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The Effect of Peer Assessment on Students' Confidence, Satisfaction, and the Transparency of the Evaluation Process

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This study investigates the efficacy of open peer assessment rubrics in an interconnected system of learning, specifically students' motivation, engagement, and self-awareness. The research was conducted in the period 2022–2023, and 98 university students participated in peer assessment. The study employs an action research design, with the view to resolve three central research concerns: (1) How confident do students feel and course content to be following peer assessment? (2) To what degree are students happy with their learning experience following peer assessment? (3) To what degree does the openness of the evaluation process affect students' sense of objectivity and fairness? These questions are examined using measures related to confidence in the quality of peer feedback (CO), value given to peer feedback as an instructional technique (VIM), and enjoyment of peer feedback as a worthwhile competence (VPS). The results indicate that peer assessment enhances students' performance significantly, enhances participation, and ignites motivation. Openness within the assessment process increases learners' confidence levels, encourages multiple viewpoints, and strengthens their understanding of course content. Yet, there were concerns regarding the influence of peer assessment on final course grades and hence the necessity of teacher intervention in maintaining fairness and accuracy of the assessment process. The findings highlight the necessity of weighing the benefits of peer assessment with requisite teacher intervention in maintaining openness of the assessment process that leads to fairer and more productive learning environments. The study concludes with implications for enhanced assessment practice and facilitating a transparent and inclusive learning culture.

Keywords: peer assessment, rubrics, online learning, evaluation process, students

INTRODUCTION

The widespread collection of learning data from students' interactions on learning management systems (LMS) has generated both considerable complexity and

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opportunity for connected learning (Henry & Venkatraman, 2015). Connected learning is founded on interest-driven knowledge, which is supported by social networks of learners and mentors (Kumpulainen & Sefton-Green, 2014; Thigpen, 2020). The underlying principle of connected learning environments is that increased participation in learner networks leads to improved learning outcomes (MacMahon et al., 2020). Thus, connected learning places the student at the center of the learning process, and by augmenting the number of connections between network nodes, the student's knowledge and comprehension are enhanced (Goldie, 2016).

In line with the advancement of online learning models, which have enabled remote access to educational materials and virtual participation in classes, the impact of the Covid-19 pandemic on education has been mitigated (Elmesalawy et al., 2021). Moreover, learning networks can now be established across spatial and temporal boundaries, transcending traditional limitations (Yousef et al., 2015a). This has resulted in online learning models being able to compensate for the spatial separation between teachers and learners by enhancing social presence and fostering the social aspect of the educational process (Aldosari et al., 2022). These advancements further support the notion of connected learning by facilitating increased engagement and interaction among students, mentors, and educational resources, leading to enriched learning experiences.

Notwithstanding the advantages of e-learning during the pandemic, there were still certain unresolved issues that hindered accurate and transparent educational evaluation processes. For example, preventing fraud during online assessments is a complex matter. Most online assessments focus largely on evaluating theoretical knowledge rather than practical skills (Li et al., 2021). The majority of what is known about assessment in connected learning settings is based on the literature that currently has on observation. Differentiating between "passive" and "active" methods of assessment has become prevalent (Fernández Cruz et al., 2020). The assignments can vary from a passive online multiple-choice quiz to an active self and peer-assessment exercise. Multiple-choice quizzes are often the norm to manage and deliver assessments in online learning models (Brown et al., 2021). The greatest demand in online learning models is for computer-based assessment that is widely accessed via course participants in different geographical locations and at different time zones. In this model, data can be obtained from directly correcting participants' assignments to assess their achievement of learning objectives (Naumann, 2019).

