PEER-ASSESSMENT IN HIGHER EDUCATION

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Abstract: *Nowadays education is undergoing an evolution by leaps and bounds in order to provide students with the fundamental professional skills. For that reason, the traditional evaluation model is complemented with other methodologies, such as peer-assessment, for improving the learning process. The present contribution describes the peer-assessment methodology applied to the ECTS students groups in the Information Security subject during the 2015-2016 academic year. From the results obtained, it is possible to conclude that although the traditional method is reliable, there are some parts to be enhanced.*

Keywords: Tutorial support session, peer-assessment, team working, transversal skills, engineering.

INTRODUCTION

Higher education is experiencing several changes not only from a structural perspective, such as length of studies and degrees (García-Suárez 2014), but also, and specially, from a methodological point of view (Esteve Mon 2011). This way, it is fundamental to go beyond the purely quantitative assessment, so that the formative evaluation should be considered in order to integrate all the components/actors that take place in the teaching learning process (Sánchez 2005). That means to consider learners as a critical basis of such process.

Regarding the evolution that our society has been undergoing in recent years, a similar change must be done in higher education. As a consequence of this need new methodologies have emerged, such as peer-assessment (Sluijsmans 1998) (Arribas 2012) that complements the traditional evaluation method. Within the peer-assessment methodology (Jaime 2012) the student moves from being a passive figure assessed only by the teacher to be an active one (Boud 1995), and along with the teacher evaluates the activities. Also by including this figure in the methodology it is possible to determine whether the evaluation criteria are reliable when the students' learning is assessed.

This experience has been conducted on the Information Security subject (Información 2016), which is taught in the third year of the Computer Engineering: Information Technology Degree and also in the fourth year of Telematics Engineering Degree, both from the University Centre of Mérida as part of the Extremadura University. This is an engineering subject with a specific distribution of 4,5 theoretical credits, 1,5 practical credits and 0,3 credits dedicated to follow-up activities, scheduled tutoring or ECTS (European Credit Transfer System) tutoring. These last ones correspond to 3 attendance hours for each working group. In the experiment, the size of the working group has varied from 2 to 5 students, being 3 the common proportion.

As occurs in the remaining subjects of both mentioned degrees, the Information Security subject is responsible for the study and acquisition of a series of competences, not only specific but also transversal competences. Specifically, the tasks assigned to every group from the ECTS activity pursue the following transversal competences:

- Communicate effectively in oral and written form (in terms of speaking and understanding), exposing knowledge, procedures, results and ideas related to ICT (Information and Communication Technology), with special emphasis on writing technical documentation.
- Have initiative and be decisive, providing effective solutions to resolve the problems set out even in situations of lack of information and/or with time and/or resources constraints.

1. OBJECTIVES

In this research the aim is to achieve an improvement in the acquisition of both specific and transversal competences by applying peer-assessment in higher education and, particularly, in the engineering field.

2. RESEARCH DESIGN

In order to join the transversal competences, within some of the specific skills of the Information Security subject a work plan is designed. This work plan has been carried out during the first four-month period of the 2015-2016 academic year. In that plan the attendance and non-attendance work time of each student is considered. The corresponding results are discussed in Section 3. The plan considers three sessions throughout the four-month period that it is described below.

2.1 First Session

The first session was performed during the third week from the corresponding four-month period.

Unlike the previous experience carried out in (Traver Becerra, Arias Masa, & Hidalgo Izquierdo 2015) in which the composition of the different groups was performed randomly, in this case learners chose their own groups. For that reason, there is a number of members that ranges from 2 to 5 students. Once the groups are created, the distribution of works activities is random, by using the same application mentioned in (Traver Becerra, Arias Masa, & Hidalgo Izquierdo 2015). The works offered were the following ones:

- History and types of viruses.
- Spanish security legislation.
- European security legislation.
- History of cryptography until the year 0.
- History of cryptography until the Catholic kings.
- History of cryptography from the Catholic kings to the last king of the Austria dynasty.
- History from the last king of the Austria dynasty to Isabel II.
- History of cryptography from Isabel II to the First World War.
- History of cryptography from the First World War to the Second World War.

