Study of the impact on student learning using the eRubric tool and peer assessment

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The current study aims to tackle the impact of self and peer assessment on learning at university, and the internalisation of competences when students use eRubrics to assess class tasks and projects. In this context eRubrics are used as a tool, a technique and a method that can help teachers to focus on the students’ learning, hence, closer to the new methodological principles of the European Space. This study focuses on the current use of technology to assess learning, and more specifically the use of eRubrics. It will look at peer assessment and all the other required methodologies to promote the development of self-regulating competences among students. Likewise, the present study aims to find out, based on contrasting results, the requirements for the implementation of the new European methodological principles. A number of peer assessments and their comparison to teacher’s assessments were analysed for three academic years consecutively. This was done based on the presentation of class tasks and projects, where 70 university students assessed their peers and the resulting assessments were compared to those provided by the teacher during their last academic year. Results include a total of 994 eRubrics, which were used to assess the presentation of 14 class groups. The final results highlighted that students internalised quality criteria, and gradually gained more practice with the eRubric methodology. During the three years the eRubric and the teaching methodologies also improved, as did the instruments required for their analysis.

Keywords: Peer assessment, eRubric, Formative Assessment and Project-Based Learning.

1. Introduction

Assessment has been reintroduced as a major area by many professors in regards to projects of innovation and educational improvement at a university level, due to the new methodological changes promoted by the European Space. This has always been a recurring issue. However, these recent changes focus on competences assessment on one hand, and on the other demand greater participation from the student throughout the entire process. The changes have turned all aspects of assessment into one of the main areas dealing with innovation and current studies. Thus, assessment has become one of the most important aspects of teaching practice, and one where both students and teachers try to give their best; although sometimes despite their efforts, lack of understanding and unsatisfactory situations may occur from both sides [1][2][3]. This may actually happen even when students have clear and precise criteria and a formative assessment is developed. Furthermore, these problems may still persist even when students raise their voices and get more involved in their own learning process. To avoid these problems, a series of procedures and strategies should be carried out in order to assess the scope and limits of this greater student participation in the assessment process.

Teachers face the assessment process from a new teaching approach focused on students’ learning, where attention is drawn to students’ workload and the credits assigned to the subjects. This new approach, together with the new resources and possibilities offered by educational technologies (online learning, etc), is shaping new methodological possibilities [4][5][6][7][8][9] and practices that require new competences from both teachers and students [10].

In general, these changes require a greater responsibility from students so that they can assume a more defined role in both the learning and the assessment processes [11][12]. This is why this model advocates a broader understanding and cooperation between students and teachers, in order to make assessment criteria, function and scope more transparent. This idea is closer to a formative assessment than summative, as it enables significant learning and allows students to check on their learning. However, formative assessment is not always possible, especially when there is a large group of students. Therefore, teachers are encouraged to try different methods and techniques in different contexts in order to reach a better understanding with students. In this way students aim to understand and internalise the assessment criteria and quality standards, while teachers aim to find out the real scope of their students’ learning process. There are two techniques that can particularly help achieve these aims:

a) On the one hand, peer assessment and self assessment are carried out by both teachers and students and are not exclusive to one or another, but instead, they become innovative methods and models which allow them both: teachers and students to reach professional competences [13][14][15][16]. Teachers carry out the final evaluation and marking. Peer assessment and self assessment must be understood as a methodology for students to acquire better knowledge of and commitment to the assessment process, but should not be taken into account in final marking and evaluation.

Peer assessment refers to both peer correction and peer feedback. The two aspects can be and must be combined, as they help to achieve class cohesion [17]. On the other hand, self-assessment aims for students to identify the criteria or standards to be implemented in their activities and to assess them according to such criteria [18]. The importance and implementation of such criteria differs according to teachers or students [19]; hence it would be interesting to research
their understanding of the process of criteria and assessment. This framework helps us understand the acquisition of these competences by students and their attainment with new teaching methodological models. This methodology is particularly interesting because it requires students to take more and more responsibility of their own learning process, making them increasingly involved and motivated. After all, the ability shown by these students when internalising peer assessment criteria is, by itself, a learn to learn methodology, or lifelong learning, to acquire and implement standards that will be later used with other peers in the professional world.

