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Session 1a

Assessment

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Assessment of oral and written communication competences in the European Higher Education Area: a proposal of evaluation methodologies

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Abstract: The international accreditation for the Master and Bachelor degrees offered at our university, together with the demands of the employers, have made it clear that the students' curricula should specify not only what they have studied, but also what they are actually able to do. Although the competence based curricula approach has been used in the development of the new programmes for the Master and Bachelor degrees within the European Higher Education Area in recent years, the assessment of these competences is still a pending task. This work presents an 'outcomes' approach for the assessment of the oral and written communication skills within subjects related to mechanical and materials engineering. In particular, this paper proposes some rubrics developed in order to quantify the level of achievement. These rubrics are based on the evaluation of some learning outcomes that can be observed by using different strategies during the course. Conclusions about preliminary results and the difficulties found in order to create these tools are also described here.

Keywords: competence assessment; learning outcomes; oral and written competence; rubrics

Introduction

The Bachelor and Master degree programmes developed at our university within the frame of the European Higher Education Area follow a competence based approach (A. Sursock, 2010; Murias, de Miguel, & Rodríguez, 2007; Rieckmann, 2012). These programmes clearly define the specific and generic competences to be worked in each degree, and also, the particular subjects along the degree. The assessment of the specific competences continues to be reflected on the students' curricula by using numerical qualifications, but the assessment of the generic competences has been passed over somehow. It has been understood that the students would have acquired these capacities and skills at the end of the studies. The international accreditation of these programmes, together with the requirements of the employers to have better information on the students' competences, have put the university to work on this issue (Andrews & Higson, 2008; Entwistle & Peterson, 2004).

This paper presents some results obtained in the frame of an innovative project (PIME program) on the evaluation of three generic competences that have been traditionally worked within subjects of mechanical and materials engineering: capacity for problem analysis; capacity for applying knowledge in practice; and communication skills, using name convention from Tuning (2014) (http://www.unideusto.org/tuningeu/). In particular, in this work some methodologies for the analysis of the skills in oral and written communication have been developed (Sparks, Song, Brantley, & Liu, 2014; Dunbar, Brooks, & Kibicka-Miller, 2006). The aim is to obtain reliable information in order to evaluate strengths and weaknesses of the students in the communication competences (Jonsson & Svingby, 2007). Furthermore, these methodologies of evaluation try to encourage students to participate and to be focused during lessons, as they will have to explain the key information in public to their classmates, in case of oral competence, and to develop a technical report dealing with the solution of a problem, in case of the written competence.

Some quantitative results are presented using data collected from two subjects: lab works on Materials Science, from the Bachelor degree in Chemistry Engineering, and Mechanical Vibrations, from the Master degree in Aeronautical Engineering, both offered at the Technical University of Valencia (UPV).

In the case of the oral competence, students were divided into work groups of 4-5 people for the Bachelor degree, while for the Master degree they worked individually. Students had to work during the time between lessons (1-2 weeks) to maximize their self-learning, so that they could expose the lesson in the best way to their classmates. Students were expected to interact, sharing concepts and strategies assuming responsibility for their self-learning and that of the other members of the class that were evaluating their work. It sought not only to develop public communication skills but also, to improve autonomous learning skills, critical thinking, synthesis capacity and responsibility to search for, analyse and verify main information to explain it to their mates. In the case of the written competence, students worked individually. Students were proposed to develop a pair of open case studies related to a specific subject. They were expected to be involved in a real problem in which, with all the acquired knowledge during the lessons, they had to decide a strategy, a method to apply, and to take decisions to solve the problem by explaining the plan and steps followed to achieve the solution. The method tries not only to develop the written communication skills, also to offer the students an active learning method as a challenge and an opportunity to deal with a real problem, that is, they have to plan hypotheses and make diagnosis of the chosen situation to find the best solution using their individual knowledge.

Methods

For the evaluation of the oral communication skills, students were asked to prepare oral presentations ranging from 10 to 15 minutes to explain some topics taught in the previous lesson to the class. The oral presentation was individual, but for the Bachelor students the work was team-based developed (4-5 people). To ensure that each member participates in a significant manner, at the beginning of each lesson the teacher would randomly choose a student to make the oral presentation of the group. The rest of the students and two teachers evaluated the presentation using the rubric below (**Table 1; *Rubric 1***). The students' presentations were evaluated considering eleven different items. The first four items were mainly related to the organization, structure and content of the whole presentation, that is, they correspond to the same dimension (content). The fifth item concerned the effectiveness into the interpretation and justification of the information presented and the sixth item evaluated how clearly the student structured and communicated the topic to the audience. The seventh item evaluated the technical language usage, and the eighth item was related to the use of additional resources (board, objects, examples…) that can ensure better effectiveness on delivery the information to the audience. The ninth and the tenth items were related to the temporal planning, and to how well the speaker explained to the audience in terms of diction, corporal position, tone of voice and visual contact, respectively. Finally, to evaluate the analytical capacity, the audience (teachers or students) made questions to value the eleventh item.

Written communication skills were only evaluated for Master students. They had to formulate and solve two different problems explaining all the solution process in a written report to demonstrate and apply the acquired knowledge during the lessons.

Rubric 2 **(Table 2)** was developed to be applied on the students' reports with a view to evaluating the level of achievement on the written communication competence.

Similarly to the oral communication evaluation, the students' written reports were evaluated also along ten different items. The first four items were about the content (introduction, objectives, results and conclusions). The fifth item dealt with the structure and formal coherence of the information, while the sixth item evaluated the quality in terms of style and format of the report. The seventh item was related to the presence of grammar and orthography mistakes, and the eighth item valued the appropriated use of technical language. The ninth and the tenth items evaluated the achievement of a professional and high quality report through the argumentation and justification of the information presented, as well as through the use of graphical resources to emphasize the most relevant results.

For both oral and written skills evaluation, each of the items was assigned a scale ranging from 0 to 5, representing an increasing level of development. As described before, first to fourth items corresponded to the same dimension, while for the rest, fifth to eleventh (tenth in case of written skills), one item corresponded to one dimension. It means that, for oral communication, there were eleven items to quantify and eight different dimensions of the competence, while for written communication there were ten items to quantify and seven dimensions. The overall score was assigned by simply adding the marks corresponding to all the items. Finally, to evaluate the level of achievement of the competences, an assessment scale was developed. The total value range obtained from the rubrics (0 to 55 points for oral communication and 0 to 50 points for written communication) were split up into six different ranges (**Table 3**) from low to master level. These scales allowed to obtain comparable values of the overall communication competence. Ranges were delimited as logical as it was possible, taking into account that most of the students would have to achieve a medium level in the development of the evaluated competence. That is, lower and higher levels value ranges were shorter than medium. Applying the same logic, higher levels of achievement were the most difficult to reach, and so they had the shortest range.

This evaluation methodology (rubric based), helped the authors not only to evaluate the oral, written and the whole communication skills of the students, but also to know to what extent the lessons had been understood (critical thinking), providing a valuable feedback about students' knowledge.

Table 1. Rubric 1; Oral communication skills

	Item	0-Does not archieve	1-Deficient	2-Regular	3-Good	4-Very good	5-Excelent
1	Effective introduction	Not introduced	Introduced but mostly incomplete	Introduced but undeveloped and incomplete	Introduced to the audience	Clearly introduced and audience put in situation	Clearly introduced and audience put in situation plus interesting examples
2	Main objectives and ideas	Objectives not presented	Very few objectives	Most of the objectives still undeveloped and incomplete	All the objectives	All the objectives organized and concise	All the objectives organized and concise with student own perspective
3	The student presents and properly argue the results	Results not presented	Very few results	Most of the results still undeveloped and incomplete	All results	Main results	Main results and well discussed
4	Conclusions appropriated and concise	Conclusions not presented	Very few conclusions	Most of the conclusions still undeveloped and incomplete	All conclusions	Main conclusions organized and concise	Main conclusions organized and concise and the student evaluates them
5	Discuss and justifies the information presented	Not done	Done with lots of mistakes	Done with some mistakes	Well done but incomplete	Well done	Well done emphasizing the relevant aspects
6	Structured, clear, effective and consistent	Not done	Partly structured	Structured	At least structured and clear	Structured, clear and consistent	Structured, clear, consistent and effective
7	Appropriate technical language	Not done	With lots of mistakes	With some mistakes	Occasionally and correctly	Frequently and correctly	Frequently, correctly and introduce new concepts
8	Available resources for a more efficient communication	Not done	Used but when not really necessary	Used to clarify ideas	Clarify some main ideas	Frequently clarify main ideas	Frequently clarify main ideas and use new resources
9	Adjust to time available	No timing control	Too long or too short	Approximately time available	Adjusts into time available	Adjusts into time available and spends proper time in each part	Adjusts into time available and spends proper time in each part and redistribute time if needed.
10	Clear voice, right tone, proper corporal posture and eye contact with the audience	None	At least makes one correctly	Voice clear but tone boring	Voice clear and right corporal posture	Voice clear, right tone and corporal posture	Voice clear, right tone and corporal posture and eye contact with audience
11	Analyse, evaluate and answer the audience questions	None	Analyse but not to evaluate or answer questions	Analyse and evaluate but not to answer questions	Analyse and evaluate but not to answer questions with the help of the teacher	Analyse and evaluate answering questions with own perspective	Analyse and evaluate answering questions Proposing questions and creating debate

Table 2. Rubric 2; Written communication skills

	Item	0-Does not archieve	1-Deficient	2-Regular	3-Good	4-Very good	5-Excelent
1	Effective introduction	Not introduced	Introduced but mostly incomplete	Introduced but undeveloped and incomplete	Introduced to the audience	Clearly introduced and audience put in situation	Clearly introduced and audience put in situation plus interesting examples
2	Main objectives and ideas	Objectives not presented	Very few objectives	Most of the objectives still undeveloped and incomplete	All the objectives	All the objectives organized and concise	All the objectives organized, concise and student relates them with real situations
3	Student presents results and well founded	Results not presented	Very few results	Most of the results still undeveloped and incomplete	All the results	Most relevant results	Most relevant results well founded
4	Conclusions appropriated and concise	Conclusions not presented	Very few conclusions	Most of the conclusions still undeveloped and incomplete	All conclusions	Main conclusions organized and concise	Main conclusions organized and concise and evaluates their consequences
5	Report clear structured and coherent	Not structured	Report´s structure have lack of coherence	Report structure partially inconsistent	Structure coherent	Structure coherent and all sections related and connected	Structure coherent and sections related, connected and information order is grounded in communication efficiency
6	Formal style and format	Not formal manner	Illogical style and format	Logical style and format but still weak	Correct format and style	Advanced format and style	Formal format and style
7	Grammar (orthography)	Completely lack of grammar / orthography	High content in grammar/ orthography mistakes	Some grammar / orthography mistakes	Writing without grammar / orthography mistakes	Correct and technical use of grammar / orthography	Correct and technical use of grammar / orthography with high content in synonyms
8	Appropriate technical language	Not done	With lots of mistakes	With some mistakes	Occasionally done	Frequently and correctly	Frequently, correctly and introduce new concepts
9	Discuss and justifies the information presented	Not done	Done with mistakes	Well done but limited	Well done but incomplete	Well done	Well done emphasizing the relevant aspects
10	Uses graphical resources in effective way giving quality to the report	Not used	Inappropriate use	Used but not increase the quality	Used and increase the quality but still in weak way	Graphical resources are used increasing the report quality	Common graphical used. Introduces new achieving a high quality (professional) report

Table 3. Range values to obtain the achievement level of the oral and written communication competence

ORAL COMMUNICATION SCALE					
LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH	MASTER
From 0 to <9	From 9 to <17	From 17 to <35	From 35 to <44	From 44 to <50	From 50 to <55
WRITTEN COMMUNICATION SCALE					
LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH	MASTER
From 0 to <8	From 8 to <15	From 15 to <33	From 33 to <40	From 40 to <46	From 46 to <50

Results and Discussion

Among the objectives of the presented work, one is to evaluate the differences between data collected by the different teachers and the data collected by the teachers and students. These results are directly related to the efficacy and reliability of the evaluation methods developed. **Figure 1** and **Figure 2** show a comparison of the average data collected on Bachelor and Master courses, respectively, to evaluate oral communication competence. **Figures 1a/2a** compare the average marks from students-teachers evaluations and **Figures 1c/2c** compare marks from teacher-teacher evaluations. Radial direction represents the marks obtained from the evaluation using the rubric 1, the minimum value being zero and the maximum 55. Each point in the graph represents one single evaluation act. **Figures 1b/2b** show the students' standard deviations of each evaluation act, and **Figures 1d/2d** are the teachers' standard deviations. These data has been ordered from lower to higher values for better understanding.

As it was expected, teachers' scoring was slightly lower to that of the students; however, small differences between students and teachers evaluations occur resulting in a relatively good correlation (**Figures 1a** and **2a**). Regarding the standard deviation between the students marks for each presentation (**Figure 1b**), variation in Bachelor values is also low, 42% of the values having $\boldsymbol{SD} \leq \pm\boldsymbol{3}$, while 63% yielding $\boldsymbol{SD} \leq \pm\boldsymbol{5}$. Comparing teachers' evaluations (**Figure 1d**), a still lower dispersion of the data was obtained, 74% of the values having $\boldsymbol{SD} \leq \pm 3$, while 95% of the data delivering $\boldsymbol{SD} \leq \pm\boldsymbol{5}$. In case of the Master values, a similar picture is obtained. Taking into account teachers and students' evaluations (**Figure 2b**), 60% and 80% of the data provide $\boldsymbol{SD} \leq \pm\boldsymbol{3}$ and $\boldsymbol{SD} \leq \pm\boldsymbol{5}$, respectively, while for teachers' evaluation (**Figure 2d**) 100% of the values present $\boldsymbol{SD} \leq \pm 5$. Thus, considering the influence of standard deviation in the final marks of the students, these only vary 5% or 9% taking into account $\boldsymbol{SD} \leq \pm\boldsymbol{3}$ or $\boldsymbol{SD} \leq \pm\boldsymbol{5}$ respectively. The **Figures 1a/1c** and **Figures 2a/2c** show a fine correlation between evaluations made by different evaluators, this has been confirmed by means of statistic analysis based on t-Student's test. Commonly, it is used to decide if it could consider means difference statistically significant. In teacher's evaluations for Bachelor and Master, p-value obtained 0.33 and 0.83 respectively, are higher than 0.05 which indicates lack of difference. In case of students versus teacher marks in Bachelor degree, 53% of evaluation acts showed no mean differences between students and teachers. This value became higher for Master degree, reaching up to 80% of agreement. The increase may be caused by further extended formation of Master students and also by more objective student evaluations.

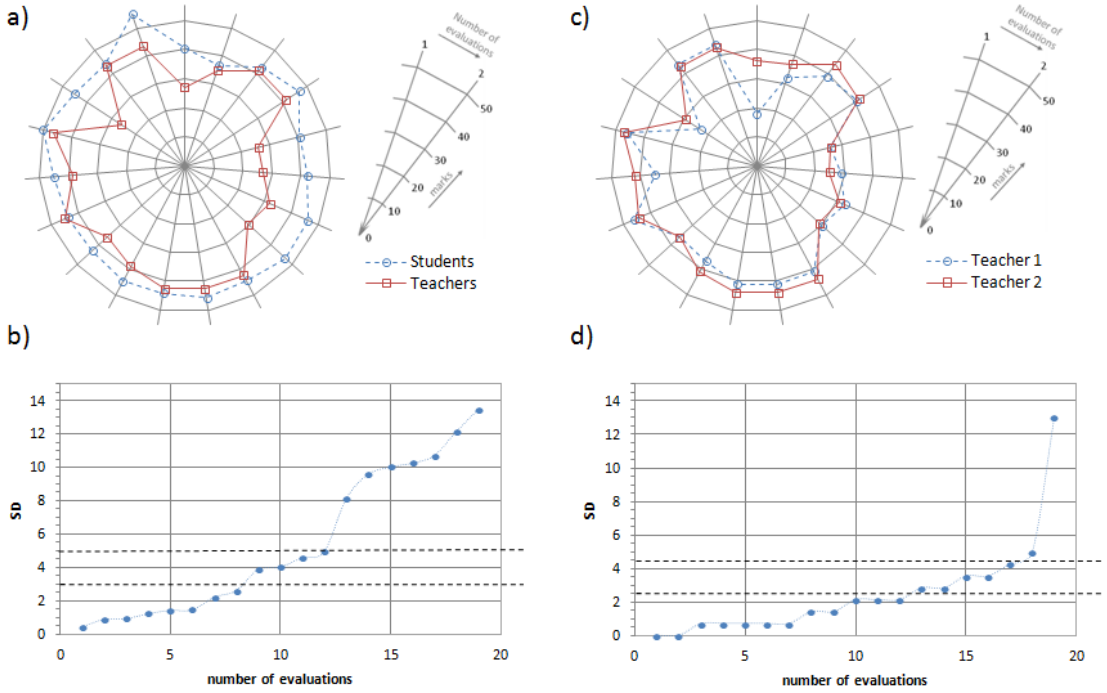

Figure 1. Comparative evaluation results in oral communication skills (rubric 1) from teachers and Bachelor degree students. **(a)** Average values of students and teachers evaluations and **(b)** students standard deviation. **(c)** Teachers' evaluations and **(d)** their standard deviation.