The work entitled "European security legislation" remained with no group assigned, so finally, 8 working groups were composed. After that, an example of project notebook is provided to them as indicated in (Arias Masa & Martin Espada 2015) as well as a predictable working agenda.

2.2 Second Session

The second session was performed in a middle week of the corresponding four-month period.

Within this second session a review was made including the following considerations:

- Analysis of each working group performance. The teacher makes recommendations according to roles and competences, which are adapted to the challenges encountered.
- Work status exposition based on the planning done for every group. Each group exposes the work schedule that includes the progress of every task defined at the beginning, the challenges encountered and how they solve them. The teacher recommends some solutions to resolve current problems and provides bibliographical references for assisting their understanding. Concerning the risks identified that may delay the end date, both parts discuss the best way to avoid them.

- Advice for facing the oral presentation. Three points are addressed in order to facilitate the exposition during the third session: the presentation (slides), the audience, and the speaker (the different students involve).

Before the last session, every ECTS group should deliver the whole work following the rules specified in (Arias Masa & Arevalo Rosado 2013) in which at least the next elements must be included: presentation, final project notebook, and the documentation prepared by the group.

2.3 Third Session

This third session was performed before the last two weeks of class for avoiding overwhelming the students at that time.

The third session covers the oral exposition of final works. The general order of groups is determined in a random way as well as the order of exposition within a specific group (this information is revealed at the beginning of every oral presentation). The objective pursued with randomness is to assess the knowledge acquired after working together and the communication skills when some unforeseen circumstances occur. Usually, when the intervention order is previously fixed there is a risk of focusing only on that part assigned.

Finally, concerning the exposition time, each individual intervention lasts 5 minutes, which is established in the first session.

2.4 Peer-assessment

At the end of every oral presentation of an ECTS group, the remaining students perform the peer-assessment at real-time. For performing this peer-assessment a Google questionnaire has been used, in which they evaluate classmates by applying a "Likert Scale" form with values ranging from 1 to 10.

Figure 1. Likert Scale sample used to evaluate the contents shown by the group

Source: Own work

For every work group the next issues are evaluated:

- Level of presentation (slides) used by the group.
- Level of individual explanation of every group member.

- Level of contents exposed by the group.
- Average level of the group.

This peer-assessment has three distinguishing components. First of all, every learner should identify himself in the questionnaire. Secondly, the student should identify the learner to be peer-assessed, and finally, should specify the group to which the peer-assessed student belongs.

3. EXPERIMENTAL PHASE

The results obtained by applying peer-assessment have enabled the final assessment of students for the ECTS activities, corresponding to a 10% of the final mark of learners.

Figure 2 shows the comparison in terms of mean of the sections evaluated by students when performing the peer-assessment method with respect the evaluation conducted by the teacher.