It is interesting to note that only 7% of online learning environments have applied peer-assessment in assessing students' cognitive achievement within a connected learning environment (Chang et al., 2020). The main criticism of much of the literature on computer-based assessment could be summarized in two points: First, it lacks security. Second, skills such as creativity, critical thinking, and problem-solving may require more open-ended or qualitative assessments, as they are complex and multifaceted (Duda et al., 2023). Multiple-choice questions or other standardized assessments may not fully capture the nuances of these skills or give students the opportunity to demonstrate their understanding in a more holistic way (Ulum, 2020). Gibbs and Simpson (2005) have carried out several investigations into the assessments that support

students' learning outcomes and have concluded that students prefer to participate in such courses based on real experiences and projects with a significant marked assignment component, feeling that such courses provide them with accurate and effective feedback that enhances the quality of students' learning outcome. In addition, the assessment methodologies are fairer.

Peer Assessment in connected learning

Peer assessment is becoming more ubiquitous in connected learning (Li et al., 2020). This approach allows students to assess and respond to the work of their peers, rather than simply being evaluated by a teacher Although peer review is welcomed for a variety of reasons, the main motivation is the belief that it can inform students have overall confidence, satisfaction with the study design and the clarity of how they are assessed (Rivadeneira & Inga, 2023). The literature on peer assessment suggests that it can indeed have a positive impact on students' confidence and their critical thinking. Jiang et al. (2023) found that students who participated in peer review had higher self-esteem and perceived competence compared to those who worked individually. Similarly, a review by Bin Mubayrik. (2020) concluded that peer assessment can provide a sense of "psychological safety" in the classroom, enabling students to take risks and participate effectively in the learning process. Moreover, the effects of peer assessment on university students' confidence, satisfaction, and the transparency of the evaluation process have gained attention in educational research (Shui Ng & Yu, 2023). However, there are still gaps in the existing literature that warrant further investigation. This research problem is justified by the need to understand the potential impact of peer assessment on students' confidence levels, as it can significantly influence their overall academic performance and motivation (Shen et al., 2020). Additionally, exploring the relationship between peer assessment and student satisfaction is crucial in order to identify effective strategies for enhancing student engagement and enjoyment of the learning process (Adesina et al., 2023).

Furthermore, the issue of transparency in the evaluation process is of utmost importance, as it directly affects students' perceptions of fairness and objectivity (Tang et al., 2024). By delving into this aspect, the study aims to address the gap in understanding how transparency can influence the effectiveness and acceptance of peer assessment as an evaluation method. Another issue is scoring bias, which occurs when assessors are reluctant to make decisive judgments in their evaluations (Mumpuni et al., 2022). Together, these studies indicate that peer assessment can have a positive impact on students' confidence, satisfaction, and perceptions of transparency in the evaluation process. By actively engaging students in the assessment of their peers' work, peer assessment can foster a greater sense of agency and ownership over learning, as well as a heightened perception of fairness and accountability in the evaluation system. However, the success of peer assessment is contingent on careful design and implementation, with attention paid to the specific contextual factors that may influence its effectiveness.

Research Questions

The specific research questions of this study were the following:

(1) How do students rate their confidence in their own abilities and their understanding of course materials following participation in peer assessment?
This research question is linked to the constructions of:

- Confidence in the quality of one's own peer feedback (CO)
- Confidence in the quality of received peer feedback (CR)

(2) How satisfied are students with their learning experience following participation in peer assessment?
This research question is linked to the construction of:

- Valuation of peer feedback as an instructional method (VIM)

(3) To what extent does transparency in the evaluation process impact students' perception of the fairness and objectivity of peer assessment?
This research question is linked to the construction of:

- Valuation of peer feedback as an important skill (VPS)

The constructs provide a framework for examining different aspects of students' perceptions and experiences related to peer assessment, which are relevant to addressing the three research questions provided.