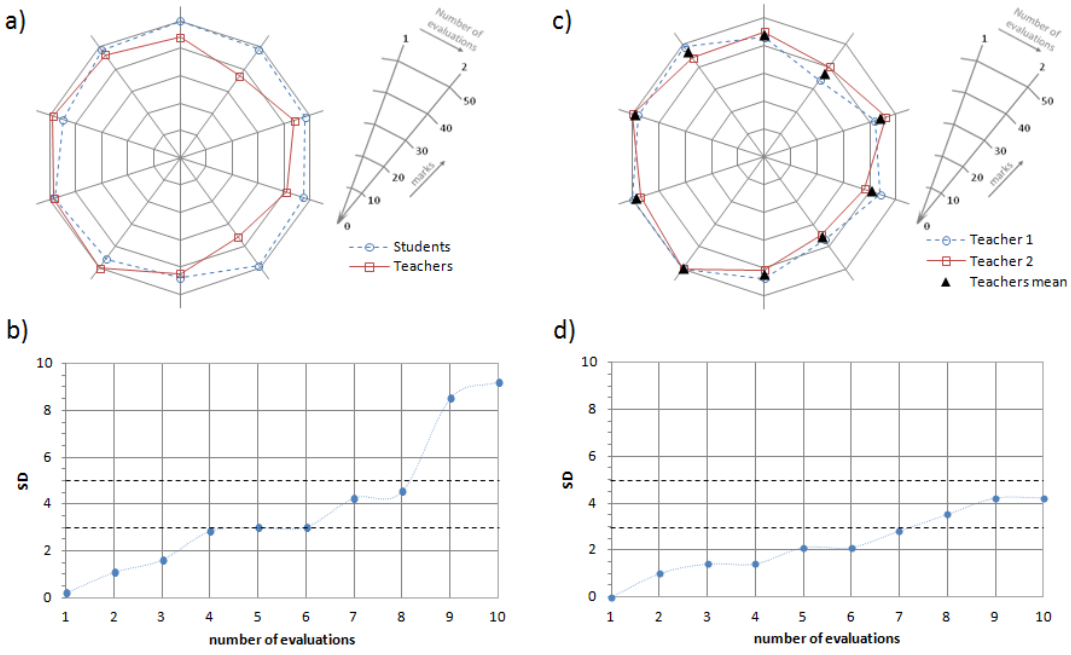

Figure 2. Comparative evaluation results in oral communication skills (rubric 1) from teachers and master students. **(a)** Average values of students and teachers evaluations and **(b)** students standard deviation. **(c)** Teachers' evaluations and **(d)** their standard deviation.

The use of rubrics has proved to be very beneficial for the students' learning and motivation. **Figure 3** shows the assessment of the written communication skills (Master students) from the beginning to the end of the course. The general trend in the global final marks (**Figure 3a**) obtained from ***Rubric 2***, is an improvement along the course. Analyzing each individual item, it also results in higher marks for all the students at the

end of educational program, pointing to a better development of the command task with the time.

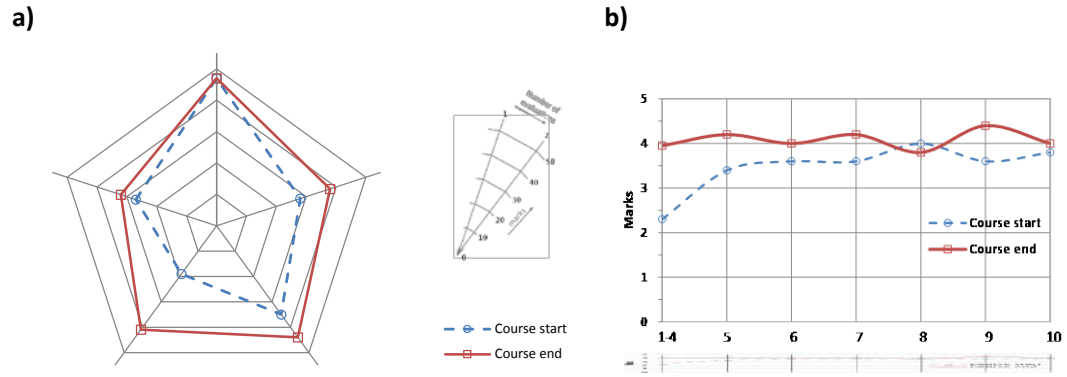

Figure 3. Evolution of the marks obtained at the beginning and end of the course for Master students. **(a)** Total marks of each student at the beginning and end of the course. **(b)** Average of the marks obtained by individual item at the beginning and end of the course.

With the purpose to evaluate the flexibility of the methodology proposed, **Figure 4** shows a comparison between the data obtained from oral communication evaluation of Bachelor degree and Master students. As it was expected, maximum total results are higher for Master students compared with Bachelor degree students. Distributing the data according to the developed scale of achievement (Table 3; *Oral communication scale*), 37% of the Bachelor degree students' marks are in a medium level, while most of the students (53%) are in a medium-high level and only 10% of the marks achieve high level in the development of this competence. In case of Master students' marks, 40% are in a medium-high level, 50% in a high level and 10% of students achieve Master level. Results are in accordance with the students' level, reflecting good connection between the method developed and the feedback obtained.

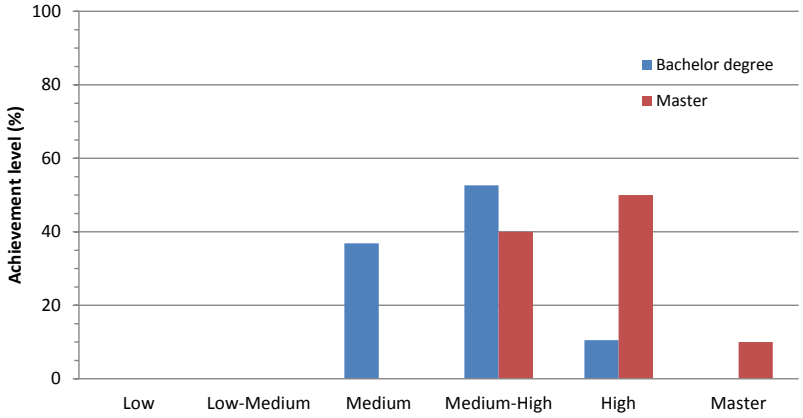

Figure 4. Comparison of oral communication competence achievement levels for master and Bachelor degree students taking into account teacher's evaluations.

Conclusions

The aim of this paper is to present a rubric-based method developed for the evaluation of the oral and written communication skills of Bachelor and Master students. The results obtained were analysed to test the reliability and validity of the methods proposed. Low differences between students judgments were obtained, meaning a good understanding of the criteria used for evaluation. That is, a good correlation between

data collected by students and teachers indicates that the criteria proposed are easy to understand, clear and transparent for different kinds of people (teachers, Master and Bachelor students). Thus, the proposed methodology can be used with independence of the framework of the subject (in technical subjects) and/or the degree of the students. This methodology presents a good correlation between teachers' evaluations and between teachers and Master students. Differences between Bachelor students' and teachers' evaluations could be caused by students inexperience in peer review evaluation and in some cases due to a doubtful objectivity. The reason for the assessment of the competences to improve in time is that, through this evaluation method, students know what they have to do, what it is important and why they are doing it, making the method meaningful for them and so promoting their learning. Furthermore, by applying the final scales developed to qualify the students in the achievement level of the competence, the flexibility of the method is demonstrated, as results obtained from students of different technical subjects and levels can be successfully "standardise" and compared. Based on the evidences found, rubrics seem to promote learning and to improve teachers' instruction as their use provides teachers-students feedback in both directions. They also provide self-assessment to the students, what makes them an effective and reliable tool to evaluate students' performance.

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Mixed-format exams in higher education: Assessment of internal consistency reliability

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Abstract: In higher education courses, instructors often use mixed-format exams composed of several types of questions such as essays, short-answer, problem-solving, and multiple-choice to evaluate student performance. It is important to discriminate reliably among students according to their performance on final examinations. The lower the reliability of student exam scores, the greater the error associated with making decisions based on them. Why then have we found no previous studies of reliability for this, one of the most common types of exam? We investigated the reliability of student scores on 12 official mixed-format final exams used in 22 classes with 1012 students in six undergraduate courses taught by five professors in three fields of business (finance, accounting, and statistics). We focussed on estimating internal consistency reliability, which is essentially a measure of the reproducibility of test scores. Using coefficient omega, the most appropriate measure for assessing reliability for mixed-format exams, we found that in these 22 classes reliability averaged .85, with over 90% of the classes with reliabilities exceeding .80. These reliabilities are very high, comparable with those reported for professionally developed standardized tests and better than those reported recently for single-format, multiple-choice exams in higher education.

Keywords: Reliability; mixed-format exams; coefficient alpha; coefficient omega; higher education; internal consistency reliability

Introduction

Professors in higher education employ a variety of different types of exams. Three of the most common types – essay only, multiple-choice questions (MCQ) only, and problem-solving only – are single-format exams with only one type of question on an exam and each question allotted the same number of marks. However, one of the most commonly used types in many academic disciplines is arguably the mixed-format exam, composed of a mixture of question types (such as short answer, multiple choice, problem solving, and essays) and with varying mark values assigned to each question (Qualls, 1995). Mixed-format exams are becoming increasingly popular even on standardized tests (Cao, 2008, p.18). These exams have the singular disadvantage of requiring an excessively long time to mark as do essay and problem solving exams (Lee et al., 2104). Nevertheless, they offer distinct advantages including ease of construction and reputedly high content validity. Given their importance in determining student success or failure, examining the reliability of student scores on examinations is of great importance.

However, "examination marks are not perfectly reliable, that is to say that if the assessment is repeated in some way, the candidate will generally receive a second mark which is different from the first" (Hill, 1978, p. 186). In higher education, it is important to discriminate reliably between students according to their final examination marks (Dracup, 1997). The lower the reliability of student exam scores, the greater the error associated with making decisions based on those scores (Crocker & Algina, 2008; Nunnally & Bernstein, 1994). Furthermore, reliability of test scores, in general, is of central importance (Henchy, 2013). Wilkinson and the APA Task Force on Statistical Inference (1999) criticized researchers for not assessing the reliability of the test scores used in their studies. Editors of many journals have argued

in a similar vein (Fan & Thompson, 2001). The same criticism can be made of classroom exams.

Reliability is generally assessed in three forms: stability over time, inter-marker reliability, and internal consistency reliability (Henson, 2001; Nunnally & Bernstein, 1994). For stability over time (Crocker & Algina, 2008, pp. 133-134), the focus is usually on assessing how student scores on an exam change over some period of time, primarily because of temporary changes in the student. Stability over time is typically estimated by test-retest reliability, the correlation between student scores on the same exam administered twice. However, test-retest reliability is of little concern here given that student exam scores on any repeated administrations of exactly the same exam would have to be suspect. Moreover, the recognition of test-retest reliability as a weak form of reliability is widespread (Morley, 2014, p. 130; Nunnally & Bernstein, 1994, p. 255). Consequently, we are not concerned with this form of reliability.

Inter-marker reliability is typically estimated by the correlation among markers in the grades awarded to students for a common exam. Various measures of inter-rater reliability have been explored by Krippendorff (2004) and Morley (2014). This form of reliability is focussed primarily on the error introduced into assessments of student exam performance by variation in how different markers score the same student exams (Crocker & Algina, 2008, p. 143). Many researchers have investigated the inter-marker reliability of classroom exams in higher education (e.g., Dracup, 1997; Hill, 1978; Newstead, 2002). In many higher education institutions, having multiple markers mark each exam in a course is economically impractical given large class sizes (e.g., in North America). More importantly, however, Morley (2014, p. 128-129) convincingly makes the case that "internal consistency is appropriate when we want to make statements about the respondent" (the student, in our case) whereas other types of reliability are appropriate for other purposes (Ebel, 1965).

Internal consistency reliability "estimates the correlation between a test and an alternative version of the same test of the same length, having randomly selected questions." Many methods have been used to estimate internal consistency reliability. However, coefficient alpha (α), which is based on the tau-equivalent measurement model (Graham 2006; Lord & Novick, 1968; Sijtsma, 2009), is the most commonly reported measure of internal-consistency reliability (Padilla et al., 2012). However, it is often an underestimation of the actual reliability because the assumptions underlying the use of coefficient alpha are frequently violated in mixed-format exams (Miller, 1995; Qualls, 1995). We argue that coefficient omega, which is based on the congeneric measurement model, provides a more accurate and more appropriate estimate of actual reliability for mixed-format exams (Dunn et al., 2014; Feldt & Charter, 2003; Schmitt, 1996). Hence, coefficient omega should be used for tests that use multiple-item formats or when the range of possible score values vary across different exam questions, as they do for the mixed-format exams in the present study (Dunn et al., 2014; Padilla & Divers, 2013a, 2013b; Qualls, 1995).

The internal consistency reliability of exams in higher education has, somewhat surprisingly, rarely been reported in the literature (Jensen et al., 2013, Cox, 1967). More recently, Jensen et al. (2013), in a quasi-experimental study of two introductory biology classes with 155 students in total, reported the internal consistency reliability of their MCQ exam to be quite poor, $\alpha = .66$. Although some professors have resorted to the use of MCQ tests in response to dramatic rises in class sizes, many eschew the use of such exams. Instead, many administer exams composed of several types of

questions (such as a mixture of short-answer, problem-solving, and essay questions) with different values assigned to each question. Yet, we could find no previous assessments of the reliability of mixed-format exams. Perhaps this is not surprising given that techniques for accurately estimating the reliability of student scores for such exams have been developed only recently (Qualls, 1995). As well, Cox (1967) noted that "although examining is an important and time-consuming occupation, very few of those who are actively engaged in it regard it as a field for experiment and research, or if they do, they keep their findings very much to themselves".

The focus of the present paper is on estimating the internal consistency reliability of mixed-format exams in a variety of classes, courses, and subject areas as well as with different professors, students, and final exams. We focused on estimating only this type of reliability, first, because it can be estimated with the single administration of a test. Second, being the most commonly reported measure of reliability (Hogan et al., 2000; Padilla et. al., 2012; Thompson, 1999), it is easily understood. Third, the other two reliability estimates, inter-marker and test-retest, were of little importance in our present studies, test-retest because it is widely recognized as a weak form of reliability (Krippendorff, 2004, p. 216) and inter-marker because in many institutions only a single individual marks each final exam. Furthermore, as Morley (2014, p. 128) pointed out "The critical difference between internal consistency reliability and inter-rater reliability is that, with the former, one is attempting to make a statement about the test-taker, and, with the latter, one is attempting to make a statement about some object of judgement such as a professor."

Method

In our study, we investigated six undergraduate courses offered at a Canadian university from three different fields in business: statistics (S), finance (F), and accounting (A). All classes were one-term 39 lecture-hour courses (see Table 1). In these six undergraduate courses, classes S1 to S15, F1, and F2 were taught in the 2nd year; F2, F3, A1, and A2 were taught in the 3rd year; and A3 was taught to graduating students in their 4th and final year of studies. The statistics and finance courses were introductory whereas in accounting the courses were either at the intermediate or advanced levels. Student performance on all exams was graded out of 100%. Each student exam was marked by a single marker (customary in many institutions) who was in all cases the course instructor. In all these courses, professors administered mixed-format exams that varied between 2.0 and 3.0 hrs in length. In these 22 classes, there were 1012 students in total. Roughly 55% were females and 45% males. One male and four female instructors, ranging from lecturers to full professors, took part in our study. A total of 12 different exams were used. For each exam, student scores on each part of each question that had been separately marked on the original exam were entered in an SPSS spreadsheet. Reliabilities were then computed for each class.