b) On the other hand, the eRubric is a tool, an equally innovative technique and methodology, which allows for the development of professional competences. At the same time it requires students to carry out ongoing self-assessment when identifying the criteria or standards to be met in their tasks, as well as applying such criteria and standards. Therefore, the eRubric is likely to elicit greater participation from students during the assessment process, by learning, sharing and internalising indicators and assessment criteria. These indicators and assessment criteria are established by the teacher and contrasted with students’ learning evidence by means of an ongoing debate. This way students are allowed to manage their own learning process. The eRubric also facilitates the peer and self-assessment methodology, and offers students guidelines to be aware of and differentiate between the learning development process when creating criteria (their meaning, their relationship with the meaning of standards, their link to professional competences, etc) and when implementing these criteria [13]. The term eRubric is not frequently used in our immediate context neither in the university teaching practice, although it is widely used in the context of assessment matrices and in the practice of this tool [20]. On the contrary, there is very little experience with the use of eRubrics by students to carry out peer assessment. In an English-speaking context, it seems that certain scholars find this term a bit confusing and as belonging to a very reduced semantic field, when they define eRubrics as a technology assessment scale [21]. There is much more published literature on eRubrics in this technology context than in the context of peer assessment.

The process of criteria and assessment making by teachers and students is a strategy that helps us understand the acquisition of competences by students and, at the same time, experience new methodological models – peer assessment -, techniques and tools - eRubrics – to assess professional competences. The peak of technology in university teaching in general and in the assessment process in particular is an unstoppable fact. Therefore, the time has come to assess experiences derived from the actions promoted by universities within the new European Space policy. The specialised literature shows some evidence of the benefits of formative assessment, peer assessment and the use of techniques and tools such as the eRubric [22][23][24][25]. However, it is still unknown as to how these thoughts and the internalisation of assessment criteria and standards occur in students when the Internet and specialized softwares - such as eRubrics – are involved.

2. Methodology

The following analysed experience took place in an elective subject for three consecutive years (2007-2008; 2008-2009 and 2009-2010) with fourth year Pedagogy degree students. The group size during the three year case study varied between 30 to 65 students depending on the year. During that period, the used methodology always consisted of project-based learning with formative assessment using eRubrics. The teacher used two eRubrics to assess the competences required during the course. The percentages and requirements of each eRubric were modified in order to adapt it to each situation depending on the number of students per group.

On the one hand, the first eRubric (40% of the total mark) tackled student participation during class and the teacher’s office hours used to follow up group projects, by means of a “learning contract” where students’ responsibilities were reflected and student participation in peer assessment was encouraged. The task consisted of designing a professional project to produce and assess teaching materials for a particular educational case. On the other hand, the second eRubric (50% of the total mark), aimed to assess all the competences necessary for the project. In addition to these two eRubrics, an individual test was also required from each student to show his/her knowledge and command of the project (10% of the total mark).

The teacher carried out an overall evaluation of each project during his/her follow-up throughout the whole year and also based on the final presentation at the end of the year. To do so, the teacher used a diary to write down the different aspects of group work and the office hours required by each project. Students assessed the presentation of the project, hence the presentation competences were the ones used to elaborate a comparative study between peer assessment and teacher assessment (e.g. oral competence, use of technology in the presentation, etc.), as it will be further explained. While all competences were designed and explained by the teacher, indicators were created and agreed on by groups as an exercise at the beginning of each year. Also, the eRubric criteria were discussed, and those aspects that seemed ambiguous to students were clarified. Likewise, the importance of internalising criteria and standards was discussed at the beginning of each year, together with the importance of peer assessment in view of the professional world. In fact, an assessment exercise driven by reasons other than professional implementation of the criteria would be wrong.

The general methodology of the course involved different strategies:

- Lessons led by the teacher at the beginning of each unit; using group dynamics to discuss the theoretical background of the programme contents.
Debate sessions and activities (outlines, summaries, reports, comments and projects) carried out by students either individually, in groups or in peers. They worked in the classroom using examples of all the materials previously presented by the teacher.

Group project. Students carried out the design, experimentation and assessment of a particular material within a specific teaching context.

Office hours and online tutor-sessions. These were of crucial importance as they aimed for teachers to use the eRubric to accompany students’ learning process with their projects. A learning contract was drawn up for each project and group; on which the sense of each eRubric indicator for each particular project was specified.

Additional activities. Several complementary activities were presented in order to look in depth at specific topics by means of conference summaries. Students also collaborated with other students who were studying different subjects and who attended different universities (depending on the opportunities available throughout the year).

Course stages:
The methodology gradually developed along the three years, through different stages and pace within each academic year; and it was finally defined by three stages gathered in the Agenda. For each stage there was an open forum on a variety of topics.

