of the profession are the emotional-relational (69,8%) and the creative one (69,5%), while autonomy is chosen by the 22,4%, social recognition by the 6% and career by the 1,6% of the respondents.

3.3 Attitudes towards training and didactic use of ICT

While the majority of respondents would like to be updated on the use of ICT (87,9%), the time they think should be dedicated to this activity is more varied: about half of the sample would like to dedicate between 17 and 40 hour to the training in the didactic use of ICT in the following year, while 38,9% think that 16 or less hours would be enough, 8,6% would

like to spend more than 40 hours and 1,9% more than 100 hours to it. As for the preferred training modalities, "frontal" lecture is still the favorite one (50,2%), but is closely followed by experiential laboratories (47,4%), while less popular methods are blended classes (24,3%), interactive workshops (18,2%), events (14%), and seminar (11,6%). When asked about how the training they were about to start would impact their job, 68,4% said they would probably change their way of teaching, and of these, 1% scarcely, 26,3% a little, 62,2% enough, 5,1% completely. The knowledge acquire during the training is believed to help: create more personalized tasks for the students 67,6%, involve more the students 61,2%, improve creativity 57,4%, stimulate self-teaching in the students 49,4%, stimulate less consistent students 45,2%, promote group work 44,2%, transmit educational aims 37,8%, improve the students' self-confidence 31,4%, clarify the topics 29,8%, evaluate the student's preparation in a more detached way 3,5%.

4. Discussion and Conclusion

Although the general level of ICT skills of the sample is quite good, it seems relevant to focus the attention on some of the less diffused ones, such as the use of spaces of online sharing and communication. These kinds of tools appear to be particularly useful both to connect with the youngest and to carry out innovative teaching projects (Ray, Jackson, Cupaiuolo, 2013). The lack of familiarity with online chats, social networks, blogs and forum suggests the need for a specific training that will improve the skills of teachers in the use of the internet to chat, share ideas and build a discourse.

For the same reasons the training should focus also on the use of tools and apps that can be useful in the implementation of innovative school projects, such as video and image shooting and editing (Godwin-Jones, 2011)

The sample expresses a strong inclination towards the emotional-relational and creative aspects of their profession. Their relationship with the students matters, and so does the possibility to promote an active, creative environment for them. The introduction of the ICT, when accompanied by coherent changes in the didactic, has been proved to augment involvement and satisfaction of the students, (Ferotti 2011), as well as their creativity (Ardizzone, Rivoltella 2008). These effects reinforce the perception of satisfaction and self-efficacy of the teachers, supporting therefore the motivation to change (Moè, Pazzaglia, Friso 2010), once that the initial effort is done.

But it's on the first, initial step that we observe some incongruence in the answers of the sample, which could lead to some problems in the implementation of a process of real change. Many of the interviewed intend to allot scarce time to the training in the use of ICT, insufficient to achieve the effects desired, especially when considering the general

level of ICT skills. The high level of preference for a traditional training modality such as the frontal lesson, highlight a strong attachment to old pedagogical strategies, that do not suite well both to the contents of the training and the declared intentions of application of the knowledge acquired.

When planning a training program, innovation of the pedagogical approaches should be object of specific attention, as this aspect represents the stumbling block for many teachers, but can be the key to a successful integration of ICT in the classroom.

Summarizing the suggestions emerging by this research, we can conclude that an effective training on the introduction of ICT in education needs to tackle the pedagogical issues connected with the adoption of a more student centered approach; have a strong focus on the use of online communication tools as well as educational apps and tools; support the beginning of a virtuous circle of feedback reception from the students, as a strong motivational tool for the teachers actively involved in the process of change.

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Social Media for Networking and Participatory Professional Learning

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Abstract

There is widespread acceptance of the need for professional learning opportunities and support for teachers and for academics transitioning into the higher education workforce. In Australia and globally, social networking sites (SNS) provide teachers with formal and informal networking opportunities. While higher education institutions are responding to an ever-changing digital environment, scholarly work aimed at understanding optimal use of, and interaction with new Web 2.0 capabilities is a pressing area of concern among academics. Limited studies are available on how and why teachers in higher education employ social networking tools to create learning networks, share professional ideas and build creative collegiality. This scoping review article investigates motivations for the adoption of SNS in higher education and the benefits and opportunities presented by social networking tools such as blogs and Twitter in teacher professional learning and practice. Results show that academics are interested in connecting with peers, sharing knowledge and networking in open participatory forums as means of building community and accessing resources. The findings indicate that the affordances of microblogging and SNS are valued by academics and that they appreciate the immediacy, relational aspects and interactions that expand their professional networks.

Keywords: *informal learning, networking, Twitter, social networks, knowledge, sharing.*

1. Introduction and aim

'Social media' refers to a set of digital tools that support communication and interaction among users. Digital tools - wikis, blogs and microblogging - facilitate the creation and sharing of content and enable many-to-many dialogue. The perception of social media in education has changed rapidly and is no longer viewed as a passing trend or fashion, so having a flexible and well-managed presence through Facebook, LinkedIn, or Google+ are regarded as part of one's professional profile. Microblogging has become essential for universities to enable rapid communication, digital and flexible learning environments and advertising to secure a place in the global educational marketplace.

Recently, the Council of Australian Directors of Academic Development (nd)) advocated use of digital tools and *Social Media Toolkit* noting three key attributes of social media channels that make them highly effective as communication channels:

- *Personalization* – content tailored to individual needs
- *Presentation* – timely and relevant content accessible in multiple formats and contexts
- *Participation* – engaging partners and the public who contribute content in meaningful ways.

What has been learnt from socio-technical systems like email and microblogging is their capacity to support an array of social, cognitive and communicative needs. Social Networking Sites (SNS) like *Facebook, MySpace, Twitter,* and *Pinterest* are web-based services that allow individuals to: 1) construct a public or semi-public profile within a bounded system; (2) create a list of other users with whom they share a connection; and (3) view and edit their list of connections (Boyd & Ellison, 2007: 211). Twitter, founded in 2006, has provided a number of educational benefits, such as sharing information and collaborating around common interests. As the service can be used from any smartphone or mobile device, it is widely used for public dialogue in world-wide events. Any Twitter user can "follow" any other, and there is no need or expectation that the person being followed will reciprocate. Twitter has impacted on communication trends in significant ways by reducing temporal and spatial constraints, and is not only used by journalists, politicians and celebrities, but also by academics wishing to connect with colleagues and keep up to date with professional trends. The focus of this article is to survey the educational research literature to examine how social media and microblogging are used for professional networking among teachers and academics. Current literature is inconclusive in identifying the contribution of social media platforms to professional learning and of online networking activity among academics, and how microblogging in particular, enhances productivity. The paper is intended to contribute to this important area in higher education practices.

2. Challenges presented by social media in educational contexts

In this article, networks are defined as the tools, artefacts and interpersonal processes that facilitate communication and sharing of interests by groups. Such virtual networks connect teachers to other individuals globally with the aim of sharing resources, offering support, feedback, and opportunities for collaboration. SNS' may also enable access to information, new ideas and connection with others around the world who share mutual interests and goals (Lock, 2006). There is acceptance across the higher education sector that that specialist knowledge and skills are required to carry out strategic development work and that the role of the academics (educational/faculty) are changing within the academic profession (Di Napoli, et al, 2010; Schroeder et al 2010). There are pressures on university teachers to change and adapt their pedagogies to include social media and digital devices. In the past, professional development was formal and top-down, characterized by face-to-face workshops and training. Now it is recognized that knowledge is experientially acquired and can occur through informal conversations and practice-based activities, peer-learning and mentoring. As increasing connectivity is part of the landscape in the 21st century, the importance of networking, along with other forms of social exchange are recognized as offering powerful opportunities for sharing and professional support. In the Australian context, teaching staff in higher education have diverse roles including teaching and assessment, research and publication, while also ensuring that pedagogic practices align with policy and maintaining best practice in e-learning (Mewburn & Thompson, 2013). Higher education teachers are also witnessing a major shift and the need to adopt revised modes of working, such as collaborative teams, shared discourse, partnerships with students and learning communities that enable just-in-time and informal learning (Veletsianos, 2012). Teaching and learning terms, such as 'understanding information' and acquisition of knowledge', have been replaced by concepts such as *activity, participation,* and *situational knowledge creation* (Paavola et al, 2004). Pervasive communication technologies have increased the emphasis on collaboration and exchange, emphasizing the importance of social networks as sources of professional learning, problem solving and innovation. While learning in networks is not new, the adoption of digital tools and microblogging has increased the ease of communication and potential for informal learning in online spaces. Due to the ubiquity of digital tools, the focus for the teaching profession has become one of horizon broadening and constant review of practices for communication, research and professional networking.

