EDULEARN24

16TH INTERNATIONAL CONFERENCE ON EDUCATION AND NEW LEARNING TECHNOLOGIES

PALMA (SPAIN)
1ST-3RD OF JULY 2024

CONFERENCE PROCEEDINGS

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Luis Gómez Chova, *University of Valencia, Spain*
Chelo González Martínez, *Polytechnic University of Valencia, Spain*
Joanna Lees, *CEU Cardinal Herrera University, Spain*

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Preface

The EDULEARN24 Conference Proceedings include the papers presented at the 16th International Conference on Education and New Learning Technologies, held in Palma, Spain, from the 1st to the 3rd of July 2024. EDULEARN aims to offer a platform for lecturers to share valuable research and insights on the changing world of education and learning and teaching technologies.

This year, participants from over 80 countries engaged in networking activities, plenary sessions, parallel thematic sessions, and workshops. Renowned educational experts delivered keynote speeches, which are available at IATED Talks: iated.org/talks/.

EDULEARN24's focus was on the topics listed here: Educational Trends and Experiences, Pedagogical Methods and Innovations, Educational Research and Technology in Teaching and Learning.

The International Program Committee of EDULEARN24 included lecturers and researchers from around the world who conducted a blind peer review process to ensure the quality of the final publication. Among the points evaluated were the content, relevance to the field, structure, clarity, originality, and alignment with conference topics and disciplines.

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Finally, we extend our heartfelt thanks and best wishes to all members and delegates who contributed to the EDULEARN24 Proceedings.

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EXPLORING THE IMPACT OF PEER REVIEW IN ELECTRICAL ENGINEERING COURSES

R. Boluda-Ruiz, M. Campo-Valera, I. Moreno-González

University of Málaga (SPAIN)

Abstract

The use of peer review in university students enrolled in STEM (Science, Technology, Engineering, and Mathematics) degrees emerges as an ever-evolving educational strategy. This approach is justified not only by its solid theoretical foundation, but also by its capacity to foster critical evaluation skills among students. In the STEM university context, peer review offers tangible benefits. This study explores the impact of employing peer review as an educational tool in courses within the Degree of Electrical Engineering at the University of Málaga, defining specific rubrics and ensuring non-influence on students' final grades. The findings indicate a positive evaluation from students, with averages reflecting a favorable perception of the quality of the evaluation produced.

Keywords: Peer review, Evaluation, Learning, Electrical Engineering.

1 INTRODUCTION

1.1 Motivation

Within the framework of modern education, the integration of peer assessment aligns with the paradigm shift towards student-centred learning methodologies. In contrast to more traditional approaches, where the teacher plays a predominantly instructive role, student-centred methodologies promote active participation and increased responsibility among students in their own learning process. Peer assessment, as an integral part of this approach, reflects the importance of collaboration and knowledge exchange among classmates, involving the evaluation of students' work by their peers who possess similar levels of knowledge and experience. This dynamic promotes a horizontal relationship among students, where each of them assumes a role as both evaluator and evaluated. By engaging in this process of active and collaborative assessment, students not only receive feedback on their own performance, but also can strength critical skills by analysing and providing constructive feedback on their peers' work.

This peer assessment process not only strengthens understanding of the theoretical concepts, but also fosters a sense of shared responsibility in the classroom. Students become active agents of their own learning experience by taking on active roles in evaluating their peers, which contributes to greater intrinsic motivation and commitment to the educational process. Additionally, peer assessment provides an invaluable opportunity for the development of social and emotional skills, such as empathy, teamwork, and the ability to receive constructive criticism. Furthermore, by receiving constructive feedback from their peers, students learn to accept criticism positively and use it as opportunities for growth and improvement.

More specifically, the integration of peer assessment in STEM (Science, Technology, Engineering, and Mathematics) university programs, such as Electrical Engineering, offers a unique opportunity to enhance the learning process and prepare students for the challenges of an ever-changing work environment. In such a dynamic and collaborative field as Electrical Engineering, where innovation and problem-solving are paramount, the ability to give and receive constructive feedback is considered essential. In this context, peer assessment can be applied in a variety of scenarios, from engineering projects and the analysis and development of communication systems to data analysis and technical problem-solving. Students can greatly benefit from evaluating their peers' work during activities within the various course programs, as it provides them with the opportunity to understand different approaches to problem-solving and improve their ability to communicate their ideas effectively. By actively participating in peer assessment, students develop leadership, empathy, and critical thinking skills, competencies that are fundamental to success in the workplace.