Theoretical Background

This theoretical framework establishes a conceptual foundation for understanding the relationships between variables in the context of peer assessment in higher education. Drawing on theories such as social cognitive theory, expectancy-value theory, social interdependence theory, social exchange theory, and cognitive dissonance theory, it offers insights into how peer assessment influences students' confidence, satisfaction, and perception of fairness and objectivity. By considering these theoretical perspectives, researchers and practitioners can design effective interventions and strategies to promote positive outcomes in peer assessment practices, ultimately enhancing students' learning experiences and outcomes. Specifically, it focuses on three key variables: (1) students' confidence in their own abilities and understanding of course materials, (2) students' satisfaction with their learning experience, and (3) the impact of transparency in the evaluation process on students' perception of the fairness and objectivity of peer assessment.

Students Confidence

Peer assessment has been recognized as a powerful tool for enhancing students' confidence in their own abilities and understanding of course materials. According to social cognitive theory (Bandura, 2023), individuals' self-efficacy influences their motivation and performance (Lee et al., 2023). Engaging in peer assessment provides opportunities for students to receive feedback from their peers, which can positively impact their confidence levels. Through the evaluation of their work by peers, students gain insights into their strengths and areas for improvement, leading to enhanced self-perception of their abilities (Topping, 1998). Moreover, by critically evaluating the work of others, students develop a deeper understanding of the subject matter (Topping,

2023). Theoretical perspectives such as self-efficacy theory and the cognitive apprenticeship model (Matsuo & Tsukube, 2020) provide a theoretical foundation for understanding the relationship between peer assessment and students' confidence and understanding.

Satisfaction with Learning Experience

Student satisfaction is a crucial aspect of peer assessment, as it influences engagement, motivation, and overall learning outcomes. The expectancy-value theory (Eccles & Wigfield, 2020) suggests that individuals' satisfaction is influenced by their perceptions of the value and relevance of an activity. When students perceive peer assessment as meaningful and relevant to their learning goals, it can enhance their satisfaction with the learning experience. Additionally, the social interdependence theory (Johnson & Johnson, 2008) posits that positive interactions and collaboration among peers foster satisfaction and a sense of belonging. Participating in peer assessment provides students with opportunities for social interaction, feedback exchange, and collaborative learning, thereby enhancing their satisfaction with the learning process (Qureshi et al., 2023).

Transparency and Perception of Fairness

Transparency in the evaluation process refers to the extent to which the criteria, standards, and procedures of peer assessment are communicated clearly to students. The literature suggests that transparency plays a crucial role in shaping students' perceptions of the fairness and objectivity of the assessment process. Social exchange theory (Cropanzano & Mitchell, 2005) suggests that individuals' perceptions of fairness influence their attitudes and behaviors in social contexts. When students perceive the evaluation process as transparent, with clearly communicated criteria and standards, they are more likely to view the assessment as fair and objective (Koris & Pello, 2023). Moreover, cognitive dissonance theory (Harmon-Jones & Mills, 2019) posits that individuals strive for consistency between their beliefs and behaviors. When students understand the evaluation process, they can align their expectations and judgments with the assessment outcomes, leading to increased satisfaction and perceived fairness.

Peer Assessment Process

Peer assessment is a process in which students in a course evaluate or have their work assessed by peers in an effort to improve both the assessors' and assesses' assignment work (Seifert & Feliks, 2019). Peer assessment has been employed in many evaluation methodologies, whether in formative or summative evaluation (Cobbold & Wright, 2021). To certify proficiency and evaluate the efficiency of the teaching and learning process, summative peer assessment is employed as a part of the grading system, whereas formative peer assessment is used to give learners instant feedback to improve their learning and comprises of benchmark, intermediate, diagnostic, and predictive examinations (Topping, 2018). Students enhance their understanding of the assessment process, recognize their strengths and weaknesses, and know the best approach to think while they complete their tasks (Hoo et al., 2022). Furthermore, students may learn how to complete assignments more accurately and enhance their exam scores (Li et al., 2022). The processes and stages of completion of these tasks lead to the achievement of learning outcomes. Students learn through their active participation in cognitive and

performance tasks, and self-evaluation by themselves and their peers is an integral part of the learning process. Therefore, peer assessment should provide guidance and instructions that help the learner in developing critical thinking skills (Yousef et al., 2015b).