To meet these demands, teaching staff are adopting social media platforms in their pedagogy, research practices, and for cross-faculty dialogue (Mewburn & Thompson, 2013). In relation to Twitter, Prestridge (2013:724) advocates use of microblogging by demonstrating that this medium offers staff and students opportunities for improved social and cognitive engagement. While social networking tools are being widely adopted there

remain important questions about the variety of ways in which digital tools and social networking services are being used in higher education to improve and support the professional work of academics. The aim of the paper is to address this gap.

3. Social Networks and their potential for professional learning

The rise of social media services offers new possibilities for the creation of "affinity spaces" where participatory cultures of collaboration and sharing thrive (Gee, 2007; Jenkins et al, 2006). Much research shows that *SNSs and microblogging amplify the communication possibilities and supplement interpersonal contact, participation, and community commitment* (Carpenter & Krutka, 2014). These tools make possible synchronous and asynchronous communication, distributed collaboration and social interaction, and are already having a transformative effect in higher education, triggering changes in how we communicate and learn. Moreover, the uptake of social software tools has gained momentum in all sectors of education (Lee & McLoughlin 2010) by enhancing communication capabilities through increased connectivity, customization, personalization, and rich opportunities for informal networking.

Research evidence indicates that SNS (*Facebook, MySpace*) assist participants in forming social connections, while enabling collaborative knowledge sharing, idea generation, creative production and peer-to-peer feedback (Dron & Anderson, 2009; Greenhow, 2011). Several authors and researchers have adopted a networked learning perspective as a conceptual framework for teaching, learning and communication with social media (Haythornthwaite & Andrews, 2011). By adopting a networked learning perspective, online spaces and virtual communities can be seen to provide important connections for individuals and that the interpersonal interaction that occurs provides important benefits such as improved satisfaction at work, extended social and professional connections and opportunities for social commentary. Therefore, social technologies hold enormous promise for enhancing, enriching, and extending traditional paradigms of professional learning, which, due to resource constraints and time limitations are moving to virtual spaces. Additionally, research on informal learning within SNS contexts suggests that participation in virtual communities fulfils important networking functions and generates social capital (Boyd & Ellison, 2007). Also, as mobile internet capabilities progress, users more often share information anywhere, anyhow, anytime, which makes communication via SNSs increasingly prevalent among all ages (Cochrane & Narayan, 2011).

Another result of the ubiquity and uptake of social networking tools is a cultural shift from consumption of new media to creative production, participation and engagement in collaborative networks with activity centered on shared interests or knowledge domains (Doherty, 2011). Austin & McDaniels (2006) identified the ability to cultivate professional networks as a critical skill for lifelong learning and digital participation. For academics and

teachers, the ability to communicate in virtual spaces and engage in professional networking is a valued skill that is enabled by social media. Lecturers and teacher educators are now using microblogging platforms to source teaching resources and create avenues for dialogue through blogs, wikis and SNS such as Facebook (Conole, 2010). These trends in social media adoption provide evidence that teachers are leveraging SNS for personal and professional reasons. To review current practice in his area, the primary research questions were as follows: *In what ways are teachers using social media and microblogging tools to engage in networking and professional learning? What are academics' motivations for professional networking and what do they perceive as the benefits?*

4. Methodology : A scoping review

To advance this line of inquiry, the approach was to assess the impact of social media and microblogging tools in supporting professional learning, and to consider cases of how digital tools are being used by teachers and academics in higher education. Social networking technologies, such as Web 2.0 tools, provide a platform for social interaction, enabling social and interpersonal relationships and as a consequence, support informal learning and knowledge sharing across temporal and spatial boundaries. By viewing social media in this way, we shed light on several technological options that facilitate collegiality and informal learning. To illustrate the potential benefits of social media and microblogging, a scoping review of articles published in refereed journals between 2009 and 2015 was carried out. Articles were chosen on the basis of whether they reported use of SNS's for networking, community building, professional development and knowledge sharing. The framework outlined by Boote & Beile (2005) was used as a guide for the review as according to these authors "*To be useful and meaningful, education research must be cumulative; it must build on and learn from prior research and scholarship on the topic* (Boote & Beile, 2005: 3). The approach adopted included criteria for inclusion or exclusion, a synthesis of literature and discussion of significance. The criteria for inclusion were first, articles on SNS used by teachers for professional dialogue, and articles on how and why teachers and academics engage in microblogging for informal networking and sharing of knowledge. The second criteria was currency i.e. recent articles, and the third criterion was publication in peer reviewed journals. Only high quality journals were selected, including:

- *Computers and Education*
- *Journal of Computer Assisted Learning*
- *Australasian Journal of Educational technology*
- *International Review of Open and Distance Learning*
- *British Journal of Educational Technology*
- *Internet and Higher Education*
- *Research in Learning Technology*

A scan of these journals provided several sources which was augmented by a search of Scopus and Web of science, giving a total of 218 articles between 2009 and 2015. This was culled down and limited to empirical studies and excluded theoretical papers. Articles detailing student perceptions of social media or the impact of microblogging on teaching and learning were also eliminated. After removing duplicated articles only 14 articles presented evidence based research on professional learning mediated by social networking tools. Table 1 presents a summary of the selected articles with a summary of findings.

Table 1: Exemplars of Social Media in Higher Education

Authors	SNS & tool(s)	Methodology	Outcomes/findings
Carpenter & Krutka (2014)	Twitter	Survey conducted of K-12 educators regarding use of Twitter for professional development	Participants reported the benefits of Twitter for access to ideas, knowledge and information; connections to sources of expertise and reducing sense of isolation
Burden (2010)	Wikis, voicethread, 3D immersive worlds	Conceptual framework for teacher reflection, publishing collaboration & knowledge construction	Affordances of Web 2.0 were seen as valuable for professional learning
Cahn, Benjamin & Shanahan (2013)	Blogs, Facebook, Social bookmarking; Twitter; Video sharing sites, wikis	Search of 154 medical school websites in the USA for media used by academic developers	Most frequent uses are Facebook, blogs and Twitter for information sharing and networking
Cochrane & Narayan (2011)	Mobile web 2.0 tools	Podcasting, vodcasting, Skype blogs, Twitter	Community of Practice model of professional development using mobile web 2.00 tools and social technologies, raised awareness
Duncan-Howell (2013)	SNS - Facebook and Tumblr	Survey of teachers use of SNS	Teachers used SNS as informal sources of professional learning and found them to be convenient and relevant
Ebner, Lienhardt. Rohs & Meyer (2010)	Microblogging Twitter/blogs	A microblogging platform was used for process oriented, informal learning	Attempts to establish a process-oriented environment with microblogging tools had limited success, but enabled staff envision new forms of community and virtual presence

Guerin et al (2015)	Social networking	Investigation of blogging effects in doctoral education	Advantages of blogging for professional development includes community building and connectivist learning
Holmes et al (2013)	Twitter	Analysis of the tweets of 30 influential users of the medium	Twitter found to be accessible source of new ideas and social support for teachers
Mewburn & Thomson (2013)	Blogs	Sampling of academic blogs using snowball method and analysis of blogs content	Blogs were found to serve multiple informal purposes in academia:dialogue reflection on academic work and research; dissemination of ideas and publications, mentoring, sharing career & teaching advice
Veletsiansos & Navarette (2012)	Twitter/social networking	Analysis of Tweets/Blogs	Academics use Twitter and social networks for sharing information, expansive learning, requesting assistance, connecting and networking
Carpenter & Krutka (2014)	Twittter	Survey of K-12 educators regarding use of Twitter from professional development	Participants reported the benefits of Twitter for access to ideas, knowledge and information; connections to sources of expertise and reducing sense of isolation
Stephansen & Couldry (2014)	Twitter	Action research project to engage a team in developing a virtual community to share knowledge	Students and teachers contributed to a Twitter feed to create a virtual community and digital story circle
Lupton, (2014)	Social media and Twitter	Large survey on 711 academics about their use of social media	Benefits for academic work included connecting and establishing networks, giving and receiving support
McPherson, Budge & Lemon, (2015).	Twitter	Qualitative research presenting vignettes of academic practice	Twitter as a means of informal networking and community building for professional learning.

Table 2 shows the various reasons behind teachers' use of Twitter and the benefits they perceived from these virtual interactions. The findings indicate that networking activities result in a range of benefits to participants, going beyond access to new ideas and information. Many found it an antidote to professional isolation and a sense of being

connected to global audience of experts. These relational benefits are described in several studies and are motivated by the desire to go beyond local sources and contacts and solicit crowd-sourced feedback from a global audience.