1.2 Literature review

Ongoing research on peer assessment in the university context has delved into various aspects that influence its effectiveness and practical application, widely recognizing its value in higher education. Among these aspects, the importance of designing clear and transparent assessment criteria, as well as establishing a conducive environment for constructive feedback exchange among students, stands out [1]. In 1998 [2], the validity of peer review was highlighted, especially when clear criteria or rubrics are established for assessment. Additionally, it was also observed that adequate training for both evaluators and students to be evaluated can significantly enhance the quality of feedback and the perception of fairness in the process [3].

On the one hand, the integration of peer assessment into the university curriculum has also evolved towards more innovative and technological approaches. Online platforms and collaborative tools enable peer reviews to be conducted more efficiently and scalable [4], facilitating the participation of a larger number of students and the management of feedback processes [5]. However, it is crucial to consider ethical and privacy aspects in the use of these technologies, as well as to ensure fairness in workload distribution and the quality of participation [6]. On the other hand, another relevant aspect in current research is the exploration of strategies to improve the quality and reliability of peer assessment. The effectiveness of peer assessment may vary depending on the educational level and the degree of anonymity in the assessment process [7]. Despite some debates on its implementation and reliability [8], previous experiences in various educational institutions, such as the University of Malaga [9], have demonstrated its potential as a learning tool. Additionally, the inclusion of self-assessment and peer assessment elements in peer review processes can promote deeper reflection and foster the development of learning skills [10]. It is evident that the use of peer assessment as an active and collaborative learning tool in the higher education context continues to evolve towards increasingly informed and sophisticated practices.

1.3 Contribution

In this study, the viability of employing peer assessment as an active and collaborative learning strategy has been investigated in two courses of the Electrical Engineering Degree at the University of Malaga: Circuit Analysis (first year) and Multimedia Information Transmission (third year). Peer assessment has been implemented within the context of two activities focused on creating multimedia content with didactic objectives. This experimental approach involved a non-anonymous methodology, supported by the design of specific rubrics for this purpose. It is important to highlight that the assessments conducted by students did not impact their final grades. The results have revealed a high degree of satisfaction among participants, thus highlighting the effectiveness of this methodology in fostering collaborative learning and the development of critical skills in the university context.

2 METHODOLOGY

In this experiment, peer assessment has been employed with a strategic and educational focus in two courses of the Electrical Engineering Degree at the University of Malaga: Circuit Analysis (first year) and Multimedia Information Transmission (third year). This methodology has been implemented within the context of two activities centered around creating multimedia content with didactic objectives. More details about the activities can be found in [11]. To ensure the quality and transparency of the process, a non-anonymous evaluation approach was chosen, supported by the use of specifically designed rubrics. It is important to note that the assessments conducted by students did not impact their final grades, aiming to promote responsible evaluation focused on learning while minimizing concerns related to grades or peer dynamics. It is worth mentioning that, as teachers, we evaluated all student work, thus ensuring the coherence and objectivity of the assessment process.

One of the challenges we faced was the potential increase in workload for teachers, particularly in the Circuit Analysis course, which has a larger number of enrolled students compared to the Multimedia Information Transmission course. However, unlike previous research [12], we did not find students experiencing frustration due to the complexity of generating multimedia content.

The teaching activity where peer assessment was applied involved creating multimedia content related to the course content. In Circuit Analysis, the focus was on solving typical exercises of the course through instructional videos. On the other hand, in Multimedia Information Transmission, the aim was for students to acquire skills in understanding scientific and technical texts in English, using multimedia resources to present and explain scientific articles.

The peer assessment process was divided into three phases:

- A first configuration phase is required to define the description of the peer assessment and provide instructions for the submission.
- During the second phase, all students are required to submit their work to be evaluated by each student or group of students.
- During the evaluation phase, there is a random assignment of reviewers by the responsible teacher.
- The evaluation of the assigned works by student reviewers is performed, following a specific rubric for each activity.