We used the MBESS program (Dunn et al., 2014; Revelle & Zinbarg, 2009; Kelley, 2007) written for the R platform for statistical computing (Field et al., 2012) to estimate reliability coefficients alpha and omega. We used the normal bootstrapping method of estimating reliabilities, as it is known to be appropriate for small sample sizes (Padilla & Divers, 2013a, 2013b).

To average our reliabilities, we used two of the methods described by Feldt and Charter (2006). In their Monte Carlo study, they examined six different approaches to

averaging internal consistency reliabilities that had been used by previous researchers. In their study, all approaches generated virtually identical averages. To be conservative, we used their approaches #1 (the simple weighted average) and #3 (the r-to-z and z-to-r transformations weighted by sample size) to average reliabilities but expected no differences between them for our data.

Results

Results of student performance in our 22 classes as estimated by reliability coefficients alpha and omega are displayed in Table 1. Both approaches to averaging reliabilities produced virtually identical values and will, therefore, not be discussed further (approaches #1 and #3 in Feldt & Charter, 2006).

Table 1. Reliability estimates for 22 classes in three higher education subjects

					Exam length		Exam marks (%)	Reliability	
Class	**Course**	**Prof**	**Exam**	**n**	**t**	**k**	**Mean (SD)**	**α**	**ω_M**
F1	Finance I	a	1	60	3.0	37	63.3 (16.9)	.85	.87
F2	Finance I	a	1	57	3.0	37	67.2 (19.2)	.86	.91
F3	Finance II	a	2	52	3.0	47	67.7 (14.9)	.85	.85
F4	Finance II	a	2	55	3.0	47	67.9 (17.2)	.88	.89
A1	Acct Int I	b	3	37	3.0	36	57.8 (14.0)	.86	.89
A2	Acct Int II	b	4	22	3.0	33	50.9 (11.4)	.67	.73
A3	Acct Topics	b	5	35	2.5	20	61.8 (15.2)	.86	.88
S1	Statistics	c	6	25	3.0	15	64.8 (23.8)	.83	.90
S2	Statistics	c	6	63	3.0	15	71.2 (22.4)	.82	.86
S3	Statistics	c	6	61	3.0	15	67.4 (23.1)	.82	.87
S4	Statistics	d	6	23	3.0	15	77.5 (14.5)	.79	.84
S5	Statistics	d	7	46	3.0	21	66.7 (19.7)	.74	.81
S6	Statistics	d	8	38	3.0	27	68.8 (15.3)	.71	.74
S7	Statistics	e	9	40	2.5	31	47.8 (15.7)	.84	.84
S8	Statistics	e	9	48	2.5	31	45.5 (19.0)	.88	.90
S9	Statistics	c	10	36	2.0	13	67.6 (19.2)	.81	.84
S10	Statistics	c	10	66	2.0	13	70.9 (20.6)	.80	.83
S11	Statistics	c	10	59	2.0	13	65.1 (21.0)	.79	.83
S12	Statistics	c	11	22	2.0	12	66.5 (26.0)	.87	.91
S13	Statistics	c	11	65	2.0	12	58.2 (23.0)	.80	.84
S14	Statistics	c	11	59	2.0	12	62.8 (22.2)	.79	.83
S15	Statistics	e	12	43	2.0	30	50.0 (19.0)	.83	.86

Note: Student marks = %; Acct Int I = Accounting Intermediate I; Acct Int II = Accounting Intermediate II; Acct Topics = Accounting Special Topics; Prof = class professor or instructor; n = number of students in class; t = maximum time allowed for exam completion (hrs); k = number of separately marked questions or parts of questions on exam; SD = standard deviation (%); α = coefficient alpha and ω_M = coefficient omega: estimated by MBESS software.

Coefficient omega averaged .85 across the 22 classes, with class reliabilities ranging between .73 and .91. The median was marginally higher at .86. Over 90% of the classes tested (20 out of 22) had reliabilities greater than .80. Average alpha equalled .82 (alphas for these classes ranged between .67 and .88). However, our empirical results confirmed the theoretical prediction that coefficient alpha underestimates actual reliability for mixed-format exams (underestimates ranged from 0 to .07). On average, coefficient alpha underestimated reliability by .035, a rather large and significant difference (sign test, 2 ties, 20/20 classes in predicted direction, $p < .0001$).

Though there appear to be some differences in the reliability of exam scores across different professors, exams, courses, and fields of study, these differences are all relatively small and inconsequential. However, we do not believe our present study

permits statistical assessments of these issues. One issue that we did address was whether student scores of shorter examinations would have significantly lower reliabilities. Professor "e" examined students using both 3.0-and 2.0-hr final exams for the same course (see Table 1). There was no significant difference between short and long exams given by this professor in this course (independent-groups $t(df = 7) = 1.47$, $p = .09$). We must caution the reader, however, of the unacceptably small sample size of only nine classes used for this test and the lack of independence of some reliability estimates (which are based on the same exam albeit for different classes).

Discussion

Professors in higher education often use exams composed of more than one type of question with variable marks assigned to each question on the exam. Many professors (mistakenly) believe that such mixed-format exams are relatively unreliable and especially poor when compared with the reliability of so-called objective MCQ exams (e.g., Cao, 2008, pp. 1 and 13). Yet we could find no reports of score reliabilities for mixed-format exams in higher education. Our study examined the reliability of student exam performance on mixed-format exams in many classes, in different courses and fields in business, and with different exams, students, and professors.

The most appropriate measure of reliability when one's focus is on decisions affecting students, as it is in our case, is unquestionably internal consistency (Morley, 2014). The most commonly reported measure of this type of reliability is coefficient alpha, but this estimate is known to underestimate the true reliability of exams composed of more than one type of question or with questions of unequal value (Dunn et al., 2014). Instead we estimated congeneric reliability using coefficient omega that is most appropriate for use with such tests as ours (Feldt & Charter, 2003; Qualls, 1995).

Reliability of exam scores was very high with coefficient omega averaging .85 in the 22 classes in our study. Moreover, the reliabilities were remarkably consistent from class to class (ranging from .73 to .91) despite variation in students, professors, exams, fields of study courses, and classes taught. Scores on the exams in over 90% of the 22 classes tested in our study had reliabilities exceeding .80. Practically speaking, these reliabilities imply that error is relatively small, and decisions based on student performance on this type of exam in the courses tested are well founded.

However, decisions on students are often based not just on their performance on a single final exam but on assignments, midterms, projects, and presentations in the same course as well. Such additional measures of student performance generally increase reliability (Nunnally & Bernstein, 1994). Thus, reliability of student scores on a single final exam undoubtedly underestimates the reliability of student grades assigned for all aspects of a course. Furthermore, decisions about students are often made on the basis of performance in many different courses with different professors, fields, class sizes, and time periods. As Dracup (1997) has shown, reliability based on student performance on essay-only exams in many courses can be exceptionally high ($\alpha = .95$) even when the (inter-marker) reliability of most courses is very poor (median inter-marker reliability = .64 with some reliabilities as low as -.28).

Previous studies of reliability are relatively rare in higher education (Cox, 1967; Jensen et al., 2013). Recently, however, Jensen et al. (2013) reported $\alpha = .66$ for the internal consistency reliability for student scores on a single MCQ exam in two introductory biology classes taught by one instructor. Such poor reliability implies that error is

relatively high and that decisions based on the results of such MCQ exams could be somewhat compromised. The reliability for all 22 of the classes in our study exceeded that for their MCQ exam scores. The reliabilities we have found for mixed-format scores compare favourably with those found by others for MCQ and other types of exam scores in higher education. In fact, the reliabilities in Table 1 are comparable with those reported for costly, professionally-developed standardized clinical and psychological tests. Yet, classroom exams, such as ours, are normally intended for one-time use (Nunnally & Bernstein, 1994, p. 295).

Several limitations should be stressed. First, in this paper we focussed exclusively on investigating internal consistency reliability to the exclusion of other forms such as inter-marker reliability, which explore different sources of error (Crocker & Algina, 2008). However, as Morley (2014, p. 128) so clearly affirms, internal consistency reliability is useful for making judgments about students while inter-marker reliability is useful for making judgments about professors. Given our focus on the importance of marks or grades on exams when making decisions about students, internal consistency reliability is unquestionably most appropriate. Similarly, the issues of moderation, a method for improving marker consistency in which several markers meet to iron out differences, and calibration, in which markers learn to mark more consistently by working with other markers, are both concerned with inter-marker reliability (Sadler, 2013), and therefore, while important issues in their own right, are not the focus here.

Second, our interpretation of the present results must be tempered somewhat by the relatively small number of exams, instructors, classes, courses, and subject fields tested in the present study. Nevertheless, we surveyed 1012 students, 12 exams, 5 instructors, 22 classes, 6 courses, and 3 subject fields. In forthcoming studies, our objective is to cover more subject areas, courses, classes and students, exams, and professors.

Third, we studied only mixed-format exams. Nevertheless, these are among the most commonly used types of exams in higher education. Others have reported reliabilities for essay-only exams in psychology (e.g., Dracup, 1997), problem-solving-only exams in engineering (e.g., Hill, 1978), and MCQ exams in biology (e.g., Jensen et al., 2013). Those interested in these other types of exams should consult the references cited.

Fourth, are the exams in these 3 disciplines really comparable? This is an important issue which cannot be addressed in appropriate depth here given space constraints. Nevertheless, several arguments can be advanced for believing that at least some of the exams are comparable. All courses examined in our study are, for example, in applied disciplines (e.g., accounting). All exams included both strong quantitative and strong non-quantitative or narrative components. Each mixed-format exam also included many problem-solving and narrative short-answer questions. Nevertheless, another response to this question is that they are certainly not. Questions on finance exams bear little resemblance to those on statistics exams. Even within a discipline, exams on introductory courses can differ radically from those on more advanced courses. However, readers will certainly differ in what they believe constitutes exam comparability. This is why the reliabilities are provided for each exam in each of the classes, courses, and disciplines studied (see Table 1). Finally, one must consider that, despite these manifold differences, reliabilities for these widely divergent exams were uniformly high in our study (more that 90% had reliabilities exceeding .80).

In our forthcoming studies, our objective is to cover more subject areas, courses, classes and students, exams, and professors. The present studies were restricted to an exploration of internal consistency reliability only. Other estimates of reliability such

as inter-marker reliability, which explore other sources of error, were not addressed (Crocker & Algina, 2008). While we have explored reliability for classes in three areas of business, other areas such as economics were not examined in our study. Similarly, we did not investigate courses in arts, sciences, or engineering. Additionally, we have not studied single-format exams such as those consisting of only essay questions.

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The role of self-monitoring in adult learning in online context

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Abstract: This paper examines the reflexions made by a set of online students regarding the results obtained in an assessment task and its consequences for the future. The sample included 43 students in continuous assessment, from both sexes. After knowing the results they were asked to indicate the implications of this exercise to their future studies. The content analysis revealed the existence of two categories - Causality (intrinsic / extrinsic) and Influence (Generics/ Specifics/No consequences) - regardless of the approach to real evaluation. The reflection that students can make about their learning process and the difficulties in developing their tasks is of great relevance to achieve success. This was evident in the analysis that our students made on the completion of the assessment work, as well as the consequences for their future study. This process of reflection and awareness in the teaching learning process is particularly relevant in online education where the role of metacognitive monitoring and control system gains a prominent role. Allowing students to reflect on these issues permits them to be more effective learners.

Keywords: metacognition; adult learning; online learning

Introduction

Technological advances have been giving a new face to distance learning systems. ICTs open new perspectives to facilitate learning. They work as tools that complement and are a real and basic support to the training system. Through the features of virtual learning environments, virtuality - eliminating barriers of time and space -, globality and the ubiquity - the campus is always with us.

This new format implies methodological, pedagogical, psychological and even emotional changes with consequent modifications in roles and functions of the actors involved in it. These new learning scenarios lead to a change of attitude and posture relative to this whole process. This change should be taken into account on both sides - learners and teachers.

Students in eLearning require greater self-direction and self-regulation to achieve their academic goals (Bol & Garner, 2011). To lead the students to reflect on their learning strategy and tailor their metacognitive strategies to achieve success in the task is of great relevance. This means that the incorporation of ICT in the educational context, using the virtual spaces, allows a more effective response to the educational challenges by allowing using strategies and tools that best fit to the real needs of their learners. The research work of Azevedo and Cromley (2004) points to the implications that the design of virtual learning environments have on the acquisition of knowledge.

Learners who know, more appropriately, how to study and how learning occurs, i.e., have better metacognitive knowledge and learn better, when compared with those who have less metacognitive knowledge. It is therefore essential to teach learners about how they learn and identify themselves with the most effective learning strategies, so that they can improve their metacognitive judgments, as well as the self-regulation of their learning.

Leclercq and Denis (1995) defined a good learner as *a person who solves learning problems* (p.155); that is a good regulator of their own learning. For them learning is a *regulated process of problem solving* (p.155). This process can be decomposed into six major phases and a good learner is one who can manage well each one. This process requires analyzing needs, setting goals, planning of learning strategies, executing, observing and ultimately deciding.

Hacker et al (2009) refer that learners can be agents of their own thoughts and behaviors, can monitor their knowledge or skills, establish their learning objectives, outline and control strategies / plan to achieve them, monitor progress for their possible adjustments and, finally, assess whether the objectives were achieved. All this translates into what Zimmerman (2000) calls self-regulation of behavior. According to this author the concept of self-regulation can be defined as self-generated thoughts, feelings and actions for attaining academics goals (Zimmerman, 1998). The key element of self-regulation is self-monitoring that involves the observation and monitoring of the performance itself, as well as its results. This in order to understand their learning process and apply these strategies in future situations, where they will prove to be adequate.

According to Serra and Metcalfe (2007) the following aspects have been associated to the concept of metacognition - knowledge about the process, about their monitoring and their control. The learning process leads to a continuous self-evaluation and a consequent decision on what to do with the information collected: What's next? What do I need to study more? Have I study this content? What strategies will be used? (Goulão, 2009).

According to Bjork, Dunlosky and Kornell (2013) for learners to become effective in the learning process, they should *not only be able to assess accurately the states of their own learning, but also be able to manage it and the activities in response to such monitoring* (pág.422).

By monitoring, the learner can check how his plans become actions and through the introspection, made about their achievements, learners can perceive discrepancies between what were their goals and what actually exists. The learner can thereby exercise metacognitive control, reviewing goals, plans to adapt or operations of change (Winne & Nesbit, 2009).

According to Blakey and Spence (2000) the basic metacognitive strategies are a) to know how to relate new information with existing one, b) to know how to select the appropriate thinking strategies and c) to learn to plan, monitor and evaluate the thought processes. The reflection, in a conscious way, about the processes of learning is therefore an essential element to the development of increasingly efficient learners.

To Ertmer and Newby (1996) the *expert learner* is one who is aware of the specific knowledge to reactivate, the goals they have to achieve, the strategies they need to achieve them, as well as this whole process – Figure 1.

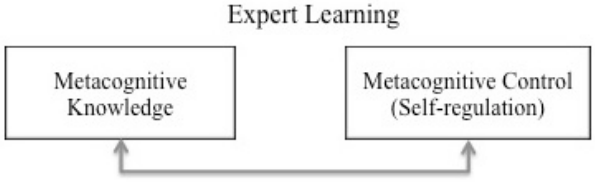

Figure1. Major components of expert learning (Ertmer & Newby, 1996, pág. 7)

Those learners are considered experts due to the fact that they can incorporate and implement different knowledge to improve their performance.

In online distance education, learners found more flexibility, allowing them to achieve goals that otherwise were unachievable. The acquisitions are located at different levels: concerning their formal knowledge and at the personal level, with the development of their autonomy, their critical thinking and collaborative work. This flexibility of time and space allows better management of their education formation according to their needs. In online distance education environments one of the most important roles of the teacher is as the mediator / facilitator of learning. This means that you as the teacher should aim to provide appropriate educational aid for students to develop their autonomy and their learning construction – Figure 2.