Table 2: Motivations for networking and its benefits

Motivation	Benefits	Authors
Access to new ideas and resources	Reduces professional isolation	McPherson, Budge & Lemon, (2015).
Conversing with likeminded colleagues and experts	Multiple perspectives and diverse ideas	Carpenter & Krutka (2014)
Professional discussion and support	Access to cutting edge ideas and current trends	Mewburn & Thomson (2013)
Connecting globally, learning about innovative developments	Getting beyond the silos of their own university/school	Stephansen & Couldry (2014)
Social conversation and desire to share resources	Expanding one's connections; collaboration with a global audience	Ebner, Lienhardt. Rohs & Meyer (2010)

5. Findings of the Review

Networked practices of academics in the articles surveyed showed commonality in a number of themes. The most significant use of Twitter was for exchange of information, team and community building, enhancement of dialogue and development of collegial networks for improved productivity (Stephansen & Couldry, 2015; Veletsianos & Navarrete, 2012). Blogs and wikis were created as a virtual space for sharing ideas and information and to build community (Mewburn & Thomson, 2014; Ebner et al 2010). Cahn et al, (2013) and Cochrane & Narayan, (2011) demonstrated that academics achieved multiple benefits from mobile Web 2.0, blogs and Twitter for information sharing and networking. The potential of social networking and microblogging tools for developing relationships and enabling swift communication provided academics with access to and use suite of tools to engage in professional conversations, shared ideas and resources (Ebner et al, 2010; Lupton, 2014). The social web is therefore a way of creating opportunities for engagement and networking going beyond traditional channels such as email or face-to-face conversation. For academics in higher education, creating web presence was seen as a strategic way to form networks and disseminate information, compare practices, raise awareness, foster innovation, build influence and effect change (Holmes et al, 2013). By providing open, alternative venues for idea sharing, social networking services foster

informal spaces for professional conversations. Teachers want to join and participate in online communities and engage in informal knowledge practices and their motivations are varied (Table 2). The evidence shows that that there is much potential value in using microblogging and SNS to enhance communication, share knowledge, and build networks within and across virtual spaces and disciplinary boundaries. The benefits of this reciprocal sharing are that it leads to strong relational ties by expanding users' professional circles as well as increasing the frequency of interpersonal contact and collegiality. Community outreach, visibility and partnerships are all important aspects of school and university culture and scholarship. By building social capital though participation and communication in networks, academics can extend their knowledge and engage in professional growth and development.

6. Conclusions: Networks for enabling informal professional learning

Web 2.0 has brought to education a suite of user-friendly tools for information access and aggregation, openness, tagging, portability, reuse, multichannel distribution, syndication and content creation. They all improve openness, communication, networking and sharing. In this article, global examples of how microblogging and social networking tools are being used globally are presented. By fueling a move towards informal networked forms of professional learning, digital tools and microblogging promote socio-experiential and grassroots communities of learning that support professional learning and are aligned to the demands and challenges of the knowledge era and networked society.

The examples show that there is a need to revise professional learning to an informal, participatory networked endeavour creating learning communities and opportunities for informal learning and knowledge sharing, rather than a top-down skills-based approach. This review has addressed a gap in the literature and advances understanding of the value of social media for relational connections and informal professional development. Few studies have focused on how teachers make use of social networking tools to share knowledge, create learning communities and access resources to expand their professional circles. By embracing social media tools, teachers are now part of a complex, dynamic techno-cultural system, using resources that lend themselves to knowledge sharing and innovation. Future research should investigate patterns of networking that expand academics' knowledge and skills base and whether these connections are cross-institutional, cross-faculty or global.

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A different approach fot training student teachers using Communication and Information Technology (ICT)

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Abstract

The aim of this research is to contribute to find new ways of teaching using the opportunities that Communication and information technology(ICT) give today. This contribution proposes a teaching strategy that allows students to think in a creative way and integrate technology in elementary school. This strategy consist in making the teacher student think themselves as inventors, detecting a need in society, designing and developing an invention that has not been yet patented. Creating marketing strategies for selling the product and presenting all this work in class for peers and teachers to evaluate. It was applied to student teachers during the period 2012- 2015 in a three month Seminary about the use of Technology at School. Surveys show that they are highly motivated with the methodology used at the Seminary and satisfied with the process. Most of them think that it is very useful when planning classroom work for children in elementary school. Presentations done for the seminary showed that the teacher students develop significant learning and many skills using information and communication technology (ICT) for learning purposes.

Keywords*: Technology, significant learning, teachers´ training.*

1. Introduction

Even though student teachers use technology in their everyday life and have access at very low cost to mobile handheld devices and wireless connectivity permanently this advantage does not always show creative ways of thinking about new teaching methods. Many research has been published concerning different strategies to integrate technology to teacher´s training (Tondeur et al.,2012).

However class observation in elementary school and classwork planning point out that the integration of technology in education practice is seldom found.

The incorporation of a technology seminar in the teaching profession helps to overcome this deficiency. In this Seminary the aim was to improve teaching practices in a creative way and using full potential that can be developed using ICT.

Technology offers multiple uses such as presenting new materials that reorganize the information , build bridges to facilitate understandings, help recognize the information in different contexts(Litwin 2005).

The teacher students held a workshop where they were asked to position themselves as inventors. They had to detect a need of society that have not yet been satisfied and design and develop an invention to give answer to this problem. In this technological project various stages are highlighted:

- Detection of a problematic situation and defining the problem to be solved
- Analysis of the problem and its causes
- Search for alternative solutions
- Design an invention to solve the problem
- Search in Internet for similar inventions, identifying reliable pages.
- Identify improvements that can be made to existing inventions on the market or think of something absolutely different and new that does not exist yet in market
- Design the invention using a proper soft design like Tinker cad or similar
- Develop the invention and make it work
- Think of the commercial target and shape a commercial to sell the product using video editing programs like Movie Maker o similar
- Make a presentation as a final work for peers and teachers using any on line presentation program like prezi or slide share
- Upload presentation on moodle platform

In the required work three stages can be clearly seen as mentioned by Gay (2012)

- study phase
- creative phase

- execution phase

In the first stage the student teachers develop a wide vision of the problem , analytical skills, comprehensive approach and inductive reasoning.

In the second stage creativity, ability to synthesize, subjective judgment and deductive reasoning.

In the third stage, organizational capacity, planning and evaluation.

During all this stages information and comunication technology is been used for developing new ways of learning and teaching. This methodological strategy aims to encourage searching and access to information, knowledge and skills for specific needs in specific contexts of use, where those resources are immediately relevant and useful. Things will be learned better and retained more effectively when they are learned in contexts of use – uses that are of intrinsic importance to the learner in a place, time, and circumstance that matters to them. (Burbules 2014)

Research shows that since the introduction of technology in classroom practice, the way students think about their own learning has changed and also the way knowledge is constructed. Also the way teachers plan their classes when they are critical of the new learning environments is very different. (Lion 2005).

This Seminary gives the student teachers the opportunity of thinking about the process of learning and teaching in a different way.

Surveys show that they develop flexible ways of thinking about technology, design and learning. They also become aware of the importance of the teaching role when planning activities leading to significant learning and the need to think about motivation for classroom work with children.

The role of the teacher is still crucially important in helping learners organize and integrate their learning in meaningful ways; in helping learners to sequence learning opportunities; in helping to inspire, motivate, and model learning as an active endeavor. (Burbules 2014)

2. Methods

In order to know the impact of this new methodological strategy developed during the three month Technology Seminary, surveys were administrated at the end of the workshop, during years 2014 and 2015. The Survey was given in class to all the students. All of them female. In 2014 we had 62 surveys and in 2015 there were 68.

The aim of this research is the analysis of numerous variables related to the skills developed by the student teachers and also how these skills can help them develop creative ways to plan classes.

The survey included the following topics:

Table 1. Skills developed by the teachers students during the Technology Seminary

Development level for the following skills	**Consider 1 is very low and 4 is very high**
Finding data in internet in trustful pages	
Interpreting data and using data to solve problems	
Learning new things	
Interest in things you didn´t think about before	
Design what you are going to do using specific software	
Developing a prototype	
Thinking marketing strategies for commercials.	
Using specific software to edit videos for commercials	
Communicate ideas to peers using on line presentation forms.	

Table 2. Elements concerning personal aspects of the teachers students

Satisfaction level with the development of personal aspects	**Consider 1 is very low and 4 is very high**
Your creativity	
Your motivation	
Your confidence to plan classroom work using ICT	

3. Results and Discussion

The result of the 2014 and the 2015sureveys all together were as follows:

- **For skills developed**

Finding data in internet in trustful pages	87% consider very high none very low
Interpreting data and using data to solve problems	52% very high 9% very low
Learning new things	72%very high 5% very low
Interest in things you didn´t think about before	63% very high none very low
Design using specific software	70% very high 3% very low
Developing a prototype	85% very high none very low
Thinking marketing strategies for commercials.	62% very high 3% very low
Using specific software video edition	86% very high none very low
Communicate ideas to peers using on line presentation forms	81% very high 2% very low

- **For personal aspects**

Creativity	74% consider very high none very low
Motivation	91% very high, none very low
Confidence to plan classroom work using ICT	47% very high, 4% very low

The percentages shown above tell us that most of the teacher students think that have improved their skills and also their personal aspects have been satisfied. The items with the highest percentage skills are related to actions they usually practice in every day life and this strategy only helped them improve. It is interesting to point out though that developing a prototype is not frecuently done at home but has probably a high punctuation because it was amusing for them inventing something new. Surprisingly interpreting data to solve problems was very low punctuated by a lot fo students eventhough all could solve the main problem that was to make a prototype work. This probably has to do with a different vision of what a problem solving means in regular classes.