The stages were as follows:

- The first stage (approximately one month), where the teacher presents the topics and group dynamics are carried out as a group.
- The second stage (almost the whole length of the course), where each group selects one project from those presented by the teacher and draws up a contract with the teacher to carry it out. At this point, group tutor sessions and teamwork are especially important, the latter through the group ePortfolio and the eRubric.
- The third and final stage, where each group introduces their project as a conference paper. The presentation is assessed by the teacher and the rest of the students. This is called peer assessment and is widely mentioned in the pedagogical literature [2].

2.1. Instruments
The analysis instrument consisted of using the same eRubric throughout the course, together with an ePortfolio for each group which kept recorded evidence of learning, experiences and presented materials. The format of the rubrics used in peer assessment during presentations was paper-based. The text of the rubric has changed over the three years due to debates and discussions at the beginning of each year and to its adjustment to students' projects. Likewise, new aspects such as scale numbering from 1 to 10 were used to score evidences in the rubric. Given that each competence included four evidences, the total range of a competence was 0-40. By doing so, the possibility of conducting correlational analyses increases.

Students’ projects were aimed at designing teaching materials adapted to a certain educational level and knowledge area, where the final user’s profile and context accounted for an important key. Such materials must come with an assessment design aimed at a specific context and users, and must require at least one pilot test to check the assessment design proposal. Designing any teaching material in a technological format (multimedia, software, web pages, etc.) requires technical competence and time that the students did not have. Therefore they were given the chance to adapt some already existing teaching materials to a particular context; or to use materials designed by the teacher’s research group. The Faculty of Education of the University of Malaga has a special department and two technicians available to assist these specialised teaching processes, as well as with the appropriate equipment to re-edit technological materials (audio editing equipment, video, multimedia, etc.).

The eRubric instrument has been modified throughout the three years and has finally kept the following variables:
- Descriptive variables:
  - Who assesses (numbered name)
  - Who is being assessed (numbered name)
  - Exam mark and final grade
  - Observations and incidents recorded
- Competence variables of the eRubric:
  1. Technology used (this section assesses the use of technology in the presentation of the project). 5% in relation to the rest of the competences.
     - No visual support at all (ranging from 0-10)
     - Poor or scarce visual support (0-10)
     - Satisfactory visual support (0-10)
Different visual support formats, satisfactorily presented and complementary to one another (posters, presentations, pamphlets, etc.) (0-10)

The term satisfactory here refers to the ideal practice taught by the subject of Educational Technology in previous years and reinforced by means of examples, templates, presentations, posters, etc.

2. Presentation of the project (this section assesses the effort made to present the project to others). 10% in relation to the rest of the competences.

The presentation is not comprehensible due to lack of coherently organised information (ranging from 0-10)
The presentation is difficult to follow due to sequential and logical failure (0-10)
The presentation is clearly comprehensible as information follows a logical sequence (0-10)
The information is presented following a logical sequence and in an European language other than Spanish (0-10)

3. Adaptation of the design and assessment. 15% in relation to the rest of the competences.

No assessment design is presented (ranging from 0-10)
The assessment design presented is not 100% coherent with the assessment objectives (0-10)
The assessment design presented is 100% coherent with the assessment objectives (0-10)
The assessment design presented is coherent, creative and full of instrumental and graphic resources (0-10)

4. Self-assessment of the whole process (this section assesses the constraints and limitations encountered in the process, together with the required resources and competences to develop the project both individually and as a group. It also assesses the steps taken to alleviate the constraints as well as the abilities developed to achieve the objectives). 20% in relation to the rest of the competences.

No group self-assessment is presented (ranging from 0-10)
The group self-assessment presented is not clearly presented (0-10)
Errors and achievements of the group are clearly presented (0-10)
Errors and achievements are identified and their causes explained (0-10)

2.2. Analysis Techniques

The data of the present study were taken from the analysis of the third year of the three that were studied between 2007 and 2010. Throughout these years the methodology, the eRubric and the instruments of the study improved. In the last year there was a total of 70 students and 14 groups, producing a total of 994 assessed eRubrics. The data were organised as follows: assessor identifier (no. of student and teacher); no. of the group assessed; data from each of the competences and their assessment by the group, and student assessor's exam grade.

The data analysis has worked out the assessment of each competence provided by each participant and the sum of all assessments provided by each group. Then, the difference between teacher and student assessment of each group has been worked out in each of the competences. In this way the distributions and differences of the teacher and student assessments are obtained. It is worth taking into account that in those cases where the teacher’s assessment is of an extreme difference (higher or lower) to that of the student’s, the student’s assessment will always be negative when it’s lower and positive when it’s higher. Whereas when the assessment is not of an extreme difference it can be positive or negative.