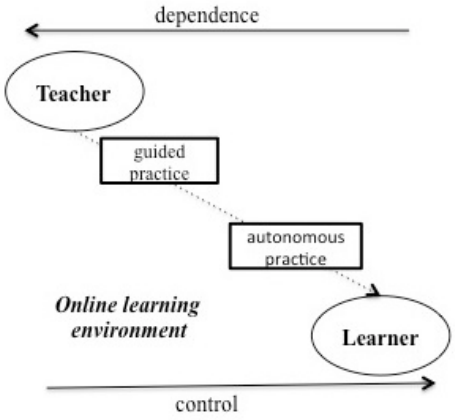

Figure 2. Methodological scenario

Thus, these new learning scenarios lead to a change of attitude and posture relative to this whole process. This change should be taken into account on both sides - learners and teachers.

Learners who know, more appropriately, how to study and how learning occurs, i.e., have better metacognitive knowledge and learn better, when compared with those who have less metacognitive knowledge. It is therefore essential to teach learners about how they learn and identify themselves with the most effective learning strategies, so that they can improve their metacognitive judgments, as well as the self-regulation of their learning.

Material and Methods

Objectives

This study aims to analyze the reflexions made by a set of online students regarding the results obtained in an assessment task and its consequences for the future.

Design and participants

Data collection was made through the answers students gave to a question made after the results of their assessment were disclosure. A total of 43 students, in continuous assessment, answered the question, as volunteers.14% were males and 86% were females. The average age of the participants was 41, ranging from 26 and 57 years old (see Table 1) one student was in his 20s, 21 students were in their 30s, 11 students were in their 40s and 9 students were in their 50s. The median age was 42.

Table 1. *Descriptive statistics of participansts' age*

Variable	N	MIN	MAX	AVG	SD
Age	43	25	60	42.17	8.82

Material and procedure

The data was collected in one curricular unit from to the first year, second semester of the degree course in Education. We have three moments of continuous assessment. Our analysis will be made only to the results obtained in the first moment.

Before starting, a message was placed in the "News" forum about the purpose of the research and requesting the participation of the students. Whenever a questionnaire was available for collecting data another message was placed in the forum requesting the response of students.

The data collection was done in three stages. Before completing their assessment test, students were asked to indicate what grade they expected to obtain (Predicted scores). Immediately after finishing their test, they were asked again to indicate the grade they expected to obtain (Postdicted Score). Finally, after the results came out students were asked to indicate whether their real grades, were higher, lower or equal compared with their prediction. Furthermore, they were asked about this and what would be the implications for their study method. Our analysis focus was on this last phase.

Data analyses

We proceeded to the analysis of participants' responses according to how the questions were asked. It was the purpose of this research to examine the justifications given by this online students regarding the results obtained in the first continuos assessment task and how this fact will affect their study process in the future. To analyse their responses, we used content analysis. In the answers given by the students could be found more than one category or sub-category. For this reason the number of occurrences by category be more than the number of participants in the study.

Results and Discussion

The content analysis of the answers given by the students to the question after the results came out (real grades) allowed us to establish the following categories and sub-categories, regardless of the dimension in question - Table 2

Table 2. Content analysis results: Categories and sub-categories

Dimensions	Categories	Sub-categories		Units of register
Higher / Lower / Same	*Causality* Statements concerning the cause of the difference in scores	*Extrinsic*	System	*Interesting and current topics*
			Teacher	*Monitoring of teacher*
			Task	*Overlap of content*
		Intrinsic	Self	*Motivation* *Self-esteem* *Lack of study* *Misinterpretation of concepts*

	Influence Statements concerning the implications of this difference in terms of future studies	*Generics*		*Lack of objectivity in the answers* *Will positively influence*
		Specifics	Motivation	*Encouragement and Motivation* *Ability to stimulate oneself*
			Method	*Structure the work in function of time* *Direct the effort* *Be more careful when answering*
		No consequences		*I will continue to study the same way*

The indication of a *Higher, Lower* or *Same* classification, comparing the scores obtained with the ones predicted was not clear. For that reason, the content analysis presented in this paper includes the responses in global terms. The Dimension has not proved to be a suitable descriptor. The following results refer to the analysis of frequency distribution taking into account the categories and sub-categories. Table 3 shows the results found in the category *Causality*.

Table 3. Categorie *Causality:* Number of occurrences of sub-categories

	Sub-categories				**N**
Causality – N=54		System			2
	Extrinsic	Teacher			2
	Total = 6	Task			2
			Individual characteristics		12
	Intrinsic	Self	Performance	Positive nature	6
	Total = 48		(Total = 19)	Negative nature	13
			Organization / Planning	Positive nature	10
				Negative nature	6
			(Total = 16)		

As it can be seen in Table 3, the highest number of occurrences that justify the classifications obtained is at the level of the **subject himself**. These may refer to more individual characteristics, such as motivation, self-esteem and lack of confidence in the competencies, but also on aspects that may be more controllable by the student. This level involves the way the subject feels within the assessment task, such as an incorrect interpretation of questions, a difficulty in understanding some questions. Finally, we find the issues related to the preparation for the assessment task. These refer to the organization and planning of the study itself.

We turn now to the presentation of the results concerning the influence for future study situations. - Table 4

Table 4. Categories *Influence*: Nº of occurrences of sub-categories

	Sub-categories			N
Influence	Generics			9
	Specifics	Motivation		10
		Method	Performance	8
		(Total=17)	Organization	9
	No consequences			1

The largest number of occurrences indicates that the influence will be felt more deeply at the level of motivation and method of work. This is particularly true in regards to issues relating to the method of organizing tasks in either study, or in they performance in the next assessment task.

Conclusions

In this paper, we set out to find out and work on the reflections that of a group of online learning students has made about their performance in a very specific assessment task. In a first analysis of the responses we observed that these reflections involve mainly factors related to the students or factors that they can control.

The analysis of the answers seems to indicate an emphasis on the concern with issues related to organization and planning of the study. This is evident in both the causes and the conditions to be considered in a future study. However, reading these results should be done in a careful manner and taking into account that the students participated in this study voluntarily and that the majority considered to have a good rating taking as reference the statement given in the previous phase of the study.

From our point of view is important to know the aspects that are taken into account and valued by students to have a good performance. These elements allow us to organize tasks and outline strategies to help students find their own strategies for monitoring and self-regulation of learning, becoming increasingly autonomous and thereby achieving a deeper level of learning. The knowledge that each person has in dealing with learning activities, becomes a powerful tool nowadays (Bjork, Dunlosky & Kornell, 2013). The understanding of learning activities and associated processes promotes understanding, retention and transfer of learning.

From the point of view of Goulão and Cerezo (2015) *to develop self-regulatory competence of students is not only very important to help them achieve success now, but also to ensure future successes. Actions relating to the control of performance have a critical role in the self-regulatory process leading to a monitoring process of learning by the students. This action control allows them to not only detect the weaknesses of the learning process, but also alert to the effectiveness of learning strategies that are being used.* (p. 1907).

According to Ertmer and Newby (1996) reflection on the learning process is considered as an essential ingredient to develop more effective learners. In this sense we believe it is important to find strategies that help students monitor their own learning process. This monitoring is a complex process that involves understanding what you're doing, where does that fit into the sequence of the task and also the anticipation and planning of steps to follow. All this happens during the actual act of learning. For Phelp, Hase and Ellis (2001) in the context of rapid transformation, with 'capable' learners, metacognitive strategies provide great advantages and can be

considered more important than some skills. In this sense the teacher should provide strategies to help the learner become an "expert learner".

Self-regulation plays an extremely relevant role in the learning process of students in general. With regard to distance learning online these processes retains relevance. The self-regulatory capacity of learning is an important factor to overcome procrastination. This importance is increased when we are in online contexts, to provide information to teachers to seek to develop strategies that help reduce procrastination and thus make them more self-regulated learners. Moreover, in the online distance education, with adult learners, when placing the emphasis on the autonomy of the same is necessary they are holders to these competencies to enable them to analyze and understand their learning processes with a view to meaningful learning.

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The Rubric: An Assessment Tool to Guide Students and Markers

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Abstract: The changing environment for both students and lecturers dictates the requirement for giving feedback on assessment activities rapidly. In order to close this cycle of learning for the student and facilitate the feed-forward process, the development of rubrics has become an essential part of the workload. The rubric tool needs to have clearly stated performance indicators and criteria so that both student and lecturer have the same expectations of the assessment activity. The rubric must be robust enough to be able to capture the balance of being both an easy tool for marking but also detailed enough to give constructive feedback reflecting the learning outcomes. The rubric development, given its complexity, when constructing this tool, can be time consuming but eventually becomes time saving. Thereby reducing the grading workload effort of the lecturer while maintaining the knowledge gained by the students through the assessment activity.

Key words: Rubric; VLE; Performance Criteria; Feedback; Feedforward

Introduction

For the teaching and learning cycle, the word 'rubric' is understood generally to connote a simple assessment tool that describes levels of performance on a particular task and is used to assess outcomes in a variety of performance-based contexts' (Hafner and Hafner, 2003 p, 1509). The rubric as a marking tool and the virtual learning environment (VLE) have both worked their way into nursing education as 'new' way of teaching, learning and assessing students (Lai and Ng 2011). This allows both lecturer and student to develop as the facilitator and interpreter of knowledge and permitting clear ideas of what is expected from the assessment and what is achievable by the student. The rubric, unlike a marking template, is not only focused on giving guidance to marker but includes the student. With the marking templates there is greater capacity for and moreover, an inherent lack of uniformity and parity between markers, born out of each markers interpretation of the marking template. With the requirement of rapid turnaround times, transparent feedback to the student, combined with the ease of access via the VLE and the moderation process to be considered, a clear need has arisen to facilitate the marking process. The progressive movement of the use of technology and the easy access provided by online learning platforms, has created learning conditions where different aspects of feedback can be used (group, individual, audio), to ensure that the students learning is fluent and allows progression of the learning cycle.

Combine the introduction of a new degree nursing curriculum in England (Nursing and Midwifery Council 2010), with the university's e-assessment strategy, and this brought an opportunity to review models of learning and teaching focussing on:-

1. How the student could engage in different ways of learning (e.g. Discussion boards, the flipped classroom, digital stories)
2. The capabilities of VLE (does it do what the lecturer wants?)
3. How best to facilitate submission and feedback within this environment.

The ideology behind the VLE is to create an engaging learning environment in which students can participate, while they are effectively developing 'clear thinking' and promoting an interactive learning experience (Lewis et al., 2012). Therefore it is of paramount importance to give clear concise performance criteria and provide a forum in which students can create their own learning opportunities. Thus enabling the learner to build a genuine comprehension of the subject matter so they can foster confidence and research skills when conveying their ideas and opinions on a topic, (Pucer et al., 2014). Given these criteria, it becomes imperative that both the lecturer and student have a clear understanding of the performance indicators, hence why the rubric was considered important tool.

The Advantages and Disadvantages of Rubrics

Andrade and Du (2005) advocate that a rubric as an assessment tool should be used by the student and assessor to give both parties clear understanding of what is expected by either doing task or grading the assessment. This aims to ensure achieving learning outcomes and activating a feed forward mechanism through concise information on how to improve performance whilst enabling student's time to reflect on their work (Truemper 2005).This reflective ethos on work produced, fosters communication and the learning cycle to be completed.

There are many different debates surrounding the use of the rubric tool as an assessment and communication tool, as the themes become clear with the use of parity and gives guidance this is evident from school age to higher education nursing and non-nursing education (Andrade and Du 2005; Caulfield-Sloan and Ruzcika; Hafner and Hafner 2003; Truemper 2004). Mandills et al (2009) support the use of rubrics in primary, secondary, further and higher education context as the grading is seen to be fairer and more consistent. While Beaglehole (2014) focuses on students of school age children in Australia and encourages that clear and specific goals for writing are highly effective.

Objective/Criteria	Performance Indicators	
	No	Yes
Meets word count requirement	(0 points)	(1 point)
Replied to 2 posts	(0 points)	(1 point)
Meets topic criteria	(0 points)	(1 point)
		out of 3

Figure 1 Rubric 1

The rubric as an assessment tool can be either presented as a simple Rubric [yes /no performance indicators Figure1], as was adopted, for example for a non-graded formative discussion board or as a complex Rubric [descriptive banded performance indicators: unsatisfactory, pass, good, very good & excellent, Figure 2], as it should reflect the assessment learning outcomes (Popham 1997) and should be presented with no confusion of the learning opportunity that needs to be taking place for the student (Vallino 2008). Oppositely, for the marker the rubric should be a tool that is ultimately relies on the ability, knowledge and preparation of the assessor this will be enhanced with the familiarity of the performance criteria.

The other advantage of the rubric when marking is its focus on the specific criteria that the students have to attain for the module (Truemper 2003). Fors and Gunning (2014)

suggests that the Rubric needs to present a clear set of assignment descriptions/categories and have levels of performance indicators that are the evaluation dimension which may or may not hold a numerical value to them. The

Objective/Criteria	Performance Indicators				
	Not Met (0 point)	**Satisfactory** (0.25 point)	**Good** (0.5 points)	**Very Good** (0.75 points)	**Excellent** (1 point)
Word count minimum of 250 words posted in THREE separate posts on THREE separate days	Does not meet minimum word count and/or posted all posts over 1/2 days	Meets minimum word allowance however did posts on two days	Meets word count minimum of 250 words posted 3 separate Posts on THREE separate days	Posted above word count minimum of 250 words posted 3+ separate posts on 3 separate days	Posted 3+ separate posts or above and exceeding the minimum 250 word count on 3/3+ separate days
Analyses and debates key concepts on the topic using literature to underpin arguments	Does not analyse and/or debate key concepts lack of literature to underpin arguments	Shows some ability to analyse and/or debate key concepts, lacks evidence in underpinning the concepts	Demonstrates some critical thinking and evidence of analyses with minimal evidence in drawing conclusions. Key concepts identified but not always relevant to the topic	Demonstrates critical thinking and analyses of the topic showing the beginning of evaluation and conclusions are drawn with the literature underpinning these statements	Analyses well and debates key concepts on the topic using literature to underpin arguments and validate concepts
Engaged in active discussion with at least two other students	Did not engage with discussion with two (2) other students.	Minimal to no engagement in discussion with two (2) or less students	Limited engagement with discussion and engaged with two (2) students	Engaged with two (2+) or more students in active discussion	Engaged in active discussion with 2+ students in leading debates
Contributed with topic and fellow students	Contributed minimally to the topic discussed and has not engaged fellow students.	Minimal contribution and understanding of the key principles of the topic	Demonstrate knowledge and understand of the key concepts and enhances fellow students understanding and contributions	Extensively contributed to topic and engaged well with fellow students	Extensively contributed to all concepts and engaged actively and in depth with fellow students
Use of appropriate language, grammar and MDX referencing	Inappropriate use of language, poor grammar referencing does meet MDX criterion.	Some inappropriate use of language and grammar. Careless attention to detail with MDX referencing	Appropriate language with some attention required in structure and adhering to MDX referencing	Appropriate and fluent use of grammar with minor mistakes in MDX referencing	Fluent use of language grammar and accurate MDX referencing and clearer attention to detail
Total: 0out of 5					

Figure 2 Rubric 2 Complex

indicators are the different categories that the students are required to meet and the performance indicators represent how well these have been achieved.