4. Conclusions

The feedback provided by the students surveys and teachers observation of the final work indicate that this approach for training student teachers in the use of technology for educational purposes is convenient and needs to be improved. There are still many questions about what skills must be developed for training future teachers and how may ICT be part of new learning environments.

The incorporation of ICT in teacher education along with good practices , will allow future teachers to make systematic use of them and innovate in their classrooms. (España, Foresi 2009)

The use of new technologies in education is fully justified if we consider that one of the basic goals of education should be the preparation of the two children to be citizens of a pluralistic , democratic and technologically advanced society (Perales; Cañal de León 2002).

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The study program open to new societal needs and challenges of the labour market - on the example of the project "Career guidance open to ecological awareness development of a society"

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Abstract

The aim of the study (poster) is primarily to present assumptions, current results and possible directions for further research and practices related to project implementation titled "Career guidance open to ecological awareness development of a society" [in Polish: Poradnictwo zawodowe otwarte na kształtowanie świadomości ekologicznej społeczeństwa] (FSS/2014/HEI/W/0032), financed with the Norwegian funds and domestic funds under the Polish Higher Education Development Programme [Program Rozwój Polskich Uczelni], Scholarship and Training Fund [Fundusz Stypendialny i Szkoleniowy], realized (1/1/2015 – 5/31/2016) at the Department of Pedagogical Sciences of the Cardinal Stefan Wyszyński University (UKSW). The analysis both literature and the currently undertaken research activities, among others, leads to the conclusions that there are at least three important tasks which modern higher education has to face. 1. The promotion of solutions, including educational ones, which aim at limiting the possible risks to human life (deterioration of its quality) resulting from the type of profession and work organization; 2. Active participation of vocational guidance consultants (present and future) in building sustainable and environmentally friendly societies. 3. The necessity of cooperation among local entities (including universities) involved in lifelong vocational guidance. In this context and with reference to the concept of "green" universities and the engaged university concept, the following question also becomes important: What is the role of higher education institutions in shaping pro-environmental attitudes?

Keywords*: higher education institution, vocational guidance, environmental awareness, labour market, continuous improvement .*

1. Introduction – from theory to practice

According to the "Expertise on education for sustainable development in Poland" [in Polish: "Ekspertyza dotycząca edukacji dla zrównoważonego rozwoju w Polsce"], the above-mentioned education is carried out primarily in the form of projects (targeted at schools) by NGOs, Ministry of Environment, local governments and local institutions. Adults are usually educated through children and young people or at the workplace, but still not very often. Thus, in the aforementioned report it is stressed that adult education on sustainable development should be realized in various ways and using a variety of sources, in order to reach as many people as possible (ITTI Consultants Team & Ministry of Environment, 2012). This recommendation was also taken into account during the planning and implementation of project activities recognized in the present text. Universities are also responsible for popularizing the idea and implementation of the principles of sustainable development, that educate future workers, employers and leaders of social life. The point is also about the opportunity to acquire (during the education process) pro-environmental knowledge and skills necessary for work.

The presented project, titled *"Career guidance open to ecological awareness development of a society"*, fits well in the increasingly popular in Poland engaged university concept, which focuses on the developmental role of a university and its capabilities of adaptation to regional needs. Assuming a more open, but also pro-innovative character of higher education institutions (Goldstein, 2010). The analysed project takes into account the needs of the labour market, it is also an opportunity to create a network of cooperation between local institutions and is an example of an approach to the problem of innovation from the creative process perspective, treating innovation as a set of skills, a different way of organization, synthesis and expression of knowledge, perception of the world and creating new perspectives, reactions and products (Triz, 1997). **Therefore, this project aims primarily at:** shaping the environmental sensitivity of people participating directly or indirectly in the implementation of vocational guidance services, equipping them with environmental knowledge and the ability to shape pro-environmental attitudes, especially among those who carry out activities aimed at environmental education at school, in extracurricular education institutions and workplaces.

2. Forms and methods of implementation of the project

To achieve the above-mentioned results, the framework of the project (the main project coordinator - dr hab. B. Baraniak, prof. UKSW) included two-semester postgraduate studies on *"Career guidance open to ecological awareness development of a society"*. Their program (authors: prof. B. Baraniak, prof. D. Cichy) – established on the basis of educational results approved by the University Senate (Resolution No. 166/2014) – includes content dealing with pro-environmental attitudes, entered in the content of

professional advice directed, among others, to students pursuing educational and professional decisions, job seekers and also employers and employees, open to the knowledge of sustainable development. As a result, the study program goes beyond the traditional concept of counselling, stressing the importance of education at the formal, non-formal and informal level (EU Council Resolution, 2008/C 319/02). It also promotes educational and professional counselling, which is bound to assist people in managing their careers and building self-esteem and is designed to provide the knowledge and skills necessary to overcome life's difficulties. Such support should be available at different stages of life, in schools, workplaces, labour market institutions, local communities (OECD & EC, 2004). Therefore, the study program consists of two thematic modules:

1) Environment in shaping environmental awareness of society (number of hours for the module - 120), including the following subjects realized in the form of lectures and classes: Basics of shaping ecological awareness, Basics of environmental axiology and deontology, Business vs environment, Legal aspects of environmental protection, Culture vs human ecology;

2) Environment in vocational guidance (number of hours for the module - 150), including the following subjects realized in the form of lectures, classes and workshops: Occupational knowledge and vocational guidance methodology in the ecological aspect, Vocational guidance in the popularisation and development of pro-environmental economy including agriculture, Vocational guidance in shaping pro-environmental and pro-health attitudes in the society, Vocational guidance vs pro-environmental attitudes of employees and employers.

The content of the aforementioned subjects includes, among others, the answer to important societal needs (e.g. the development of health self-awareness). Over 70% of Poles give health as the most important value in their lives, just after family happiness. However, health attitudes for most people are only general declarations (CBOS, 2012). A conscious society, engaged in making deliberate choices in different areas of life – as basic units of the society, professional groups and local governments – is a prerequisite of directing a country towards a sustainable way of development. In "The Strategy for Sustainable Development of Poland until 2025" [in Polish: "Strategia Zrównoważonego Rozwoju Polski do 2025 roku"] we read also that educational programs should promote values and life-styles other than those consumption-oriented (Ministry of Environment, 1999). This is what happened in the case of the project studies, including e.g. the problem of achieving well-being at work, motivational programs concerning changing the organization of work or work-life balance.

On the other hand, the answer to the challenges of modern economies and labour markets are included in the following (discussed during studies) issues: strategies for safe and economical disposal of household waste; responsibility programs to water quality; employment opportunities in pro-environmental occupations; risks occurring in industries and occupations having a negative impact on the environment; solutions that minimize the incidence of occupational diseases, the possibility of effective cooperation among local entities on pro-environmental issues, forms of extracurricular education useful in solving the problems of sustainable development. The syllabi of subjects included issues identified as significant **ecological opportunities** (decisive works on the transposition of the EU environmental legislation, well-managed public forests) **and challenges** (limited possibilities for performing an economic analysis of environmental policies, low level of innovation), and are described, among others, in the latest Polish ecological review (OECD, 2015). During the studies, also the following issues were discussed: social and environmental responsibility among companies, eco innovations. At this point it is worth noting that pollution, in the eyes of EU societies, is considered one of the most negative effects of business – after corruption, non-compliance with labour standards and reduction of jobs (Eurobarometer 363, 2013).

Referring to the analysed project it should also be noted that when planning the educational process, it was ensured for the course to be dominated by activating methods (brainstorming, debate, map of associations, working in teams, case studies). Acquainting the participants of the course with the currently undertaken actions aimed at the protection of the environment, including the use of unconventional methods, e.g. utilisation of waste generated from industry or service activities, allowed study visits at employers' premises. This is consistent with the assumption, which at the same time constitutes a specific challenge that environmental education should aim for greater interrelations between the process of teaching and the reality. Post-graduate students (61 people) also take part in the preparation and presentation of group projects – they prepare, among others, pro-environmental solutions in their workplaces or homes and develop a concept for their implementation. Actively conducted courses are not only aimed at sensitizing, moving emotions, but also motivating for further education and self-education, which is what the students have proved with their projects.