Online peer assessment is more than a scalability for connected learning and therefore strives for a more advanced and deeper understanding of the learning tasks, skills, and subject matter (Panadero & Alqassab, 2019). Peer-assessed activities are frequently used in Massive Open Online Courses (MOOCs) as an effective technique to evaluate student work on a large scale (Dittrich & Van Staden, (2025); Gamage et al., 2021). Peer assessments can, however, be easily adapted to small classes, where they may even be more helpful in fostering collaborative learning (Wang et al., 2021). There are increasing concerns that are centered on how to ensure the quality of the peer assessment's feedback. Also, how to collect valid and reliable data to grade learners' assignments is another concern. Several lines of evidence suggest that without a high-quality rubric to direct students through the online peer assessment process, there will be no satisfactory feedback for students, and therefore online peer assessment will be less effective (Seifert & Feliks, 2019).

Peer assessment in connected learning environments depends mainly on the connectivism learning theory, in which learning is more effective when learners process knowledge in a specific context in the learning cycle (Downes, 2023). Connectivism suggests that learners should be encouraged to build networks of resources, experts, and peers, and use these networks to access and exchange information, ideas, and feedback. This approach recognizes that knowledge is distributed across diverse networks and that the role of the learner is to find, filter, and make sense of this information by collaborating with others and constructing their own understanding of the world (Downes, 2022). Thus, connectivism (Downes, 2019) and learning framework principles (Cornwell & Cornwell, 2006) are complementary theories that facilitate the education design, improve online learning, and enable learners to connect with their peers positively.

Surveys such as those conducted by McGarr and Clifford (2013) and Suen (2014) have reported the issues that can arise when implementing online peer assessment in learning at scale scenarios, which can be exacerbated by the challenges of connected learning, e.g., diversity of course participants' background and prior experience, lack of accuracy and credibility of assessment feedback and lack of transparency of the assessment process. Moreover, course participants do not trust the validity and reliability of peer review results due to the absence of clear evaluation rubrics and evaluation criteria (Yousef et al., 2015b). Thus, universities, faculties, and professors are currently looking for methods to improve peer assessment feedback as well as develop new modes capable of satisfying peers and building trust among them (Li et al., 2021). Therefore, the value of rubric-based peer assessment enables students to have feedback from which evidence is drawn on the strengths and weaknesses of each student's performance separately, with the intention of giving him or her feedback that helps to strengthen and consolidate their learning outcome (Fertalj et al., 2022; Staubitz et al., 2016).

Furthermore, for constructive peer assessment among course participants, feedback

literacy is essential (Nieminen & Carless, 2022). Researchers attempted to evaluate the impact of feedback literacy on peer assessment. Ketonen et al. (2020) analyzed the data of seventh- and eighth-grade science class students from a public urban school in Finland and concluded that as students' feedback literacy increases, peer assessment becomes more appropriate. In the best-case scenario, feedback literacy and peer assessment are very closely related (Panadero & Brown, 2017).

In connected learning, learners respond to feedback on assignments based on several factors including specific disciplines, curricula, and contextual settings (Carless & Winstone, 2020). Thus, comprehension of learning topics, capacities, and attitudes are then required to make sense of assessment and apply it to improve feedback literacy and learning processes. Carless and Boud (2018) described the four interrelated aspects that support students' feedback literacy including, appreciating feedback, making judgments, controlling affect, and acting. Considering this, the current study relied on designing a new model for peer assessment based on the standards of transparency proposed by Carless and Boud (2018) and the principles of connected learning developed by Cornwell and Cornwell (2006), using action research which will be explained in the following sections.