Rubrics fall into two categories, either 'analytical or multiple trait consisting of multiple, separate scales and therefore provides a set of scores' (Rezaei and Lovorn 2010 p19; Dunbar et al 2006). This loans itself to different types of teaching and assessment strategies enabling use of different tools to assess different aspects of what is required from the student. A holistic rubric will look at the elements combined and give an overall impression of the learning to be achieved, (Dunbar et al 2006; Truemper 2004). It has been agreed that rubric is not simply a checklist or just a checklist (Andrade 2005; Petkov and Petkov 2006). A rubric is only as good as its design, support and explanation in its use and conversely the expectations from the use of the rubric should enhance the learning outcomes for the students. Without this, a rubric can lead to promotion of shallow learning whilst producing conformity and standardisation in the VLE, (Mandills et al 2009). In turn this can create missed learning opportunities for the student as they are only working towards the rubric criteria. There are some criticisms of the use of rubrics in regards to 'validity, reliability and fairness' particularly in relation to students in view of a lack of empirical evidence to support

effective use of a rubric, (Andrade and Du 2005 p 29). Jonsson and Svingby (2007) propose that effectiveness of rubrics can be examined based on literature at the time of writing. Despite these on-going issues there is growing confidence about the effectiveness of rubrics (Rezaei and Lovorn 2010)

When developing a rubric the lecturer needs to consider the type of assessment being designed eg essay, learning log, discussion board, poster, and whether there is already a marking guide on which to base the rubric. Hence in development of the rubric, Nicol and Mcfarlen–Dick's (2006) seven principles of good feedback should implemented:-

1. Clarify what good performance is
2. Facilitate reflection and self-assessment in learning
3. Deliver high-quality feedback information that helps learners self-correct
4. Encourage teacher–learner and peer dialogue
5. Encourage positive motivational beliefs and self-esteem
6. Provide opportunities to act on feedback

It should be simple to use and the language of the performance indicators should be easily understood by both the lecturers and students (Whittaker, Salend and Duhaney 2001; Wilson and Fairchild 2011). To promote this effect it is critical that the language used in the performance indicators and the categories is transparent and there is no misconception of what is expected from the learning outcomes (Lasater, 2006). Other contributing factors to consider is how the rubric is intended to be used as a feedback mechanism for students, and thereby to continue to improve their comprehension and expectation of the assessment activity (Morgaine, 2010; Frances 2010). When using the rubric as a grading tool and to elicit the engagement of the students through understanding the assessment activity requirements, the main reference to the rubrics for both parties are the differing criteria for each of the performance indicators. These categories have to be accurately represented and achievable. The communication that the rubric gives, enables the students to engage in assessment activity. Hence the use of the language within the rubric must foster a dialogue that works in partnership with the feedback and promotes discussion between the lecturer and the student. Stevens and Levi (2005) sees the rubric as a translator device to gain a level playing field in the learning activity.

The goal of the developing rubric, is to create equal opportunities for the students when engaging with the assessment process and receiving feedback from the lecturer. A result of the changed the learning environment via the VLE for students is to have a constructive influence on student engagement. The VLE gives easy student home-based access with the benefits of developing critical thinking with socialised interaction with others in a learning space (Buckley, et al 2005). A key positive outcome for the lecturers when using the rubric is that the tool being user friendly, it becomes easy to identify the different grading scales that correlate with the performance indicators. This simplifies the marking experience speeding up the process whilst enabling the giving constructive feedback in a timely fashion. It also minimizes the inconsistencies between lecturers and gaining parity in the assessment process.

Conclusion

In today's educational environment, the student wants clear guidance and direction to "how is this assessment being graded?" and "what is it that the assessment is asking for?" In return there is increasingly more expectations on the lecturer to engage with a variety of different modes of assessment and to enhance the learning experience of the student. In real terms this means rapid marking and feedback to be ready in a short time frame, therefore the use of a rubric for this purpose is a tool that can facilitate this. However to design an effective rubric requires time and revaluation after each usage. Each rubric should be designed individually to reflect the assessment activity. When starting out it is easier to start simple rather than complex as the road travelled for the rubric is about meeting the needs of the lecturer and the student. The rubric is a grading tool that should communicate the expectation of the assessment activity and used as constructive feedback for the student to feed-forward with the learning concepts obtained from the assessment task.

The performance levels indicators must enable both the lecturer and student to differentiate between levels. Hence the description of these levels needs to be clearly defined and logically sequenced. It should promote recognition of varying levels of performance and encouraging the student to improve and drive own learning to enhance their depth of knowledge. This can be further achieved through the ability to discriminate between performance levels via the use of a range of subjective words in defining these differences. The specificity of the performance indicators needs to demonstrate usefulness, and allow enhanced analysis of the given task.

The development [see Figures 1 and 2] of this rubric was to facilitate fast and effective feedback to feed forward for an online discussion board. It was a way of ensuring that both lecturer and student understood what was required of them. This style of analytic rubric provided the potential for the student to take accountability for their own learning through clear performance criteria. By combining the assessment outcomes with the performance indicators the rubric has been able to provide the students with information regarding what is most important to focus on and where their level and depth of knowledge is in relation to the given assessment. Through reviewing students work and the original rubric against the developing rubric other additional criteria are generated or deleted. This therefore triggered another revision of the rubric which will concentrate on the finer differentiation of levels. How the rubric continues to develop will be dictated by its usage and the revision/evaluation process. In conclusion it be seen that the rubric is not a static thing but a tool that is continually evolving and enhancing the learning process.

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SESSION 1B

COMPETENCES

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Students' perception of competences development in an undergraduate university environment

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Abstract: The pressure for universities to generate employable graduates requires the implementation of different ways of managing the learning process. Course programmes have thus been adapted to the new framework where skills and competences development are to be the resulting outcomes of students' stay at university. On-going evaluation systems, in combination with the selection of specific activities, help professors plan for the achievement of this objective. The study carried out in a group of 3rd year Marketing students of Business and Management shows that students identify different activities as both adequate for and effective in competences development. The authors conclude that embedding competences development in course programming is a useful and helpful tool for course management that is well accepted and valued by students.

Keywords: Learning process; competences development; course programming

Introduction

Professionals at all levels of education, whether primary, secondary or terciary (higher) education, living in increasingly knowledge-based societies such as the European Union member countries, do not question the need to help students develop skills and competences allowing them to adequately enter the labor market (EACEA, 2014), which is to say, education, specially higher education, should increase graduates employability (EACEA, 2012).

However, employability is not only a necessary goal of higher education; it is also a "complex concept encompassing many definitions and approaches" (EACEA, 2014, p. 61). In fact, there seem to be two main approaches to help graduates achieve the adequate degree of employability: the employment-centred approach, which is related to increasing "graduates chances of finding employment soon after graduation" (EACEA, 2014, p. 63). Universities develop and implement programmes addressed towards helping students entry into the labor market; including practical training in study programmes, developing seminars about specific issues such as preparing C.V. and job interviews, creating placement offices, etc. (EACEA, 2014).

The other approach is the competences-centred one, where the role of higher education is "to develop the skills and competences of graduates necessary to find a job" (EACEA, 2014, p. 64), furthermore, "students' knowledge, skills and competences are expressed as the learning outcomes of the education process" (EACEA, 2010, p. 22). A learning outcome is understood to be a statement "of what a learner is expected to know, understand and/or be able to demonstrate at the end of a period of learning" (Adam, 2006), learning outcomes "chief advantage is the clarity and precision they bring to any curriculum development process" (Adam, 2006).

The competences-centred approach requires that education professionals, in this case higher/terciary education professors, understand their job to be student centred. Not a small challenge. According to the Eurydice Report: The European Higher Education Area in 2012 "genuine student-centred learning is (…) difficult to integrate into everyday higher education reality. It should comprise actions that ensure that students learn how to think critically, participate in all kinds of academic life and are given more

independence and responsibility." (EACEA, 2010, p. 25). The approach that can be found in Spain is this second one, the competences-centred approach. Although many Spanish Universities also implement employment-centred activities.

This article focuses on the analysis of students' perception of competences development and the adequacy of the tools used to help them develop these competences. This analysis was performed within a third year (junior) marketing course: Marketing I (Course 102353_04 Facultat d'Economia I Empresa, Universitat Autònoma de Barcelona –UAB).

The course program is designed according to an UAB model that is built on several assumptions, being one of them the fact that "competencies needed to be effective can be developed" (Boyatzis, 2008). Another one is that the "development of competencies needed to be effective managers and leaders require program design and teaching methods focused on learning" (Boyatzis, 2008).

Course Programing

The Marketing I course program includes, therefore, a list of 17 learning outcomes that can be organized into two categories, course specific and transversal learning outcomes, but can also be organized in the three categories established by Katz in 1974; technical skills, human skills and conceptual skills (Katz ,1974; Parente, 2012). These skills include analysis, critical thinking and problem solving (hard skills according to different authors (Parente, 2012)) as well as soft skills, related to dealing with others, such as communication skills and team work, information and knowledge sharing (Parente, 2012), as well as related to dealing with one-self, such as being able to organize one's learning process, time management, and information selection and generation among others.

Marketing I sessions were programed by the author-teacher with a "co-responsibitily" framework of mind. Both the professor and the student are responsible of the outcome of their interaction in Marketing I. The professor is to organize sessions' contents and activities in order to help students develop the learning outcomes of the course, and students are to invest the time, effort, as well as willingness and enthusiasm required for these learning outcomes to come true.

With this objective in mind both contents and activities were programmed. Activities include exercises, cases, articles and readings, oral presentations, and mind maps generation. Activities may be individual or in group, in order to help students develop competences related to dealing with others. Each type of activity is intended to help students develop specific competences, and may be to related more than one competence. Table 2 shows which competences are related to each type of activity.

Each activity was programmed at least twice during the course (15 weeks) in order for the learning process, usually cumulative, to take place. In that way students could incorporate the learning s of the first time each activity was performed and see their own improvement the second time each activity was carried out.

Methods

The sample was composed by students enrolled on Marketing I UAB -ADE, English track 3rd year. A total of 52 students were studied). Most of them were students from

20 to 22 years old (82.7%), 69.2% female and 30.8% male, both local (36.5%) and Erasmus students (63.5%).

The research instrument used in this research was a questionnaire that included personal characteristics, opinions, satisfaction and recommendation. Specifically a two-wave cross-section was conducted during the second semester of the academic course 2013-14.

The first wave was conducted at the beginning of the course asking questions about their expectations with regard the different activities that they will develop during the course and the objectives that they thought these activities would help achieve. Self-report indicators of these expectations were measured by the items "Do you think these activities can help students achieve the objectives related to them?", to each activity and each objective. The questions had to be answered on a Liker scale ranging from strongly disagree (1) to strongly agree (5).

The second wave was conducted at the end of the semester, after completing the course, asking about their opinion with regard to the different activities and the objectives/capabilities that they had helped improve. This second questionnaire contained items similar to the previous questionnaire, but the general question was "Do you think these activities have helped you develop or improve your capabilities?", to each activity and each capability. The questions had to be answered also on a 5-point Likert scale. In addition, in this questionnaire questions regarding the general satisfaction with the course and the intention to recommend it were included. The level of satisfaction was assessed by one item "What is your degree of satisfaction with the course?", a 5-point Likert-scale was used. In addition, recommendation was also measured by one item "Would you recommend other students to take this course?", measured with a 5-point Likert scale.

The data collected were computed and analysed using the SPSS 19. The frequency and percentages of the responses to the specific questions were calculated. We used chi-squared analysis to analyse whether the personal characteristics of the students influenced some of their responses. Spearman's rho rank-order correlations, which is a non-parametric test that is used to measure the degree of association between two ranked variables (Myers *et al*., 2010), were used to investigate any significant correlations between the ordinal scales, that is, those which were measured by 5-point Likert scales. The correlations were measured between the objectives that they thought they could achieve developing the different activities, and the capabilities they thought that they had improved with these activities, the general satisfaction of the course and the possibility of recommendation.

Results and Discussion

Descriptive analysis

Table 1 presents the different activities, the objectives assigned to each activity and the degree of opinion about whether these activities can help achieve these objectives ("Can help" column) and if have finally helped to achieve them ("Have helped" column). Students understand activities programmed to be adequate tools for competences development, and they acknowledge these activities have been effective in developing and/or improving the specified competences.

Table 1. Objectives and capabilities that students thought that the activities could help to acquire and which have finally have help to acquire

Activity	Objectives	Opinion categories	Can help	Have helped
Exercises	Illustrate specific concepts related to a given topic	2 - Disagree	1.9%	5.8%
		3 - Neutral	11.5%	21.2%
		4 - Agree	**69.2%**	**61.5%**
		5 - Strongly agree	17.3%	11.5%
Cases	Illustrate. Use and apply models of analysis studied in class	2 - Disagree	0.0%	1.9%
		3 - Neutral	5.8%	21.2%
		4 - Agree	**65.4%**	**59.6%**
		5 - Strongly agree	28.8%	17.3%
	Models. Develop diagnosis capabilities	2 - Disagree	1.9%	3.8%
		3 - Neutral	28.8%	30.8%
		4 - Agree	**48.1%**	**50.0%**
		5 - Strongly agree	21.2%	15.4%
	Diagnosis. Develop a systemic understanding of a given business situation	2 - Disagree	5.9%	5.8%
		3 - Neutral	21.6%	25.0%
		4 - Agree	**49.0%**	**48.1%**
		5 - Strongly agree	23.5%	21.2%
Articles and readings	Knowledge. Acquire complementary knowledge about a given topic	2 - Disagree	7.7%	7.7%
		3 - Neutral	25.0%	21.2%
		4 - Agree	44.2%	53.8%
		5 - Strongly agree	23.1%	17.3%
	Analytical. Develop analytical capabilities	2 - Disagree	3.8%	3.8%
		3 - Neutral	34.6%	**46.2%**
		4 - Agree	**53.8%**	36.5%
		5 - Strongly agree	7.7%	13.5%
Oral presentations	Group work. Be able to work in work (negotiation, job coordination)	1 - Strongly disagree	0.0%	1.9%
		2 - Disagree	7.7%	9.6%
		3 - Neutral	21.2%	19.2%
		4 - Agree	**40.4%**	**48.1%**
		5 - Strongly agree	30.8%	21.2%
	Present Orally. Be able to present orally to an audience the results of your work	2 - Disagree	7.7%	5.8%
		3 - Neutral	9.6%	25.0%
		4 - Agree	**50.0%**	**40.4%**
		5 - Strongly agree	32.7%	28.8%
Individual mind map	Develop a global understanding of a specific issue, and the relations between topics	1 - Strongly disagree	0.0%	9.6%
		2 - Disagree	23.1%	15.4%
		3 - Neutral	23.1%	21.2%
		4 - Agree	**34.6%**	**34.6%**
		5 - Strongly agree	19.2%	19.2%

Regarding satisfaction and recommendation, which is also other way to measure the satisfaction (Keiningham *et al*., 2007), in general, students are satisfied (55.8% satisfied and 25% strongly satisfied) and will recommend other students to take this course (38.5% agree and 38.5% strongly agree). It is worth noting that no student was strongly dissatisfied or strongly disagreed.

Chi-square test for independence

Given two categorical variables, the chi-squared test of independence determines whether or not there exists a statistical dependence between them, that is, whether the proportions for one variable are different among values of the other variable.

In our case, we analyse whether or not there is an association between socio-demographic characteristics (gender, age, Erasmus or not and student characteristics) and opinion about the objectives that can or have helped achieve each activity.

We conclude that there is no association between the variables under consideration (p-value>0.05), except for gender and the opinion that "Articles and readings" can help to achieve the objective "Acquire complementary knowledge about a given topic" (Chi-Square=10.969; Sig.=0.012). Most women do agree that articles and readings can help increase knowledge (52.8% do agree and 22.2% do strongly agree) and a minor percentage is neutral (25%). However, men's opinion is equally distributed from disagree to strongly agree (25% in each category)

Correlation analysis: Spearman's rho test

Correlation is a bivariate analysis that measures the strengths of association between two variables. The value of the correlation coefficient varies between +1 and -1. Specifically, coefficients between 0.10 and 0.29 represent a small association; coefficients between 0.30 and 0.49 represent a medium association; and coefficients above 0.50 represent a large association or relationship (Corder and Formena, 2014). We will focus on Spearm rank correlation. This test does not make any assumptions about data distribution and is the appropriate correlation analysis when the variables are measured on a scale that is at least ordinal (Lehman, 2005; Spearman, 1904).

We will analyse the correlation between the opinion about whether the activities under consideration can help develop or improve certain capabilities before and after carrying them out, and the perception of whether they have finally helped achieve the objectives, and the general satisfaction level and recommendation intentions.

Table 2 shows Rho test for all the variables under consideration. It is worth noting that, regardless of significance, all Rho test values are positive (Rho>0), indicating a direct positive relationship between variables, that is, they move in the same direction.

Regarding the opinions about whether the different activities have helped achieve the objectives under consideration, significant correlations were found with the opinions they had at the beginning of the course regarding whether they thought they could help ($p<0.05$). The Rho test shows a large association or relationship for each variable (Rho>0.50), except for "Exercises" can and have helped illustrate specific concepts and "Cases" can and have helped develop diagnosis capabilities, which represent a medium association (Rho between 0.30 and 0.49).