3. The perspective of the development of project activities

Today, not only educational and vocational guidance, but also education faces an important challenge of promoting specific occupations, labour and its organization, and the implementation of specific plans, strategies and programs that minimize potential risks to human health and life. Therefore, the framework of the project includes the preparation of

didactic materials dedicated for the e-learning platform and two peer-reviewed publications: "Shaping ecological awareness society. Theory and practice", science editor: prof. dr hab. D. Cichy [in Polish: "Kształtowanie świadomości ekologicznej społeczeństwa. Teoria i praktyka"] and „Vocational guidance in shaping society environmental awareness. From theory to practice", science editor: dr hab. B. Baraniak, prof. UKSW [in Polish: "Poradnictwo zawodowe w kształtowaniu świadomości ekologicznej społeczeństwa. Od teorii do praktyki"]. The authors of elaborations sought primarily to draw attention to environmental risks (at the national and European levels) and the resulting need for shaping environmental awareness among people who determine the level of education, both general and vocational. The developed teaching materials in an electronic format, books, the program of studies – available not only for the participants of the project – will also contribute to a wider promotion of knowledge conveyed during the course.

In addition, it is assumed that the ongoing project will also bring the following benefits:

1) For participants in the project (besides the aforementioned values)

- Workshop scenarios developed during the studies and presented in publications, tools used by today's vocational guidance consultants, as well as forms and methods of education characteristic for modern enterprises will enhance the students' working environment.

- The project reflects the fact that today's employers search for people endowed with the, so called, soft competencies, such as the ability to organize work, work management with regard to the need of minimizing waste – a threat not only to the environment but also the health of employees and their safety at work.

- Increased environmental awareness of the project participants will also translate into their personal actions (concerning the workplace or household) having a positive impact on the environment, as well as their everyday lifestyle.

2) For the university implementing the project

- Knowledge and skills of the post-graduate students – the knowledge of practitioners with great professional experience e.g. in public employment services, will be utilized through conferences, lectures or workshops.

- The activity of the students of the Department of Pedagogical Sciences at the Cardinal Stefan Wyszyński University in the project allows them to acquire essential skills (organizational, communicational) and establish new professional contacts, it can also help to launch new "green" academic ventures.

- Actions undertaken within the framework of the project are also aimed at increasing knowledge and awareness of the entire university community, concerning the protection of the environment and environmentally friendly jobs.

3) For external stakeholders

- Study visits in enterprises are an example of measures aimed at enhancing the cooperation between university and employers – and an opportunity to establish new contacts, which may be useful in the future, e.g. in developing a program or path of education; conducting research, or organizing apprenticeships;

- The potential of the teaching staff and the experience gained in the project can be used and developed during the forthcoming projects: the preparation of new courses, specialization, thereby extending the business offer of the department.

- The conference, expected to be held at the end of the project, will contribute to enhancing institutional cooperation, among others, at all levels of education (both general and vocational), and will include representatives of the labour market.

4. Conclusion

Most of the above-mentioned points fit in, primarily, in social and environmental aspects of the awareness of sustainable development. However, we cannot forget about the correlated economic aspect. The adopted by the European Council "Europe 2020" Strategy has identified three interrelated development priorities: 1. Smart growth - economy development based on knowledge and innovation; 2. Sustainable growth - supporting economy being more resource efficient, greener and more competitive and 3. Inclusive growth - promoting a high-employment economy which delivers social and territorial cohesion (EC, 2010).

In the case of adults it is worth talking about the principles of sustainable development using the language of profit. It should also be ensured that the actions are not just occasional actions, but that they should constitute part of the strategy – e.g. education for sustainable development in all fields of study. Such education at university level should also include: various forms of professional development, popularization of innovative scientific achievements, the search for innovative methods of education and participation in national and international programs, cooperation between universities and learning from the experience of others (Sustainia & IARU, 2014). Pedagogical education institution can also help popularize the idea of taking pro-environmental actions, e.g. among the cooperating employers, while taking into account the environmental determinants of human capital management models in companies.

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The Bologna process: a study about teachers´ perception of their new role and its consequences

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Abstract

The present paper analyzes the implications of the Bologna Process concerning two specific issues: the perception of teachers about their new role and its consequences, and to what extent the adaptation to Bologna has brought about major or minor changes in the teaching methodology. In addition, we examine whether differences of opinion arise depending on the distinct personal and professional characteristics of each teacher. The conclusions of the paper note the benefits and drawbacks encountered that can help in setting out future goals.

The results reveal that most of the methodological changes undergone by the teachers stem more from the new profile of their students than from mandatory regulations. There is a unanimous opinion that the time and effort dedicated to teaching is now notably greater and that it is necessary to develop a rigorous system of teaching evaluation. In addition, we observe two clear aspects: on the one hand, staff with longer experience has carried out more changes and uses new technologies to a greater extent and, on the other hand, the use and promotion of English in class is still a crucial issue. This paper focuses on Economics and Business teachers, but most results apply to other degrees.

Keywords: *Transformed Role of Teachers; European Higher Education Area (EHEA); economics education; university teaching; teaching methods*

1. Introduction

University in general, and in Spain in particular, has undergone a significant change in recent years. We have witnessed important social, economic, and technological transformations which have lead us to a completely different scenario. In this context, the development of the European Higher Education Area (EHEA) brought about specific and regulated changes in degrees, affecting both the organization of the institutions and the formal structure of the courses and, most importantly, a new approach to teaching and to learning.

All this process has generated great controversy both among teachers and students and, despite education always being in continual evolution, it seems that there is a consensus that now is the moment to evaluate not only what has been done in Spain but also the exact manner in which it has been done. The concern is not to continue making alterations but to reflect on those already made, to know what consequences have emerged from the transformation process and detect problems before setting out future goals.

In recent years papers on this subject have been published. Many of them are reflections concerning diverse aspects of the EHEA (Rabinet 2008; Fernández, Carballo and Galán 2015), others are descriptive studies analyzing a specific new teaching methodology (Cabello and Antón 2005; Trilling and Fadel 2009, Macfarlane 2011) and there are also numerous papers based on students opinions or attitudes (Linblom-Yläne, Trigwell; Negui and Ashwin 2007; Fernandéz-Sainz, García-Merino and Urionabarrenetxea 2015). However, studies on teaching staff questionnaires are scarcer. The information provided by this type of work is very valuable since it will allow us to know lecturer's opinions about the negative and positive aspects of this process. Moreover it is important to have a sufficient number of this type of research so that we can draw clear and verified conclusions that can be considered in future reforms in higher education.

Hence, we present a new study towards this objective. By means of a survey of University teachers in the fields of Economics and Business, we can analyze their perception of this process in these key ways: the new methodologies which have been implemented and the reasons for the change; the extent to which this whole process has modified their way of working and, finally the benefits and drawbacks encountered. Moreover, we examine whether differences of opinion arise in terms of the distinct personal and professional characteristics of each teacher.

This type of study is not easy to conduct on the University system as a whole. We have chosen Economics and Business university studies for two reasons. First, the application of most of the contents is practically immediate (financial products, business management, etc.) so that changes in methodology have been rather abrupt. Second, these are degrees with a high demand profile and a high rate of employability. Nevertheless, even with these particular features, we found that many of the conclusions can be generalized to other degrees.

2. Methodology

Participants were 370 teachers (181 females and 189 males) from Spanish public and private universities with degrees in Economics and Business. In order to achieve the objectives stated, a survey with nineteen questions was developed according to a five-point Likert scale, where Strongly disagree = 1, Disagree = 2, Somewhat agree = 3, Agree = 4 and Strongly agree = 5. This questionnaire was organized in two parts. Eight questions were included in the first part with the idea of assessing to what extent the Spanish university teacher is assuming a new role in the classroom and eleven questions were included in the second part with the objective of knowing to what extent these teachers have articulated changes in the development of their lectures. The selection of the questions is based on what we saw in other papers, the information we want to achieve and on our own personal experience and perceptions in relation to the most important recent changes.

Information on this study and the hyperlink giving access to the questionnaire (which was available on the Web) was sent to all deans and directors of Spanish universities with degrees in Economics and Business, who then circulated it to all the teaching staff.

3. Findings and discussion

3.1. Teacher evaluation of the change process

In the first part of the questionnaire eight items referring to the study of teacher perceptions about change are raised and it is worth noting the high response rate in most of them (Table 1).

Table 1. Summary results about the perception of teaching changes

Assertions	N	%	Mean	Median	Mode	Standard Deviation
1. In recent years I have considerably changed my teaching methodology.	370	100%	3.6	4	4	0.947
2. Changes in teaching methodology have been made on my own initiative in order to adapt to the student profile.	366	99%	3.83	4	4	1.028
3. Changes in teaching methodology have only been given by the implementation of new degrees.	367	99%	2.97	3	4	1.249
4. The new teacher role requires a greater dedication to teaching than traditional teaching.	368	99%	4.54	5	5	0.787
5. I believe it is necessary to assume specific training to take on the new role.	367	99%	3.56	4	4	1.227
6. The lack of time and resources are real obstacles to obtaining better teaching development.	367	99%	3.75	4	5	1.171
7. Research assesment in university teaching prevents me from devoting time to teaching practice/work.	360	97%	3.65	4	5	1.264
8. The definition of a reliable and rigorous system of teaching and traininig quality assesment for he university teachers should be necessary.	363	98%	4.47	5	5	0.853

The item which generates a greater consensus, in line with the findings of Ariza et al (2014) and Quevedo-Blasco et al (2015), is the one related to the greater teaching dedication.required by the new role of the teacher in relation to the dedication formerly required in traditional teaching (item 4). This question is followed closely by the fact that there is a general feeling among teachers consulted regarding the need to define a reliable and rigorous system of teaching quality assessment (item 8, in the same way as an assessment of their research activity is made). This matter is also stated by teachers in Quevedo-Blasco et al. (2015), indicating that the teacher evaluation methods are inefficient.