The scale used to assess each indicator in each competence ranged from 0 to 10, for being the one students were most familiar with, as it is the scale used to grade in the Spanish educational system. The average and the typical deviations of the distribution of the differences between student and teacher assessment have been worked out for each competence and for the total of all competences. This was done with the purpose of finding out which competences present more differences between student and teacher assessment, and whether or not these differences were maintained in the total; as a competence may be assessed at its lowest and another one at its highest, in which case the total assessment average would be similar to that of the teacher.

This method allows us to detect all the differences, regardless of whether they were produced in the assessment of a competence or in the assessment of all competences. Additionally, the average of these differences in peer assessment has been worked out for each student. This allows us to distinguish those students who, on average, over-assess in relation to the teacher from those who under-assess and finally those whose assessment is similar to the teacher’s. Students’ attendance in the activities was also taken into account, differentiating between the assessment provided by regular attendees and by irregular attendees.

Data and variable analysis:

- Differences between teacher and student assessment of competences
- Differences between teacher and student assessment of competences as compared to students’ exam grades
- Changes detected in peer assessment over time as compared to teacher assessment. The aim is to find out whether the internalisation of the criteria improves in line with a more frequent use and practice of the eRubric methodology and peer assessment.
- Differences with other variables such as attendance
3. Results

Graphic 1 shows the average of the differences between the total assessments of each group provided by each student and by the teacher respectively. In the first two groups, it can be observed how students under-assess in relation to the teacher, as they seem to be more demanding with their peers. Instead, in the following groups, there is a tendency to over-assess in relation to the teacher. There might be various reasons for this: students may want to favour their peers, they may have more reference information as they assess more and more groups, etc. In the competence analysis (graphic 2) the tenth group is the most irregular, as it has a positive difference in the first three competences and a very negative one in the fourth competence. This explains why the total of peer assessments for this group is similar to the teacher’s assessment (graphic 1). Another aspect to be highlighted is the fact that students under-assess their peers in relation to the teacher in the fourth competence. It can also be observed that, except for the first group and the strange case of group 10, the average of the differences in the assessment of each competence is generally between five points.

If we look at the averages of the differences in the assessments provided by each student in relation to that provided by the teacher (see chart 1), we find that 19.14% of students under-assess their peers in relation to the teacher, with an average of 3 points out of 40; whereas 10.63% of students give an average assessment of 3 points or more. The averages of these differences throw 6.4 points out of 40. Likewise, 42.55% of students give an assessment of which the average of the differences ranges between -1.9 and 1.9.

Graphic 1. Averages of the differences in the total assessment of each group by each student and by the teacher.

Graphic 2. Competence analysis
According to our data, the averages of these differences tend to go up. This may be due to students’ learning process when applying the eRubric criteria over time, as well as to more psychological factors inherent to every assessor. Once a first moment of “tension and responsibility to assess others” (where students might be tempted to carry out a more demanding assessment) has passed, they might eventually apply the assessment criteria more calmly and rationally, taking into account the shown evidence. Likewise, as projects are presented and students apply criteria to different situations, they are learning to internalise the criteria. Additionally, students might improve their projects over time due to them analysing their peers’ presentations. However, the teacher’s assessment seems to have disregarded this possibility, as except for the first group (that has the lowest grade), the rest of the groups have high grades regardless of their presentation order (the ones with the highest grades are 3, 5, 6, 11 and 14).

### Conclusion

The eRubric methodology and technique applied to peer assessment poses a huge professional challenge for both students and teachers. Students are gradually learning to use it by means of regular practice, which contributes to them better internalising criteria and assessment standards.

Some competences were easier to learn than others. For instance, students assessed less accordingly to the teacher in competences of self-assessment, in the analysis of constraints and limitations encountered, and in the required resources and competences to develop the project both individually and as a group. We therefore understand that we must invest more effort in these types of competences and pay constant attention to the follow-up of projects, demanding ongoing analysis from students by using techniques such as elaborated learning diaries. In an increasingly globalised world, our institutions will also be globalised [26] and will have to offer professional training for an equally globalised future [27]. This implies that from basic educational training, students should have more involvement in self assessment and in the exchange of quality criteria and standards. In other words, we need our students to discuss these criteria and standards when working with other students from their own or different universities, just like they would in the professional world. Likewise, students need to share and generalise assessment criteria from other institutions. This higher level of commitment from students towards the teaching and learning processes, together with globalisation and standards exchange, places assessment in the core of attention. Likewise, the learning of quality criteria and standards shared with other institutions requires the creation and research of online tools and services to assist teachers and students in competence assessment, peer-assessment and self-assessment.

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