In the second block of variables listed in Table 5, the relationship between the opinion about the objectives that the different activities have helped achieve and the satisfaction of the course are presented. We can observed that there is not significative correlation between the general satisfaction of the course and the opinion about whether the

"Cases" have helped develop diagnosis capabilities, "Articles and readings" have helped develop analytical capabilities and "Oral presentations" have helped being able to work in work (negotiation, job coordination) and being able to present orally to an audience the results of your work ($p>0.05$). However, there is a medium association between the level of satisfaction and the opinion about the "Exercises" have helped illustrate specific concepts related to a given topic, "Cases" have helped use and apply models of analysis studied in class", "Articles and readings" have helped acquire complementary knowledge about a given topic, and "Mind map" has helped develop a global understanding of a specific issue, and the relations between topics (Rho between 0.30 and 0.49; $p<0.05$). Finally, there is a small association between satisfaction and opinion about "Cases" have helped develop diagnosis capabilities (Rho=0.296; $p<0.05$).

In the third block of variables in Table 2, the relationship between the opinion about the objectives that the different activities have helped achieve and the probability of recommending other students to take this course are presented. It is worth noting that there is not significative correlation between the possibility of recommending the course and the opinion about whether the "Exercises" have helped illustrate specific concepts related to a given topic, "Articles and readings" have helped develop analytical capabilities, and "Oral presentations" have helped being able to work in work and to present orally to an audience the results of your work ($p>0.05$). However, there is a large association between the possibility of recommendation and the opinion of "Articles and readings" have helped acquire complementary knowledge about a given topic (Rho=0.518; $p<0.05$). Oh the other hand, there is a medium association between the possibility of recommendation and the opinion that "Cases" have helped use and apply models of analysis studied in class, develop diagnosis capabilities and develop a systemic understanding of a given business situation, and "Mind maps" have helped develop a global understanding of a specific issue, and the relations between topics (Rho between 0.30 and 0.49; $p<0.05$).

Finally, it is worth noting that there is a positive and large association between the satisfaction with the course and the probability of recommending it (Rho=0.715; p<0-005). If a student is satisfied with the course, there would be a high probability of recommending other students to take this course.

Table 5. Spearman's Rho test

		Rho	Sig. (2-tailed)
Have helped: EXERCISES concepts	Can help: EXERCISES	0.493	0.000**
Have helped: CASES_Illustrate	Can help: CASES Illustrate	0.601	0.000**
Have helped: CASES_models	Can help: CASES models	0.545	0.000**
Have helped: CASES_diagnosis	Can help: CASES diagnosis	0.401	0.004**
Have helped: ARTICLES AND READINGS Knowledge	Can help: ARTICLES AND READINGS Knowledge	0.803	0.000**
Have helped: ARTICLES AND READINGS_Analytical	Can help: ARTICLES AND READINGS Analytical	0.600	0.000**
Have helped: ORAL PRES_Group work	Can help: ORAL PRES Group work	0.714	0.000**
Have helped: ORAL PRES_oral pres	Can help: ORAL PRES oral pres	0.663	0.000**
Have helped: MIND MAP	Can help: MIND MAP	0.651	0.000**
Have helped: EXERCISES concepts	Satisfaction	0.364	0.008**
Have helped: CASES_Ilustrate	Satisfaction	0.336	0.015*
Have helped: CASES_models	Satisfaction	0.296	0.033*
Have helped: CASES_diagnosis	Satisfaction	0.263	0.060
Have helped: ARTICLES AND READINGS Knowledge	Satisfaction	0.438	0.001**
Have helped: ARTICLES AND READINGS_Analytical	Satisfaction	0.196	0.164
Have helped: ORAL PRES_Group work	Satisfaction	0.235	0.093
Have helped: ORAL PRES_oral pres	Satisfaction	0.103	0.468
Have helped: MIND MAP	Satisfaction	0.426	0.002**
Have helped: EXERCISES concepts	Recommendation	0.262	0.060
Have helped: CASES_Ilustrate	Recommendation	0.464	0.001**
Have helped: CASES_models	Recommendation	0.307	0.027*
Have helped: CASES_diagnosis	Recommendation	0.399	0.003**
Have helped: ARTICLES AND READINGS_Knowledge	Recommendation	0.518	0.000**
Have helped: ARTICLES AND READINGS_Analytical	Recommendation	0.259	0.064
Have helped: ORAL PRES_Group work	Recommendation	0.168	0.234
Have helped: ORAL PRES_oral pres	Recommendation	0.027	0.851
Have helped: MIND MAP	Recommendation	0.346	0.012**
Satisfaction	Recommendation	0.715	0.000**

*Sig.<0.05 (2-tailed)
**Sig.<0.01 (2-tailed)

Conclusions

As suggested by different authors (Andrews *et al.*, 2012; Boyatzis *et al.*, 2008), embedding competences development in different courses is possible provided it is taken into account when programming the course. Our research shows students agree with this and acknowledge their having generated and/or improved the sought after competences. We conclude that when both professor and students involvement is high, results and satisfaction are positive.

Students understand their investment in the course has effectively helped them grow not only in knowledge, but also in competences development (students think activities can help, they acknowledge activities have helped, they are satisfied). Therefore, probably, one of the reasons for the high degree of satisfaction is the professor's practical approach and students' involvement required for this course.

This research also suggests female students, prefer reading as a learning strategy for the acquisition of complementary knowledge. In spite of the chi-square test being adequate for this size sample, a future research line could be to analyze a bigger sample and find out whether male or female students show different preferred learning strategies. Another future research line is related to the optimum combination of activities required for the development of specific competences.

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Teamwork competence assessment

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Abstract: Teamwork is an important competence to be developed among students and this paper presents a case study related with teamwork competence assessment and development. Several processes take place during team assignment among students. We consider that the development of teamwork competence is related with being efficient in those processes. From a literature review of the processes that arise during teamwork, we present a evaluation tool which includes formative feedback in order to help students to target their own teamwork competence development. By providing students with guidelines for improvement, it seems reasonable to expect a better performance in subsequent experiences and thus it is also reasonable to assume the progressive competence development. A total of 58 teams from a Bachelor's Degree Programme in Industrial Engineering have been evaluated with this tool and therefore some conclusions are presented.

Keywords: Teamwork, competences, higher education

Introduction

Under the new European Higher Education Area it has been necessary to design learning and evaluation models in accordance with the Bologna guidelines which imply moving from acquiring knowledge to developing competences. In particular, in this paper, we are focused on teamwork competence and its development.

Students' teamwork competence is not developed just by working together on an assignment and involves the acquisition of different skills. Moreover, teamwork competence is obtained through a process that is difficult to tackle if students do not receive justified feedback on their performance as part of work teams (Marin-Garcia *et al.*, 2008, Martinez-Gomez & Marin-Garcia, 2009). This feedback will help the students to improve their performance in next team assignments. Students' acquisition of teamwork competence is a continuous and progressive process. Teachers should monitor this process and, in order to assess teamwork competence development, evidences regarding students' performance during their learning experiences need to be collected and analyzed.

During a team assignment among students several processes take place. According to the literature review, those processes are participation, conflict management, problem solving, internal communication / mutual respect / trust, external communication / feedback, collaboration / cooperation and leadership. We consider that to the extent that the students are efficient in relation to those processes, their teamwork competence development is enabled. There already exists a tool for assessing the performance of the team regarding those processes (Viles et al., 2013). In this work we are focused on the assessment of the individual performance of each student.

Usually, the teacher tries to assess the individual performance of each student; however nobody argues today about the need of finding new ways to assess competences taking into account not only the teachers' perceptions but also the perceptions of the others agents involved in teamwork, i.e., the students. In order to evaluate students' performance the use of peer ratings and self-evaluations are evidenced to be useful techniques that will help students to improve their individual performance. In this context the paper present a case study related with the assessment of teamwork

competence among students. We present a tool that allows self-assessment and peer evaluation of students' performance during a team assignment. It also allows giving formative feedback to the students on their performance as part of work teams. By providing students with this formative evaluation, it seems reasonable to expect a better performance in subsequent experiences and thus it is also reasonable to expect the progressive competence development.

A total of 224 students involved in 58 teams from a Bachelor's Degree Programme in Industrial Engineering participated in the case study and some conclusions from this experience are presented.

Conceptual framework

Self-assessment and peer review

Self-assessment and peer review have been deployed in some areas of education for many years. The disciplines areas where this type of assessment is used are varied and it is used across a very wide range of educational stages, from school to higher education and even in professional post courses. While some authors discuss about the lack of reliability or validity of this type of assessments, in contrast, others mention that formative assessment can help students to plan their own learning, identifying their own strengths and weaknesses, in order to direct their efforts to specific areas for improvement actions and to develop other personal and professional skills (Boud *et al*., 1990; Boud & Fachikov, 2006; Falchikov & Goldfinch, 2000; Brown & Knight, 2004; Topping, 2003).

Regarding teamwork, some authors have provided valuable research on the assessment of team members (Chalupa,Chen & Sormunen-Jones, 2000; Gueldenzoph & May, 2002). Specifically, Gueldenzoph and May (2002) mention some best practices in order to achieve and effective evaluation process. Creating an effective evaluation tool and implementing formative feedback are some critical aspects which have to be taken into account. Crews and North (2000) suggest that formative evaluation should be conducted throughout collaborative experience. Peer ratings help students to develop teamwork competence (Oakley *eta al*., 2004) and anonymous peer feedback is recommended as a way to shape members' teamwork skills (Parratt *et al*.,2014). If students can receive continual feedback on their team performance, group members could modify their behavior as necessary to assure the correct acquisition of the competence.

Processes that arise during teamwork

Several processes occur during teamworking and affect the team performance and its effectiveness. These processes are divided into two groups: operational processes and emergent states (Marks*et al.*, 2001). Operational processes are included in the different models of teamwork (Cohen & Bailey, 1997; Kozlowski & Ilgen, 2006; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2008, McGrath, 1964). These processes describe functions and interactions that occur during teamwork and how they are managed in order to perform team tasks (OP1-OP7). Emerging states consist of motivational processes that capture trends, relationships between team members and affective reactions (ES1-ES4). These processes involve a dynamic display, which tends to be stable over time (Kozlowski & Ilgen, 2006). Our understanding of these processes is consistent with the proposals of different authors as shown below.

OP1: Participation - refers to the extent to which team members have an active role in the development of the work and how decisions are made. (DeDreu & West, 2001; Sheppard *et al.*, 2004)

OP2: Conflict management - refers to how conflicts are valued in the team and if they are properly managed. (Bolton, 1999; Kozlowski & Ilgen, 2006; Oakley *et al.*, 2007; Sheppard *et al.*, 2004).

OP3: Problem solving - refers to the ability to solve problems, which is related to the team's goal of improving. (Sheppard *et al.*, 2004; Thylefors *et al.*, 2005).

OP4: Internal communication / mutual respect / trust - is in relation with proper and effective communication. (Brooks & Ammons, 2003; Delson, 2001; Oakley *et al.*, 2007; Sheppard *et al.*, 2004; Zander, 1994).

OP5: External communication and feedback - refers to the extent to which the team has access to information and is duly listened to by the organization. (Delson, 2001; Oakley *et al.*, 2007; Seat & Lord, 1999).

OP6: Collaboration and cooperation - refers to the extent to which team members work on a voluntary basis to achieve the objectives that have been established. (Gratton & Erickson, 2007; Lopez-Paniagua *et al.*, 2011.).

OP7: Leadership - refers to the internal team leader (Zaccaro *et al.*, 2001).

ES1: Team Learning. This learning refers to knowledge embedded within the team (Edmondson, 1999). The capabilities accumulate and improve as team members accrue experiences and learn how to work together better (Kozlowski & Ilgen; 2006).

ES2: Team climate. Climate refers to "the set of norms, attitudes and expectations that individuals perceive to operate in a specific social context." (Pirola-Merlo *et al.*, 2002). Creating a positive team climate implies creating conditions and an atmosphere in which individuals can speak up and express concerns (Leonard *et al.*, 2004).

ES3: Mutual trust. Trust in a team is the shared belief that team members will perform their roles and protect the interests of their teammates (Salas *et al.*, 2005).

ES4: Motivation. Motivation is related with the sense of collective confidence and task-based cohesion with regard to mission accomplishment (Marks *et al.*, 2001). This includes encouraging team members to perform better or to maintain high levels of performance by communicating their beliefs about team ability, competence in particular tasks and being leaders involved with the development of the project. (Guzzo & Dickinson, 1996).

Case study

The case study presented in this paper was designed to assist the development of students' teamwork competence. For this purpose we both measured students' individual performance and provided such information to students involved. Moreover, a proposal of actions leading to improve that performance was also provided to the students.

A total of 224 students were involved in the experience, who were attending at the first-year subject of a Bachelor's Degree Programme in Industrial Engineering. In this subject, students had to do an assignment in groups of 4 members and therefore a total of 58 teams took part in the case study.

Once students had completed the assignment each student was asked to individually rate their own performance and the performance of each of his teammates. Items in the questionnaire used to collect the data were defined taking into account several proposals (Viles et al., 2013; Oakley et al., 2007; Gueldezoph & May, 2002 among others). The questionnaire was developed in a web platform and the link to the questionnaire was sent to the students via mail. The aim of the questionnaire and how to answer it (instructions and dates) were also explained in the mail. As a condition to know the final mark of the assignment, each student had to respond to the questionnaire.

The Tool

To measure student performance, we elaborated an evaluation tool based on a questionnaire which evaluates the student performance within the team from both their own point of view and the point of view of the other team components. From data collected in the questionnaires we draw a individual student performance radar graph. To provide adequate feedback to the student, each student received an evaluation file with his or her individual radar graph together with a set of guidelines for teamwork competence improvement.

The questionnaire was designed to assess the operational processes that arise once a team is working on an assignment. Although the analysis of the teamwork emerging states would be also interesting, it is quite difficult to evaluate. On one hand, the establishment of scales in this case is more complex. On the other hand, the literature indicates that emerging states tend to stabilize over time as the teams remain (Ilgen *et al.*, 2005; Mathieu *et al.*, 2008), and this characteristic hardly occurs in a degree or teaching cycle where the teams often are exclusively formed for a particular assignment. Therefore, the questionnaire measures only the operational processes, not the emerging states.

Table 1 presents the specific items in the questionnaire related with the operational processes they aimed to assets using a scale from 1(never) to 5 (always).

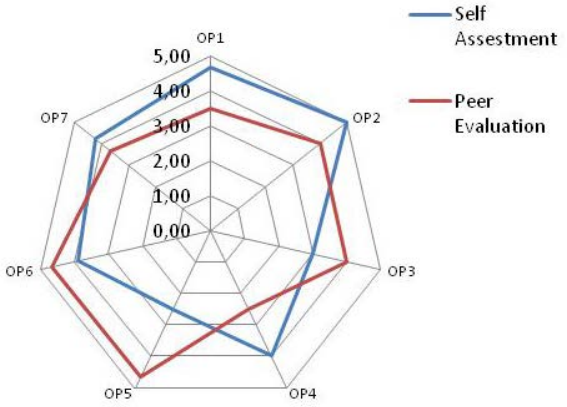
Table 1. Operational processes and items in the questionnaire

Process	*Items in the questionnaire*
OP1: Participation	The student has attended team meetings punctually.
	The student has assumed and performed the role and the tasks that have been assigned to him.
	The student has actively participated in decision making.
OP2: Conflict management	The student has exposed his opinion in an impartial and constructive way
OP3: Problem solving	The student has analyzed problem information and has proposed solutions
OP4: Internal communication / mutual respect / trust	The student has paid attention to the opinion of his teammates with respect for them
	The student has been open-minded to different ways of thinking and working
OP5: External communication and feedback	The student is aware of external factors that may affect the teamwork

Process	*Items in the questionnaire*
OP6: Collaboration and cooperation	The student has made contributions in team meetings The student has cooperated with the overall team effort (analysis, resolution and completion of the report)
OP7: Leadership	The student has been the leader planning and organizing the team

Once the questionnaires were fulfilled, data collected were processed in order to obtain for each student and for each process the following information: auto-assigned score and an average of the scores given by his teammates. This information was summarized using individual radar graphs which were delivered to students in a document or file. The radar graph allowed the student to compare his own perception with the perceptions of his teammates about his performance. Every student knows the average of the scores assigned by their peers; therefore, anonymity in response is guaranteed.

Figure 1 shows an example of an individual radar graph together with some guidelines for teamwork competence improvement.



Guidelines for teamwork competence improvement

OP4: Give your opinion respecting others turns.