From the answers to questions 2 and 3 we deduce that changes made in teaching methodology have not only been due to the implementation of the new degrees, but rather due to teachers´ commitment to connect with students much more. In fact, 69% of teachers state that they have made changes in the teaching methodology on their own initiative and not by external demands.

Regarding the need to assume specific training to take on the new role, 57% of teachers agree with this assertion. These results differ somewhat from those obtained by Ariza et al. (2014) and Quevedo-Blasco et al. (2015). In these papers, 60.5% and 50.8% of teachers, respectively, consider that they have adequate training to teach in the EHEA context, while 32.8% and 35.8%, respectively, maintained that they could improve and would need to receive more training.

For the analysis of the issues taking into account the personal and professional characteristics of the interviewed subjects, we use contingency tables in order to show evidence of significance between the answers and the different characteristics of the teachers. Table 2 provides the results of contrast, highlighting in bold those cases where the null hypothesis is rejected and there is therefore significant association (corresponding to higher values of the statistical chi-square and p-values taking a value less than 0.05).

Table 2. Pearson Chi-square test.
Analysis of teacher´s perception taking into account the teacher profile.

	QUESTION NUMBER								
VARIABLE	1	2	3	4	5	6	7	8	
Gender	**8.191**	2.648	**10.824**	**14.173**	**12.029**	5.095	7.503	1.925	*Value*
	0.042	0.449	**0.013**	**0.003**	**0.007**	0.165	0.057	0.588	*Sig.*
Employment Situation	14.822	**31.221**	16.982	5.053	8.332	14.760	11.512	5.070	*Value*
	0.251	**0.002**	0.152	0.282	0.759	0.255	0.486	0.535	*Sig.*
Professional Status	22.069	**29.873**	18.311	**22.035**	25.422	**37.086**	**32.281**	15.979	*Value*
	0.229	**0.039**	0.107	**0.037**	0.114	**0.005**	**0.015**	0.594	*Sig.*
Teaching Experience	**25.461**	16.078	11.899	9.519	12.154	7.051	19.843	16.856	*Value*
	0.013	0.188	0.454	0.658	0.433	0.854	0.071	0.155	*Sig.*
Public/Private University Institution	6.905	3.618	2.082	0.387	2.507	0.565	0.376	1.724	*Value*
	0.075	0.306	0.556	0.943	0.474	0.904	0.945	0.632	*Sig.*
Subject Area	16.033	17.098	16.142	4.844	**25.366**	7.539	20.872	23.821	*Value*
	0.381	0.313	0.373	0.774	**0.045**	0.941	0.141	0.068	*Sig.*

Once it is known that a significant association exists between two nominal variables, the corrected standardized residuals[1] are used to accurately interpret the meaning of the detected association (when interpreting residuals focus must be placed on those presenting absolute values larger than 2, as these are the ones providing evidence of relationship).

The results reveal that teachers with less experience claim they have undertaken a lesser degree of change in their teaching methodology than teachers with experience between 10 and 20 years. With respect to the labor situation, we also find that teachers who are civil servants, facing the permanent staff, are the ones who have expressed greater agreement with item 2 (changes in teaching methodology have been carried out on my own initiative in order to adapt to the student profile). On the other hand, it can be stated that these are mainly teachers who have "junior" profiles (Assistants and Temporary), who mostly believe that research assessment as well as the lack of time and resources, are real obstacles to performing a better development of teaching.

Considering the gender variable, it can be observed that men agree less than women with items 3, 4 and 5. Females request more than males specific training in order to take on a new role which they believe requires more dedication than traditional teaching. They also confessed to have made changes in teaching methodology mainly due to the implementation of Degrees. Considering the area of knowledge, a different perception regarding the need for training to assume the new role can be detected.

[1] Standardized residuals are available upon request, but they have not been shown due to space limitations.

3.2. Specific implications for Teaching Methodology

In the second part of the survey eleven items referring to changes in teaching conducted by university lecturers of Economics and Business were included. Our findings show that the teachers interviewed have modified their teaching methods significantly, the material for students work (item 6) and the use of computers and audiovisual resources (item 9), being the items acquiring a higher score (see table 3). In addition, there is unanimous agreement which indicates that now content matters as much as the procedure used to teach (item 8), which is a very important aspect to keep in mind when considering training courses for university teachers.

Our results also show that the use and promotion of a foreign language in the classroom (item 10) is still a pending issue in higher education, confirming the results obtained by Cavero et al. (2014), who observed the low presence of subjects linked to instrumental generic competences, like languages, on the European level Business Administration (BA) degrees (see Table 3).

Table 3. Summary results about the perception of implementation teaching changes.

Assertions	N	%	Mean	Median	Mode	Standard Deviation
1. My lectures are increasingly more interactive.	368	99%	3.98	4	4	0.909
2. I look for greater involvement by students.	368	99%	4.31	4	5	0.755
3. I encourage the student to work in a more independent way.	368	99%	4.15	4	4	0.801
4. I plan and prepare the daily classwork to make classes more participatory.	364	98%	4.11	4	4	0.779
5. I prepare topical issues by adapting them to the topic of the classes.	368	99%	4.23	4	4	0.832
6. I prepare material for students work (problem solving. summary guides. activities to develop…..)	368	99%	4.4	5	5	0.840
7. I plan and organize debates on some issues.	368	99%	3.45	4	4	11.589
8.In the new role of the university teacher. not only content ("what to teach") is important. but also method ("how to teach").	364	98%	4.45	5	5	0.829
9. Frequently I use computers and audiovisual resources in the classroom.	368	99%	4.36	5	5	0.970
10. I promote the use of a foreign language in my classroom (with readings. explanations. et…)	370	100%	2.81	3	2	13.385
11. I correct. guide and mentor several student projects.	367	99%	4.08	4	5	10.059

Due to the existence of high correlations between the answers (to the eleven items) found in a preliminary analysis of the variables, it was considered appropriate to apply the technique of principal component analysis. We have applied this technique of data reduction as an intermediate step obtaining, three new uncorrelated variables (dimensions) between each

other, which, later on, will be used to perform differential comparative analysis by taking into account the personal and professional characteristics of the interviewed subjects.

In the case of dimension 1 the first eight items (apart from 11) are shown to highly saturate that factor, so it is considered a measure of the degree of interactivity and planning in lectures of all the teachers interviewed. Dimension 2 indicates the degree to which teachers use new Information Technologies (NICT) in their classrooms and promote a foreign language, which is related to the acquisition and development of generic skills. Finally, it can be stated that dimension 3 only corresponds to item 7, which concerns the extent to which teachers interviewed organize classroom discussions on topics related to the subjects being treated.

The next step is testing Anova on each of these three dimensions or new variables in order to study whether the answers are the same for the different groups (p-value <0.05) or if there is a common viewpoint. On the basis of the results obtained with the ANOVA test[2], dimension 1 (interactivity and lesson planning) show relevant differences when the gender variable is considered. It enhances the high percentage of women (83 %) compared to men (65 %) who report that their classes are increasingly more interactive. The major involvement of women is also evident in all other questions, except question 5, where the results obtained by both sexes are broadly similar.

In the case of dimension 2 (use of NICT and use of foreign language), different average results are observed by taking into account the professional features (employment situation, professional status and experience in the teaching practice). Regarding the employment situation and teaching experience, the highest percentage of teachers who agree or strongly agree with question 10 (Promoting the use of a foreign language) are the civil servants and teachers who are in the range of 20-30 years or have over 30 years of teaching experience.

According to professional status (rank or work category), it can be observed that lecturers with greater stability (Full Professor and Associate Professor) are the ones using NCIT to a greater extent during the development of classes, which is also confirmed from the analysis of the labor situation as 88% of teachers who are civil servants agree or strongly agree with question 9 (table 3). With regard to the other employment categories the Assistant Professor position can be highlighted, as 85% of teachers from this group reveal they habitually use these resources in the classroom.

4. Conclusions

This paper analyzes the implications of the Bologna Process concerning two specific issues: the perception of teachers of their new role and its consequences, and to what extent the

[2] Tests for equality of means-One way ANOVA have not been shown due to space limitations.

adaptation to Bologna has brought about major or minor changes in the teaching methodology.