In the case of Circuit Analysis, the evaluation focused on aspects such as clarity in presenting the exercise statement, coherence in problem-solving, appropriate use of technical language, and the ability to contextualize and summarize the resolution process. Meanwhile, in Multimedia Information Transmission, the evaluated aspects included clear introduction of the topic, creativity in the use of visual resources, equitable distribution of participation among group members, and effective understanding and discussion of the technical aspects of the presented scientific article.

3 RESULTS

The sample of this experiment included a total of 50 students, where 28 belonging to Circuits Analysis and 22 to Multimedia Information Transmission. According to the data in Table 1, it can be observed, firstly, that the averages of the evaluations for each of the videos associated with each didactic topic of the Circuits Analysis course and the total indicate that, on average, the students received positive scores.

Table 1. Statistical results corresponding to the peer evaluation for Circuits Analysis.

Parameter	*Video 1*	*Video 2*	*Video 3*	*Video 4*	*Total*
Mean	7.1	7.5	7.7	7.8	7.5
Standard deviation	2.9	3.9	3.6	3.4	3.5

The overall mean is 7.5, allowing for a favorable evaluation overall, considering that they are first-year students. There is also some variability in the evaluations, reflected in the standard deviation. In general, the standard deviations range from 2.9 to 3.9, indicating some variability in the evaluations among students. Higher values would indicate greater dispersion in the received evaluations. It is noteworthy the consistency in the evaluations; the mean scores tend to be quite consistent among the different videos, with gradual increases. This could indicate that the perceived quality of the videos improves gradually as students have progressed through the semester, as well as improved their oral communication skills. On the other hand, it could also indicate some consistency on the part of students during the evaluation process. It is therefore concluded that, since the mean scores and standard deviations do not show extremely high or low values, students positively evaluated the videos among themselves in this course.

Lastly, according to the data in Table 2, a considerable variability is observed in the scores among the groups of the activity implemented in the Multimedia Information Transmission course, unlike the individual scores obtained in the Circuits Analysis course, with scores ranging from 6.5 to 9.0.

Table 2. Statistical results corresponding to the peer evaluation for Multimedia Information Transmission.

Parameter	*Group 1*	*Group 2*	*Group 3*	*Group 4*	*Group 5*	*Group 6*	*Mean*	*Standard deviation*
Total	6.5	8.7	8.8	8.3	9.0	7.5	8.1	1.15

This indicates that the perceived quality of the evaluated works differs significantly among the different groups. Group 5 stands out with the highest score of 9.0, indicating that their work was evaluated as exceptionally good compared to the other groups. The overall mean of all scores is 8.1, reporting generally positive performance in peer assessment in Multimedia Information Transmission course. The standard deviation of 1.15 indicates a certain consistency in the scores, although there is variability

among the groups. In summary, it can be concluded that the Multimedia Information Transmission course achieves positive performance in peer assessment, with a generally high average. However, the variability among groups suggests that there may be significant differences in the perceived quality of the works among groups.

4 CONCLUSIONS

Based on our experience, we have observed that the adoption of peer assessment in the university context has been highly beneficial as a tool for active and collaborative learning. The perceived quality of the videos created by students improved gradually throughout the semester, reflecting progress in both oral and audiovisual communication skills, as well as in the achievement of learning objectives. Although generally positive performance was recorded in peer assessment in the Multimedia Information Transmission course, variability among groups suggests possible differences in the quality of the work. However, both courses demonstrated similar results in strengthening oral communication skills, thus highlighting the versatility and applicability of this learning strategy across diverse academic areas.

Finally, the observed improvements in communication skills and achievement of learning outcomes underscore the value of peer assessment as a pedagogical tool. In the future, its continued integration in academic courses holds promise for enhancing student engagement, promoting deeper understanding of course material, and cultivating a culture of constructive feedback and peer support. Embracing peer assessment as a regular practice in academia has the potential to empower students as active participants in their own learning experience while preparing them for the collaborative and dynamic environments they will encounter beyond the classroom.

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