OP5: look for dialogue with the teacher in order to receive feedback about the work.

Figure 1. Individual radar graph and guidelines

Results

To assess the students' opinion about the new evaluation tool, we asked them about its usefulness.

They were asked about the feedback they had received (understandability and usefulness of the evaluation file). They were also asked whether they considered the information provided useful guide for improving their individual teamwork competence in future team assignments that they will have to face with throughout the degree. Both questions should be rated between 1 (very unclear / useless) to 5 (very light / useful). At the same time, they could make any comment about the effectiveness of the evaluation process.

Table 2. Data collected

Variable	n	Mean	StDev	Minimun	Q1	Median	Q3	Maximun
Understandably	81 (35%)	3,81	0,85	1	3	4	4	5
Usefulness	77 (33%)	4,17	0,7	3	4	4	5	5

The 34% of students who participated in this study answered to this survey. Table 2 summarizes collected information. From these data we can observe that students scored high both understandably and usefulness. It should also be noted the broad acceptance among students this information has had. The students received as something positive the result of their assessment and their comments were in general that the feedback received could help them to improve. The majority of comments referred to the importance of having information from their peer teammates. As opposed to other authors we have not detect rejection towards this type of assessment.

Conclusions

The new educational models aimed at developing competencies also lead to the need to assess the degree of acquisition of them. Therefore, for competences development it is necessary to provide supervised learning experiences to the students throughout the degree. These learning experiences have to be monitored and students have to receive feedback that leads them to achieve better performance in the following experience which they face with. Giving each student their individual radar graph along with a list of guidelines for teamwork competence improvement can facilitate understanding, monitoring and improving the individual performance in team projects/assignments and it can lead to a progressive acquisition of teamwork competence by each student.

To the extent that this method is used in others team projects/assignments throughout the degree it will allow student to collect evidences of their teamwork competence development along the whole degree.

Future studies could pass the questionnaire during the course in order to analyse the impact of the feedback on their team learning experiences.

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Use of scoring rubrics for evaluating oral presentations in aerospace engineering education

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Abstract: Under the frame of Bologna system, alternative assessment methodologies gain significance in the evaluation process of the students. This article analyses the use of scoring rubrics for evaluating oral presentations of two different courses in aerospace engineering education, namely *Aircraft Design* and *Aerodynamics II*, at Universitat Politècnica de València. The score obtained at the presentation represents a significant percentage of the final grade for both courses. It has been observed that the students find difficulties to keep timing limitations overall. In addition, rubrics have proved to be a powerful tool to enhance some skills of the students, such as critical thinking and self-evaluation, although they may lead to unfairly high grades nonetheless.

Keywords: scoring rubrics; aerospace education; oral presentation; evaluation

Introduction

UNESCO (Delors, 1996), through the International Commission on Education for the XXI century, points out that the main theme of any educational project should be 'teach to know to do, to educate'. In other words, the students should learn by applying the knowledge, but also determining under which conditions they have the capability to apply it, for instance, enclosed and summarized in a single assignment. Therefore, education must not allow to comprise the understanding just from one point of view.

Engineering education in Europe is nowadays experiencing important changes (Joshi (2009)). In particular, aerospace engineering education is being affected by two main reasons. Firstly, the problem of educating aerospace engineers is worldwide, given the strong competition that USA is facing from Europe and Japan nowadays in this industry (Niosi and Zhegu, 2005). Secondly, the Bologna declaration and the European Higher Education Area (UK HE Educational Unit, 2015) make it necessary to improve the teaching-learning process. Assessments become more dynamic and short-term based. Therefore the students need to mature the knowledge in a faster way, which is not possible only through exams. New initiatives, projects and methodologies are needed in order to provide the future engineers with a comprehensive view of the practical aspects of engineering, forming not just scientists and designers, but professionals that could deal with multidisciplinary problems including design, manufacturing, finances and business plans, among others. At this point, teaching activities and facilities that bring the students closer to real life situations in aerospace systems are essential in order to progress in the teaching-learning procedure and contribute to stimulate the student to acquire knowledge.

As pointed out above, aerospace is one of the most dynamic and competitive of the technical fields (Lapins, 1997). Therefore, it is important to determine whether the students have acquired critical knowledge and skills. With this purpose, it is convenient to stimulate the self-evaluation when the students perform an engineering work and focus a portion of their thinking to a critical process through an objective foundation represented by a professional character. Exams are the most common way to evaluate the students. They are a good instrument when the evaluation is individual

and its purpose is to make the student demonstrate his knowledge (Crooks, 1988). Through this action however, the students do not get the capability to determine their capacity and demonstrate their attitudes to carry out engineering work by themselves. In other words, they do not develop critical knowledge. New approaches to assessment, often known as "authentic" or "performance" assessment, are needed to make the students develop important transversal skills like public speaking or the aforementioned self-evaluation. Project courses and oral presentations, in combination with others, are good evaluation methodologies for doing so (Palomba, 1999). Nonetheless, the information interchange between the professors and the students has a strong impact on the success of these methodologies. On one side, the students auto-evaluate the information and they can improve the theoretical lessons offered by the professor, and on the other side the professors are responsible for improving the critical spirit created in the student.

Courses in topics such as aircraft design or aerodynamics play an essential role in any Aerospace Engineering Degree. Their contents are fundamental to reach further detailed knowledge of aircraft systems. Hence, it is needed to provide the students with a suitable balance between conceptual and real world background, so that a successful future professional career can be ensured. In that sense, integration of theoretical and practical work is desirable. Theoretical concepts are necessary in topics such as design, in which complex morphology (airfoil, engine location, pressure distribution, fuselage shape, etc.) is found in real systems. To accomplish these goals, *Aircraft Design* and *Aerodynamics II* courses at *Universitat Politècnica de València* include a public oral defense of the course projects as part of their evaluation process. In these projects, which are described in the next section, the students put into practice the theory explained during the theoretical and practical classes and compare their results with real aerospace vehicles that fly or flew on the skies.

Methods

Evaluation of oral presentations

The common way to evaluate the quality of an oral presentation is to employ a *scoring rubric*. In education terminology, this means "a standard of performance for a defined population" (NCSESA, 1996). Rubrics are standardized ratings linked to learning objectives which theoretically support student self-reflection and self-assessment as well as communication between an assessor (the professor) and those being assessed (the students). They also allow professors, in combination with students, to review the employed criteria, which can be complex and subjective.

Since more than 30 years ago, many scoring rubrics have been presented in a graphic format, mainly as tables, by many universities, associations and companies. According to Herman et al. (1992), all of them present the same elements:

- One or more traits of dimensions that serve as the basis for judging the student response.
- Definitions and examples to clarify the meaning of each trait or dimension.
- A scale of values on which to rate each dimension.
- Standards of excellence for specified performance levels accompanied by models or examples of each level.

One of the main advantages of this type of evaluation is that the criteria employed to prove the quality of the performance (what in real worlds may be a product, process, etc.) can be known beforehand by the student. Nonetheless, this feature may imply a negative effect on the overall performance. The students, obviously, focus on the traits which are evaluated and forget other aspects of an oral presentation that, although not evaluated, may be relevant (for example, the dressing code). This work analyzes the students' outcome with and without knowing in advance the assessment criteria.

Another issue of scoring rubrics is that each level of fulfillment covers a wide range of marks. In addition, a small change in the evaluation on the rubric may lead to an unfair change in the numerical grade. Therefore, one of the subjects presents numerical scoring determined by ranges according to levels of fulfillment.

Multidimensional rubrics allow students to hide and compensate for a lack of ability in one trait by improving another one. However, if the traits are weighted properly, rubrics are a very effective way to improve the student weaknesses.

Description of the courses

Aircraft Design and *Aerodynamics II* courses are taught simultaneously during the first semester of the 4th year of the *Aerospace Engineering Bachelor Degree* at *Universitat Politècnica de València*. At that point, the students already have the basic foundations in Mathematics, Physics, Structures and Loads, Solid Mechanics, Fluid Mechanics, Aerodynamics, Control Systems and Aerospace Technology. The teaching-learning methodology is similar for both courses. In both evaluation methodologies, a significant percentage of the total grade of the course is obtained through the assessment of an oral public presentation. The presentation deals with the defense of their ideas and the work performed during the semester. With this kind of system, not only knowledge and critical thinking are evaluated, but also transversal skills such as teamwork and communication.

Aircraft Design

The *Aircraft Design* course is structured as a project-based course in which the students are required to apply their knowledge of different topics in order to perform a course project about the conceptual and preliminary design of an aircraft that fulfils the requirements in all different areas, taking into account general requirements such as performance, applications, green design, sustainability and economy.

Its evaluation is divided in three different parts: the evaluation of the course project, a oral defense of it, and a traditional exam. The project accounts for the 50% of the student grade, while the oral exposition and the exam weight 25% each. The course project consists in pre-designing an aircraft following certain specifications given by the professors, such as maximum cruise speed, range or propulsion technology. This project is carried out by groups of 3-4 students.

In this course, the scoring rubric of the oral exposition (see Table 1) is not known in advance by the students. Thus, they must use their general knowledge (or personal research) to figure out which abilities are ranked in the evaluation process. Professors who form the evaluating tribunal are also asked to give a global mark to the presentation without taking into account the traits of the rubric, just by their general opinion.

Table 1. Scoring rubric employed in the Aircraft Design course

Criterion	Description	Score
		0-10
Contents	Aircraft design final results, marketing, and mission definition.	
Answers	Critical judgments, defense of their design.	
Time	Fluency of the presentation, use of a given time.	
Resources	Organization, presentation, posture, speaking skills…	
Innovation	Morphology, new applications, versatility, operation…	

Table 1 shows that each criterions is qualified with a score from 0 to 10. As previously said, different levels of fulfilment determine scoring ranges, providing clear and uniform criteria for the different professors. Due to manuscript length limitations, the levels of fulfilment for each dimension are not included.

Aerodynamics II

The *Aerodynamics II* course is a traditional lecture-based course with several computational laboratory sessions. The main topic of this course is fundamentals of high speed aerodynamics, for example potential flow over supersonic wings or lift force of slender bodies.

The global evaluation of this course consists of three exams, a course project and an oral presentation of the project. Exams represent 70% of the grade, the course project 20% and the presentation 10%. The course project and also the oral presentation comprises four laboratory sessions in which the students analyze different aircraft geometries (a missile, a slender wing…) under different high speed (subsonic and supersonic) flight conditions. In this case, the students know the scoring rubric of the presentation (shown in Table 2) since the beginning of the course. In addition, they are provided with a brief guide about "how to" perform an oral presentation. This rubric could be used by the students to guess the aspects evaluated in the Aircraft Design course, but the tribunal is not the same. For this reason rubrics and mainly rank criteria are quite different.

Table 2. Scoring rubric employed in the Aerodynamics II course

Criterion	Description	Score				
		0.0	0.5	1.0	1.5	2.0
Contents	Clear communication, critic judgment, answers.					
Organization	Order of topics, connection between sections.					
Time	Fluency of the presentation, use of a given time.					
Resources	Graphics and animations, creativity, quality and utility.					
Scenic performance	Posture, confidence, eye contact, voice volume.					

In this course, the score for each dimension can only present 5 different values, from 0 to 2.5 points (see table 2), corresponding to the different levels of fulfilment. Again, for the sake of brevity, descriptors are omitted for the scoring rubric described in Table 2.

Results and Discussion

In this section, the scores obtained by the students as well as the personal opinion of professors and students alike are analyzed. In order to simplify and extract general trends, averaged values and standard deviations are given. The same 40 students (academic year 2014-2015) were ranked in both courses to minimize uncertainties. The time gap between the two evaluation events is less than two weeks, so the experience of the students in oral presentations is more or less the same.

Case 1: Aircraft Design

Table 3 shows the *Aircraft Design* presentation score. Relatively high scores were obtained by all the students. The low standard deviation found in each item remarks that the groups performed in a quite homogeneous way. The highest average grade was obtained for the "Time" criterion, i.e., the ability of the students to defend their project in no more nor less than a predefined time (in this case, 15 minutes). However, it has the highest standard deviation. This is due to the fact that a couple of groups exceeded the time limitations in a really important way.

On the other side, the "Innovation" dimension was the aspect in which the students performed in a poorer way. This criterion awards the groups of students which design an innovative aircraft in terms of aerodynamics, operability, target mission… instead of a straightforward one. The authors noticed that this is a trend that changes over the years in the *Aircraft Design* course: when students from one year really try to innovate in their design in order to improve their marks in this sense, the students from following years show a lack in innovation in order to enhance other aspects of the project and go further in their calculations. The authors suspect that this is due to the fact that older students prevent the next generation ones from introducing complicated innovations in their designs due to the added difficulty.

Another important result is that the global marks given by the professors without considering the scoring rubric matches almost perfectly the average of the scoring rubric criteria, with just a slightly higher standard deviation. This could be explained since the evaluators' experience probably leads them to assess a global mark based on the same items considered in the rubric in an unconscious way. What is more, the marks they globally give to the presentations might be inferred by the marks they just gave to each of the criteria, since the professors internally try to respect these marks.

Table 3. Grade obtained by the students in the oral presentation of the *Aircraft Design* course

Criterion	Average grade [%]	Standard deviation [%]
Contents	76.17	5.67
Answers	77.5	5.94
Time	83.0	11.57
Resources	81.33	8.74
Innovation	72.33	8.02
Total score	**78.07**	**4.66**
Global mark	**78.83**	**7.66**

Case 2: Aerodynamics II

Table 4 presents the *Aerodynamics II* course presentation marks. Generally, high scores were obtained with high difference between teams. Low homogeneity is observed in the group of students. Some of them took profit of the documentation given to them and performed very well with oral presentations, whilst some other did not defend their work in a proper manner. It is interesting to see that "Organization" is the aspect with the highest average score and lowest deviation. This means that *Aerodynamics II* students are able to sort the data correctly and logically. Again, "Time" is the criterion with the the highest deviations. However, in this subject this dimension presents the lowest average mark. Students find it very hard to stick to a given time when they feel that they have done a high amount of work and want to present all of it. This means that they have to improve the transversal competence related to summarization of information.

Table 4. Grade obtained by the students in the oral presentation of the *Aerodynamics II* course

Criterion	Average grade [%]	Standard deviation [%]
Contents	80.68	15.30
Organization	95.45	12.53
Time	75.00	28.87
Resources	82.95	19.50
Scenic performance	89.77	14.76
Total score	**84.77**	**13.92**

General results

Score of presentations is generally high. In fact, no one (out of 40) failed. In average, there is a difference of about 15 points when this score is compared to the mark obtained in other evaluation activities, i.e. exams. As stated in the "Methods" section, rubrics allow the students to hide some of their weaknesses. This does not mean rubrics are not useful. The students are aware of their downsides and that is why they are able to hide them. Thus, the auto-evaluation skill has been enhanced indeed. Nevertheless, score presentations then seem kind of unfair.

When both studied cases are compared, it is noted that the influence of knowing in advance the scoring rubrics leads the student to perform better in the different items that are evaluated, obtaining scores about 6 points higher than the ones obtained without this information. When preparing their presentation, students tend to focus on the particular items that will be assessed, rather than trying to introduce additional features to their presentation. For instance, it was noticed by the professors that most students stuck to a formal dress code in the *Aircraft Design* presentations, whereas they did not give any importance to this fact in the *Aerodynamics II* ones.

Conclusions

The use of scoring rubrics for the evaluation of oral presentations in an Aerospace Engineering Degree has been analyzed. Their advantages and drawbacks are well known by the community, and they have also been observed in this work. However, interesting results have been obtained.

Overall, the students find difficulties to keep timing limitations even when they are warned to do so by giving them the information about the scoring rubric in advance. Given the relevance of timing in engineering projects, exercises to improve the summarizing skill should be proposed to the students. The use of scoring rubrics is hence a good tool to identify the performance of the students in this transverse competences.

In addition, this work pointed out that the fact that the students know the scoring rubric in advance leads them to focus exclusively in the stipulated criteria, forgetting about other features that could also improve the overall quality of their presentations. In order to get the best of both worlds, the criteria might be given in advance, but an additional "overall impression" dimension should be included.

However, in general terms, the objective of enhancing self-evaluation and critical thinking is fulfilled with the methodology proposed in this paper. Thus, it is recommended to keep the use of scoring rubrics for the evaluation of next generations.