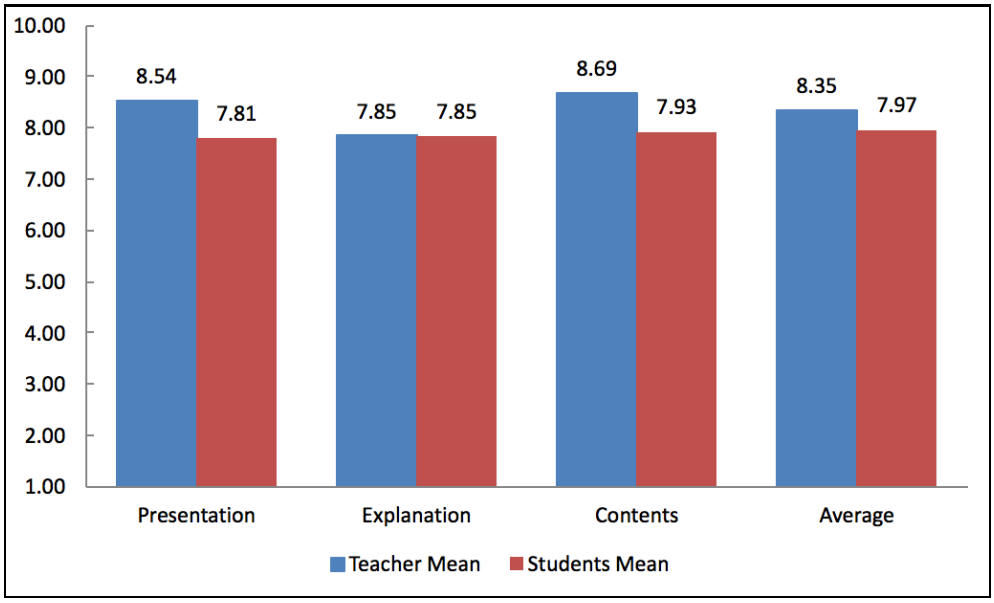

Figure 2. Global results when comparing both students' peer-assessment and teacher evaluation
Source: Own work

In this figure it is possible to observe the coincidence of mean when the section "Explanation" is evaluated by students and the teacher, specially when it is compared to the mean values resulting in the "Presentation" and "Contents" sections in which a difference exists.

For determining if there is a significant difference in these two evaluations, considering that it is a normal distribution and the population size (number of students) is small, the student's t-test is used. In this case the student's t-test is paired, since the population is the same and both students and the teacher evaluate it.

Figures 3 and 4 show the results obtained when applying the student's t-test for the evaluation performed by students and the teacher in the sections "Presentation" and "Contents", respectively. The results, for the two cases, with a significance level of $\propto$=0.05 obtain a p-value much lower than the significance value, so that, the null hypothesis is rejected. That is to say, the peer-assessment of students and the teacher in these two parts is significantly different. However, the differences between both assessments are less than 1.

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        Paired t-test

data:  students_presentation and teacher_presentation
t = -4.2666, df = 25, p-value = 0.0002492
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.0732570 -0.3744353
sample estimates:
mean of the differences
             -0.7238462
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Figure 3. Results from the student's t-test of the "Presentation" mean
Source: Own work

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        Paired t-test

data:  students_contents and teacher_contents
t = -5.8524, df = 25, p-value = 4.19e-06
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.029536 -0.493541
sample estimates:
mean of the differences
             -0.7615385
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Figure 4. Results from the student's t-test of the "Contents" mean
Source: Own work

It must be highlighted that students complete the evaluation based on the information exposed during the oral presentation and explanation, due to the fact that they do not have the knowledge of the topic described, whereas the teacher

does. Even more, the mean obtained in the "Contents" section presents a greater difference between the teacher's assessment and the students' peer-assessment.

If the mean of the evaluations results for every section ("Presentation", "Explanation", and "Contents") is performed, it is possible to observe that the difference between the students' peer-assessment and the teacher evaluation with respect the "Average" is minimal, without exceeding a 0.11 in the student case, which is the worst case.

CONCLUSION

Concerning the results obtained during the ECTS activity, it is important to note that the peer-assessment methodology benefits both parts, students and teachers. Learners are more participative and involved with the subject, while enhancing the transversal competences. Moreover, the teacher gets a feedback about the learning process and the students evaluation, in order to identify whether the objectives fixed have been achieved and which parts are susceptible to improvement.

Regarding these results, it is possible to conclude that our initial goals, which imply the improvement of transversal competences as from the specific ones, have been attained. Future work will include a strengthening and review of the corresponding material to allow improving the learning and the acquisition of students' transversal skills, through peer-assessment methodology in complement to traditional evaluation.

Finally, after analysing the obtained results, future work also will imply to carry out several tasks for acquiring knowledge of the topics to be exhibit for all groups with the aim of reducing the difference shown in the results of "Presentation" and "Content" sections between the student peer-assessment and the teacher evaluation.

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