On the one hand, there is unanimous opinion that the new role of the University teacher (more committed to the ongoing assessment and interactive classes, using NICT actively, fostering tutorials, etc.) requires greater dedication than the traditional one which should be taken into consideration by the university system. Attention should be drawn to the staffs´ concerns to have a reliable and rigorous system to evaluate their teaching, in line with the assessment of the research activity. The great importance given to research can prejudice lecturers who invest more effort in improving the quality and effectiveness of their classes.

Regarding certain changes in the way of teaching, it is important to highlight that the teacher attaches great importance to the development of his/her own material for students as well as the increased use of NICT. As expected, the University is moving in this direction at the same pace as society. It can be concluded that teachers are aware that in the new context or educational setting, content is as important as procedure when transmitting knowledge to students.

In relation to professional characteristics, the teachers interviewed with 10 to 20 years of experience are those incorporating more changes in teaching skills. On the other hand, this research shows that the teachers interviewed with less stable profiles in the workplace and who are less experienced (Temporary staff and Assistants) believe that research, as well as lack of resources and time, prevent them from devoting more time to their teaching. In terms of gender, women feel to a greater extent the need for training and for involvement in order to adapt to the challenges of the new teaching model promoted by EESS and the new role that university teachers must acquire.

Finally, it is important to note the fact that the use of English in the classroom is severely limited in the Spanish university education system. It is absolutely necessary to make progress in this issue and to attempt to solve it with the necessary measures so that the Spanish University may have a significant presence in the world.

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Audiovisual Tool for understanding Audio concepts for being used in bachelor's degree programmes

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Abstract

In the Audio Signal Processing field, there exists difficulties in order to explain different concepts such as compression, masking, quantization, sampling, among others. Further, most of these concepts require the use of audio laboratories and multiple practical session that must carry out students. Another issue is that there are students that are not able to internalize these concepts straightforwardly and require more practical sessions. In order to address these problems, we have developed an audiovisual tool, designed with Matlab, that can be used for professors and students. This tool allows to analyze, test and apply the audio concepts to real audio signals. The developed tool has been successfully experienced by professors of the audio signal processing field that recommend its use in upcoming academic courses.

Keywords: *Audio Processing; Matlab; Software Interface; Teaching Tool.*

1. Introduction

Learning and teaching are two concepts that are highly related. However, the way we teach is changing day to day. Different works such as Shyr (2010), Bonwell (1991) and McKeachie (1994) indicate that students retain much more when they directly experiment at laboratory in contrast to the traditional classroom lectures where they only see or listen concepts. In agreement with the above mentioned perspectives, the field of education has been affected by Information and Communication Technologies (ICT's) which contribute to improve student learning and better teaching methods. Through ICT's, teachers can easily explain complex concepts and ensure student's comprehension. Furthermore, they are able to create interactive classes and make the lesson more enjoyable, which could improve the student attendance and concentration.

In this context, it is important to note that teaching audio concepts can be difficult for understanding if there is not a proper laboratory and all lectures are given in a theoretical way. Moreover, audio concepts are full of abstractions and signal theory that can tire and demotivate the students -see Christensen (2010), Hanrahan (1998), and Henning (2007)-. Practice lectures in audio processing are totally mandatory. However, there is occasionally schedule limitations that prevent to carry out the necessary practical sessions. As a consequence, multiple concepts are misunderstood by the students, which are not able to carry out a complete learning. Moreover, there exists universities that do not allow students to access to laboratories outside lectures schedule by themselves, which means an important restriction.

To solve this issue, we have developed a audiovisual tool that has mainly two applications: to show different audio concepts in order to help students to understand this concepts from a perceptual (visual and sound) point of view, and, at the same time, to help teachers in their teaching activity. One of the most advantages of this tool is that students are able to execute it in their personal computers and future versions will be available in mobile devices.

The paper is organized as follows. Section 2 describes the software and the design used for the development of this application. Section 3 explains in detail the four audio concepts that can be learnt with the proposed tool. Finally, conclusion remarks are given in Section 4.

2. Application features.

Currently, a significant number of signal processing researchers and engineers develop their algorithms under MATLAB (2015). MATLAB offers and excellent signal processing development environment because of the "DSP System Toolbox". Moreover MATLAB offers Object Oriented Programming (OOP) that simplify the development . The presented

tool provides the user with a friendly graphical interface (GUI). The fact of using MATLAB allows the tool to be run under different operating systems. Another important factor is that this tool does not requires previous knowledge about MATLAB programming.

The GUI represents the framework that allows the user interaction. As is appreciated in Figure 1, the GUI is divided in three blocks. At the left hand side, four applications that are linked to four different audio concepts are presented. When the user selects one of these concepts, it appears at the center of the GUI a description of this concept and different options that depends on the concept to evaluate. Normally these options are composed of different sounds such as noise or a signal generator, among others. In the following section, we will specify the characteristics for each implemented concept. At the right hand side, the user will appreciate three plots that will show the waveform in different domains: time-domain (top left), frequency-domain (top right), and spectrogram (bottom).

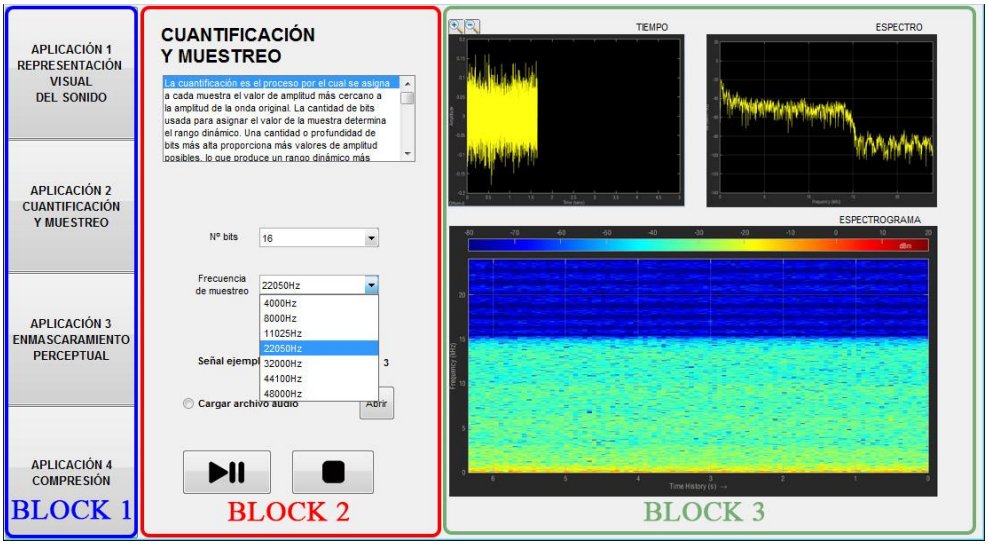

Figure 1. Main interface of the implemented tool.

3. Audio Concepts and Hands-on approach

During an audio course, the students must study multiple and different audio concepts. Among them, there exists audio concepts that are difficult to understand since they are plenty of mathematical formulations such as visualizing a signal in multiple domains, quantification and sampling, masking and compression. These four concepts are tackled in four different applications inside the tool from a perceptual (visual and sound) point of view as follows:

3.1.Visual representation of audio signals (time and frequency domain)

The temporal representation of a signal shows the time evolution with respect to an amplitude level and it is usually the most common way to see a waveform. But, in some cases, the frequency representation can help us to understand better some characteristics of audio signals since we perceive sounds from a tonal content point of view. The mathematical formula that transforms time domain functions to frequency domain functions is the Fourier Transform -Oppenheim (1975)-. A spectrogram is a useful visual representation where frequencies and amplitudes of audio signals are displayed at the same time as its time evolution. Figure 2 shows a capture of the first application of the tool that corresponds to the visualzation of signals in different domains. Spectrogram shows the amplitude at various frequencies (usually on the vertical axis) at a specific time (horizontal axis). The colors of the spectrogram indicate frequency power levels. Usually, bright warm colors indicate frequency content with higher power and dark cold colors indicate frequency content with very low power. A strong red horizontal line indicates the existence of a tone at a concrete frequency.

This application allows to generate sinusoid signals introducing its frequency and amplitude in an intuitive way. In addition, there is a noise generator that allows to select among different types of noises. Finally, this tool includes also the possibility of loading audio files in different audio formats.