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Instructional factors and over-education of university graduates over time

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Abstract: The aim of this study is to test the role of the level of generic competences developed during University studies and the professional and practice orientation of instruction (PPOI) in the prediction of graduates' initial vertical fit and change in vertical fit over an 8-year period. The study sample comprised 334 graduates who finished their degrees two years before they were interviewed for the first time (Time 1). Four and eight years later they were interviewed again (Times 2 and 3, respectively). All of them were employed at Times 1, 2 and 3. Hypotheses were tested by means of Latent Growth Curve Analysis. The results showed that only PPOI was positively and significantly related to graduates' rate of change in vertical fit over time, meaning that the rate of change of graduates who received a more professional and practice-oriented instruction was faster than the rate of change of graduates who received a less professional and practice-oriented instruction.

Keywords: generic competences; professional orientation of instruction; vertical fit; over-education

Introduction

Over-education is an important issue among Spanish graduates (García-Montalvo & Peiró, 2009). It means that many graduates have jobs that require lower educational levels than the level they actually have.

Taking into account the negative consequences of over-education (i.e. it has been negatively related to salaries, job and life satisfaction, well-being, etc.) (McKee-Ryan & Harvey, 2011), it is important to know what kinds of factors prevent young people from starting their professional careers as over-educated employees and/or mitigate this situation over time. In the context of Higher Education Institutions, some instructional factors may be especially relevant because they could become routes to prevent graduates' over-education and reduce it over time. There is some evidence that the quality of training and the orientation of teaching toward labour market demands have a positive effect on educational fit (Verhaest & van der Velden, 2013). However, empirical evidence in this area is still quite scarce.

With this in mind, we expect that teaching focused on the development of key job competences and abilities, on the one hand, and instruction oriented toward professional practice (PPOI), on the other, will allow graduates to obtain jobs that fit their educational levels better. Thus, we propose the following hypotheses:

Hypothesis 1: Higher levels of generic competences acquired during university studies will be positively related to initial levels of graduates' vertical fit and its rate of change over an 8-year period.

Hypothesis 2: Professional and practice orientation of instruction (PPOI) will be positively related to initial levels of graduates' vertical fit and its rate of change over an 8-year period.

Method

Sample and procedure

To test the study hypotheses, we used longitudinal data from a representative sample of university graduates who obtained their degrees in 2002 and 2003. The sample was surveyed two (Time 1), six (Time 2) and ten years after graduation (Time 3). The final sample comprised 334 graduates who were employed at Times 1, 2 and 3. The average age of respondents was 27.4 (SD=4.3) at Time 1. Regarding sex, 63.8% were female. In terms of their fields of study, respondents were distributed as follows: Engineering (6%), Natural Sciences and Mathematics (11.4%), Humanities (13.2%), Health Sciences (17.4%), Educational Sciences (18.9%), and Social Sciences (33.2%).

Measures

To measure the study variables, we used a number of scales and items included in the questionnaire administered to the surveyed graduates.

Development of generic competences at Time 1 was assessed by the following question with 9 items, "To what extent has the training received at the university contributed to the development of each of the following competences and abilities?: 1. social skills, 2. time and resources planning and management, 3. problem solving, 4. decision making, 5. creativity, 6. management, 7. team work, 8. critical thinking, 9. oral and written communication. Respondents answered by using a response scale that ranged from 0 (It has not contributed at all) to 10 (It has contributed a lot).

A global competence score was calculated by averaging the ratings provided for the nine competences mentioned above. The scale reliability (Cronbach's coefficient alpha=.91) was satisfactory.

Professional and practice orientation of instruction (PPOI). This variable was measured at Time 1 by means of a 4-item scale (e.g., "Teaching methods facilitate the acquisition of professional abilities and skills"). The response scale ranged from 0 (strongly disagree) to 10 (strongly agree). The scale reliability (Cronbach's coefficient alpha = .81) was satisfactory.

Vertical fit. The dependent variable was operationalized as the ratio between the educational level required by the job and the graduate's attained educational level. Graduates were asked to indicate the educational level required by their current job. The response options were as follows: 1. None, 2. Compulsory education, 3. Vocational education-1st level, 4. Vocational education-2nd level, 5. High school, 6. A 3-year university degree, and 7. A 5-year university degree. Graduates' attained educational level only presented two values (6. A 3-year university degree or 7. A 5-year university degree). Therefore, values less than one (<1) indicate over-education (graduate has a higher level of studies than what is required by the job). Values equalling one (1) indicate vertical fit. Graduates' vertical fit was calculated at T1, T2 and T3.

Analysis

We tested our hypotheses by means of Latent Growth Curve Analysis. The analyses were conducted with MPlus using Maximum Likelihood estimation methods. Apart from our two independent variables (competences acquired and PPOI), we controlled for a number of variables: academic performance (average degree mark), sex, age, social class, and field of study (basic, technical, health, social, humanities, and educational sciences). For the field of study, 5 dummy variables were created, using

humanities as the reference category. All the variables were introduced as predictors of initial vertical-fit (intercepts) and fit change over time (slopes).

Results and Discussion

Regarding our hypotheses, the tested model was satisfactory in terms of fit (χ^2=24.06, df=13; p<.05; RMSEA=.05; CFI=.96; TLI=.89; SRMSR=.02). The results are shown in Tables 1 and 2. The professional and practice orientation of the instruction received at the University was positively and significantly related to graduates' rate of change in vertical fit over time (estimate=.01; standardized estimate=.25 p<.05). In other words, the rate of positive change toward better fitting jobs in graduates who received a more professional and practice-oriented instruction was faster than the rate of change in graduates who received a less professional and practice-oriented instruction. Contrary to our expectations, the level of competence developed during the studies did not significantly predict the initial levels of vertical fit or the rate of change in fit.

Table 1. Results of the Latent Growth Curve Analysis to estimate the relationship between the predictors and graduates' initial vertical fit

	Estimate	SE	p[b]
Age	-0.007	0.003	0.017
Sex	0.028	0.026	0.291
Social class	0.016	0.009	0.077
Average mark	0.019	0.030	0.516
Dummy Basics	0.013	0.048	0.788
Dummy Technical	0.045	0.060	0.452
Dummy Social	-0.020	0.039	0.603
Dummy Education	-0.029	0.043	0.496
Dummy Health	0.079	0.043	0.068
Competences development	0.006	0.010	0.516
PPOI[a]	-0.008	0.009	0.363

[a] Professional and Practice Orientation Instruction
[b] Unstandardized Coefficients. Two-tail p-values

Table 2. Results of the Latent Growth Curve Analysis to estimate the relationship between the predictors and the rate of change in vertical fit over time

	Estimate	SE	p[b]
Age	-0.001	0.002	0.452
Sex	0.014	0.015	0.355
Social class	0.004	0.005	0.398
Average mark	0.005	0.017	0.742
Dummy Basics	0.002	0.027	0.941
Dummy Technical	-0.023	0.034	0.491
Dummy Social	0.010	0.022	0.637
Dummy Education	0.033	0.024	0.168
Dummy Health	-0.005	0.024	0.849
Competences development	0.002	0.005	0.731
PPOI[a]	0.010	0.005	0.046

[a] Professional and Practice Orientation Instruction
[b] Unstandardized Coefficients. Two-tail p-values

Conclusions

The results show that universities should consider increasing the professional and practice orientation of the instruction (PPOI) they provide because it may help to reduce graduates' over-education over time. This could be mainly due to the fact that PPOI can affect graduates' job search process. Specifically, PPOI can give graduates a broader knowledge of the labour market, which, in turn, can help them to avoid experiencing career indecision (Zikic & Hall, 2009) and ending up in mismatched jobs.

In addition, an education oriented toward professional practice, which clearly shows professional paths and relates theory to practice, is likely to be a facilitator of career exploration, and this may also contribute to improving fit over time (Zikic & Hall, 2009). Finally, a professionally oriented education can also contribute to higher job search clarity in graduates, which has shown positive effects on job search intensity and outcomes (Côté, Saks & Zikic, 2006).

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Some aspects of the Formation in Engineering: the Curriculum by Competitions and the Curriculum Socio-Critic

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Abstract: This paper discusses some aspects of the training of engineers, showing two different approaches, the skills approach and socio-critical approach and how they are possible to be integrated in such a way to bring their potential to the formation of this professional, considering the challenges the future.

Keywords: engineer, competitions, socio-critical.

Introduction

Science and technology have had a steady and sustained progress in the past five decades, causing a strong impact on human activities.
In turn, the work field has felt the impact as education; it has been forced to introduce major changes to meet the needs of companies to have qualified human resources and advanced.
UNESCO, through the Delors (Delors, 1994) Report and other documents (Magendzo, 2006), (Faure, 1973), (UNESCO, 1990), (UNESCO, 2000) and others (Prelac, 2002), (CRES, 2008) have introduced the concept of lifelong learning and have added that education is a highly relevant and inalienable right, whose purpose is the integral development of individuals.
Skills training have been one of the ways in which education has faced the needs of the workplace. This stems from the world of work and has been adopted by many institutions of higher education as a model for engineering education.
Skills training are a curricular approach among its qualities shows job training, based on a look at the productive sectors resulting in the relevance of the curriculum, but relativizing humanist education. (Ibid) (Schink and Ormeño, 2006), which has preoccupied the academic world by the emergence of neoliberal thinking, leading to other more humanistic approaches.
In this context, the socio-critic curriculum appears as opposed to curriculum competencies, which promotes the transformation of society through a reflective-critical transformation, humanizing, which gives an emphasis on the role of education and curriculum content, attaches importance to the student as an agent of change and shows a social vision of the school.

Methodology

From Engineering Congress 2014, held in Buenos Aires in which UNESCO guidelines for engineering education arise from the concern arises 2015 by entering into this topic. Starts collecting information, interviews with professionals from the University Of Santiago De Chile, curriculum specialists and engineering review of official electronic

information from some universities. Then, analyzed and studied the information is applicable to the preparation of this work, including its conclusions.

Objectives

Demonstrate the possibility to apply the socio-critic curriculum in training engineer.
Analyze the advantages and disadvantages of both approaches in engineering training.

Antecedents

The University of Santiago, Chile (USACH) is a state institution of higher education and public which, among its many degrees, dictates Engineering with two different approaches: competency in the Faculty of Engineering (Letelier et al, 2005) and linear curriculum Faculty of Technology.
Currently, the skills approach is recurrent in the current training of engineers, paradigmatic in many universities. The reference document presents a sustainable system for engineering skills training; only mentions training for work and not considered an important aspect as the integral formation that allows the student to be a critical professional and dutiful to society.

The Curriculum

Within the curricular concepts, one of the most important approaches has raised Shirley Grundy (Grundy, 1992). It argues that the curriculum is a cultural concept that reflects what society tries to reproduce in the new generations. In this conception the skills approach corresponds to a technical curriculum characterized in that the objectives are predefined by the company; the idea of curriculum, reflected in the plans and programs of study, before the educational activity; the organization, based on the ability of the teacher and the teaching action as a product giving searched learning in students. In this approach the task of theory serves the efficient achievement of operational objectives; practice only exists in relation to compliance with certain plans.
Today, the conceptualizations of competencies point to perform the action, experience and performance context as key in such conceptualizations. The trend is that the powers integrate theory and practice that it solves everyday problems but as well how emergent problems, atypical or rare in the engineer applies a repertoire of knowledge and skills that allow you to be smart against a given situation. This concept involves a concatenation of knowledge that not only articulates a conception of being, knowledge, know-how and knowledge to live, or put another way, involves pragmatic knowledge and knowledge production oriented.
In relation to engineering education, this approach allows the engineer is able to solve problems in different contexts, whether professional or cultural; combining training and work cycles; self-learning; ability to respond quickly to new everyday problems; integrate and reconvert skills; jeopardize the capabilities of mathematical-abstract and reflection to develop initiative, creativity, innovation and decision-making ability logical thinking.
On the other hand, advantages of this approach are the effective linkage between business and universities, training in various sociocultural contexts, continuous updating of curricula and study programs, learning through electronic media, facilitating the integration and better learning assessment.
This approach is also possible to mention disadvantages. Including interference neoliberal economic model that prioritizes the needs of the companies of the country, there is a limitation of control and autonomy of teachers in the development and

implementation of learning, poor training in the social and human level, creates unmet demands on workers.

Curriculum Socio-Critic

Socio-Critical Theory meets a set of theories from different fields of thought whose purpose is to look at reality from a revolutionary and transformative view, for it seeks to transform the world. Within this concept USACH motto is inscribed, "Educating people to transform the country".

Curricularly, postulates that the basic values to develop are the shared values, cooperative, shared in common and liberating. The contents must be socially meaningful and the constructive activities and shared learning activities. The relation between theory and practice is inseparable from this contradiction in the facts and situations; practice is the theory in action. The fixation of objectives is made through dialogue and discussion among students. It considers that the official curriculum is an instrument of reproduction of power. Primacy of teamwork within the school and its environment. The teacher's role should be considered reflective, critical, transformative agent of social change, a researcher in the classroom, committed to the education of students and the socio-political situation.

Analysis

Perform a curriculum redesign involves a profound changes; especially if it is passed from a still persistent, a curriculum by competencies and even more if it is a socio-critical curriculum, somewhat unknown linear curriculum.

In engineering, it is very important training in basics science; they provide solid and broad foundation for the basic technological development of professional performance. The formation in basic science, based on the transmission of knowledge, is shaped suitably in the linear curriculum, then the formation in sciences of engineering and specific technologies can be developed according to various curricular approaches.

It is necessary to mention that the engineer can perform in varied professional and cultural contexts, different areas of performance and complex situations, dysfunctional situations and emerging contexts. This means that a curriculum hardly can shape the variety of skills that the professional can develop. All the engineering competitions essentially point at the technology, relativizing the integral formation, which is the ultimate goal of education.

In a curriculum which foster the integral development engineer taking skills training as an axis, it would be advisable to exercise gradually, through the hidden curriculum, introducing elements of socio-critical curriculum, integrating the qualities of both approaches. Incorporate skills for development of critical thinking, related to moral discernment, to live and understand, to issue ethical and aesthetic judgments and to express himself adequately in their mother tongue. In this regard, the prominent educator Ms. Viola Soto (Soto, 2004) believes that educational policy should advocate training that "on the one hand, a caring man looking in continuing cooperation with others, with a story based on which builds its vision and its entry into the planetary civilization; otherwise, a competitor individual, able to deny the presence of others or separate their benefit, whose north is the future of techno-scientific "globalization".

The success in the implementation of a curriculum as the indicated will be difficult and slow, have a natural resistance to change; teachers with initial training that does not comply with the principle of "reflective practitioner" (Schön, 1992); guide training in the learning-development axis; to approach the theory and the daily practice,

incorporating service-learning methodology; joint training levels that enable effective training itinerary; universities should provide quality education with an innovative multidisciplinary management by incorporating a culture of change and continuous quality improvement; sufficient for the associated costs of the student practice financial resources.

These concepts are shaped the recommendations of UNESCO (Brito, 2014) in the Agenda for the Development after 2015.

In Chile, some universities declare skills training, including, secondarily, social skills, but a simple analysis of information on the official websites of these schools, enough to realize that the stated curriculum is linear, ie, traditional no indication of socio-critical curriculum. (U de Chile, 20015), (U of Talca, 2015), (U de la Frontera, 2015). They all agree on issues such as ethics, social responsibility, oral and written communication incorporated as subjects with no more than 2 hours a week. Moreover, a study conducted at the National Technological University of Argentina shows the difficulty of incorporating, as elements of social skills and personal development. The authors, among its recommendations point to the increase in social science subjects. (Ferrando, Karina and Páez, Olga, 2009)

Conclusions

The competency-based approach has gained ground in engineering education with the strong support of the prevailing neoliberal system and international organizations, but it should be stressed that the linear engineering, traditional approach still remains and, in some colleges the approach competences not pass rather than being a statement. If deemed central to the curriculum competency axis, facing a socio-critical approach, it is advisable to integrate the best of both concepts in order to develop and implement a curriculum that ensures competency-based training, which is Based on the engineering training that will lead to a comprehensive education, implying an engineer with technological and scientific training at the highest level, with a high sense of social responsibility and a marked development of critical and reflective thinking and skills issue argued and ethical judgments, that places engineering in central finding solutions for sustainable development and promote a more integrated and collaborative research. (Ibídem)

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