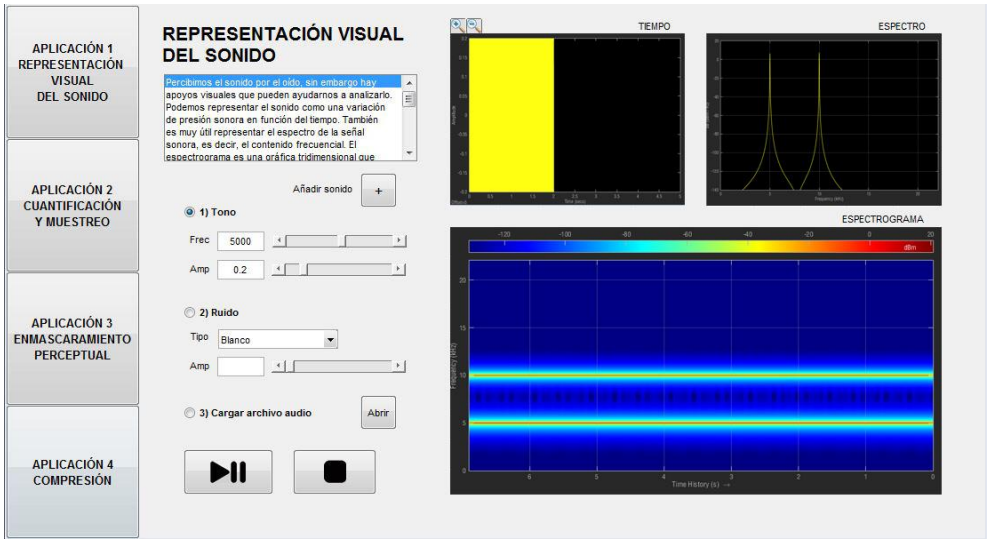

Figure 2. Capture of the first application of the tool that corresponds to the visualzation of signals in different domains.

3.2. Quantization and sampling

As described in the previous section, audio signals can be represented as a function that depends on amplitude and time, both continuous values in nature. However, to store audio signals into a digital device, as a computer, it is required to convert the continuous signal amplitude and time values into a discrete representation.

This occurs because digital devices store signals using finite numbers of bits. Thus, both amplitudes and time values can take discrete values. The process of digitizing the time is denoted sampling and the process of digitizing the amplitude is called quantization.

Sampling is the process of recording an analog signal at regular discrete moments of time. The sampling rate is the number of samples per second and the time interval between samples is called the sampling interval. Sampling allows us to convert continuous-time signals into discrete-time samples without loss information if the sampling rate is high enough. The Nyquist-Shannon sampling theorem states that the sampling rate for exact recovery of a signal is larger than twice the maximum frequency of the signal.

Quantization converts the amplitude of a signal in a finite set of values. Unlike sampling, it is generally irreversible and causes loss of information. As a consequence, quantization introduces distortion into the signal (that is denoted in the literature as error quantization). This distortion indicates the amplitude difference between the samples and their quantized versions.

The second application allows to select between quantization and sampling. The tool allows to select the number of bits for the quantization option and the sampled frequency for the sampling. In both cases, the user can select between different sample signals or load an own audio file.

Figure 1 shows a capture of the second application of the tool where it is illustrated the difference between the original signal and the processed signal in terms of time, frequency and spectrogram.

3.3. Auditory masking

The masking is a well-known and common phenomenon that frequently surrounds us. This phenomenon occurs when a louder sound (masker) occurs at the same time as a softer sound (masked). As a consequence, the louder sound prevents to hear the softer sound. This phenomenon is known as frequency masking. When the masker and the masked are not presented simultaneously, we refer to this phenomenon as temporal masking. In addition, masking can occur before the presence of the masker (pre-masking) and after the presence of the masker (post-masking). It is important to note that the masking is related with the hearing threshold that represents the lowest sound level that we can hear at a given frequency.

The third application allows to visualize and hear perceptual masking effects. The user can select amplitudes, both of noise and of a click signal and change them in real time. Figure 3 shows a capture of the third application related to the masking phenomenon.

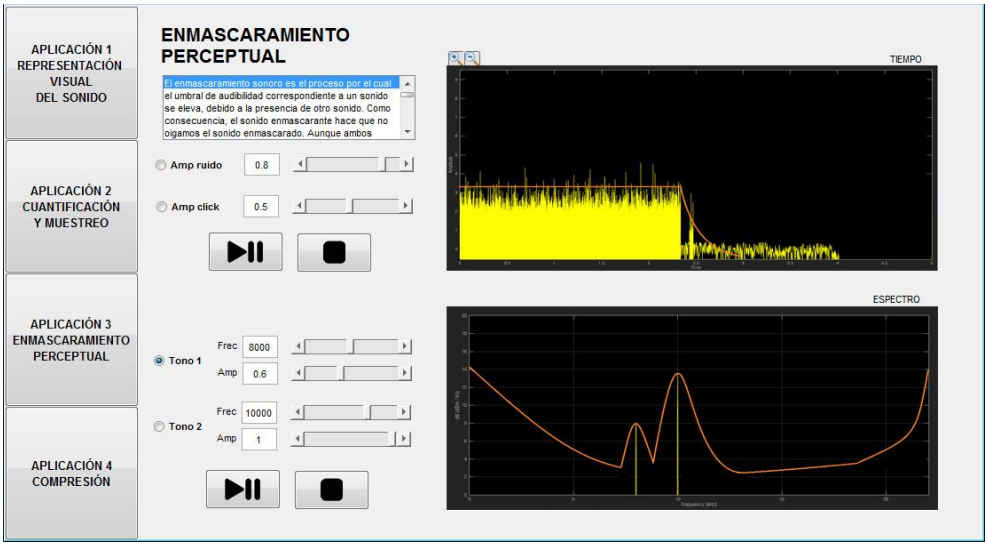

Figure 3. Capture of the third application of the tool where it is illustrated how the perceptual masking affects to a click signal and how a tone can perceptually mask another one.

3.4. Audio compression

The main objective of a perceptual audio compression system is to reduce the quantity of digital audio data by considering the manner in which humans hear. There exists two types of compression: lossless and lossy compression. In lossless audio compression, the decoded signal is exactly the same as the original one bit by bit. Examples of these audio formats are FLAC (Free Lossless Audio Coding) and WV (Wave Pack), among others. In lossy audio compression, the decoded signal is different as the original one. In fact, some data are removed. However, humans are not able to appreciate this effect. Examples of these audio formats are MP3, WMA (Windows Media Audio), among others.

It is interesting to highlight two important concepts in this fourth application: Compression ratio (the relation between the bits of the original signal and the bits of the compressed signal) and Bit rate (the number of bits that are processed per second). Note that a high number of bits involves more information and therefore more quality, but also more data to be stored in memory. Moreover, besides using different compression or bit rates, the design of the coders is based on different auditory phenomena. Figure 4 shows a capture of the

fourth application where the user is able to select among different types of encoders and bit rates. As in previous applications, the user can load its own audio files and the tool displays the differences between the original signal and the compressed signal in terms of time, frequency and spectrogram.

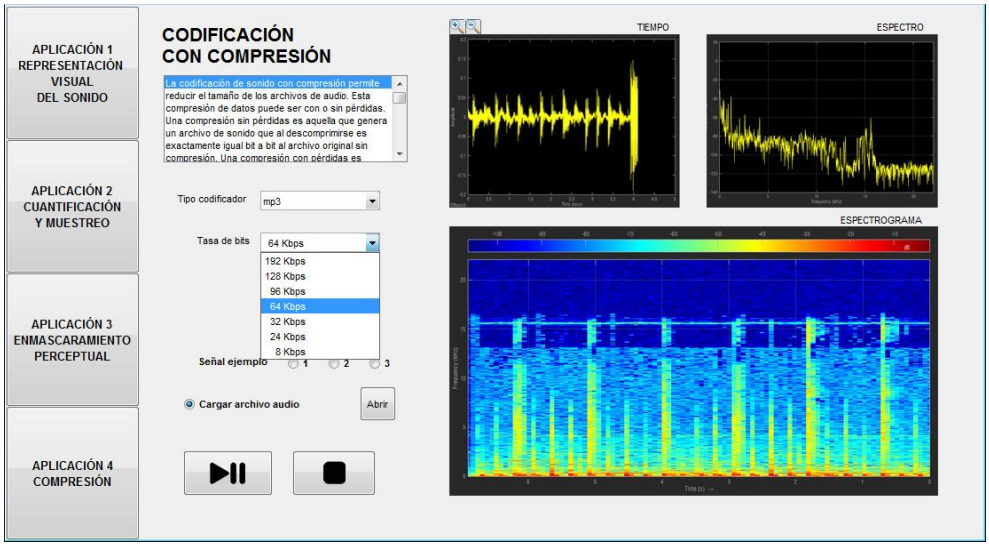

Figure 4. Capture of the fourth application where the user is able to select among different types of encoders and bit rates.

4. Conclusion

This work has presented an audiovisual tool composed of four applications that analyze and explain four audio concept such as visualizing a signal in multiple domains, quantification and sampling, masking and compression. The use of this application allows to teach these concepts more easily and help students to better grasp the concepts. As a future work, different improvements will be carried out. For example, this tool will be developed for being used also in mobile devices. Thus, the students may use their own mobile phones during class without being in a computer room. Other possibility consists in implementing others audio concepts such as filter design, delay-based effects (flanger and phaser), reverberation and spatial sound, among others. For this purpose we must consider if other theoretical audio concepts need a visual aid to understanding.

Acknowledgements

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