The proposed new model of peer assessment is a form of open co-assessment that involves the analysis of a student's work by their classmates (Quesada et al., 2019). In our context, students use a rubric that serves as a guide to evaluate the performance of their peers, the quality of the activity or the result. Likewise, the teacher must provide a frame of reference that helps to eliminate subjectivity in the evaluations and promotes constructive criticism, helping the evaluator and the evaluated learning. University LMS is a platform that facilitates peer assessment activity since it has the mechanisms to organize and deliver feedback through our new design of a peer assessment module. In addition, the new model for peer assessment allows assigning time for each student to perform a peer evaluation and manage some functionalities to show the student what they should do before doing the evaluation. It is also possible to adjust the settings so that comments are anonymous. The role of the rubric is fundamental to ensure a fair and objective process, eliminating possible close friends, helping students in their inexperience, and avoiding any kind of "fixing" in grades, since all of them must be justified. In short, the rubrics as standards of transparency will be the key element that makes the whole process productive for students. Thus, based on the rubric guide, the student will have to submit an evaluation report justifying the scores assigned and, very importantly, at the end make a general assessment of the activity to be evaluated, highlighting its strong points and weak points.

METHOD

This work follows action research methodology, action research defined as “a small-scale intervention in the functioning of the real world and a close examination of the effects of such an intervention … continuous learning process in which the researcher learns and also shares the newly generated knowledge with those who may benefit from it” (Cohen and Manion, 1994, p. 186) as depicted in Figure 1. To apply the action research method to answer the research questions related to students' confidence, satisfaction, and perception of fairness and objectivity in peer assessment, the following

steps were undertaken. The action research process began with identifying the research questions and the specific issues related to peer assessment. The first question focused on students' confidence and understanding, the second on their satisfaction with the learning experience, and the third on the impact of transparency on their perception of fairness and objectivity. Based on these questions, a plan was developed to address the research objectives.

In the first cycle of the action research process, a brainstorming session was conducted to design the peer assessment framework. The principles of connected learning, which emphasize interest-driven knowledge and social networks, were employed to create an assessment environment that promotes active engagement and collaboration among students. Table 1 presents the designed assessment environment, incorporating elements such as peer feedback, collaborative discussions, and self-reflection.

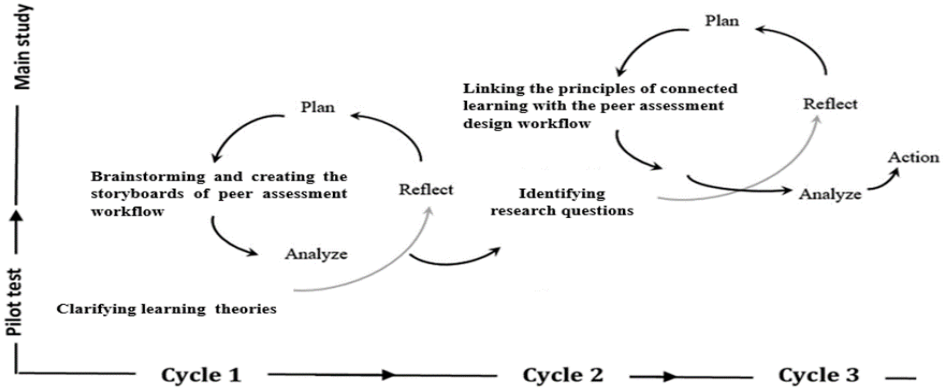

Figure 1
Adaptation of action research in the peer assessment module

Implementing Peer Assessment and Data Collection:

During the second cycle of the action research process, the designed peer assessment framework was implemented in the educational setting. Students participated in peer assessment activities, where they provided feedback on their peers' work, engaged in discussions, and reflected on their own learning. Data collection methods were employed to gather information on students' confidence, satisfaction, and perception of fairness and objectivity. For example, surveys or questionnaires were administered to collect quantitative data, while interviews or focus groups were conducted to gather qualitative insights.

This is prepared by adapting the evaluation procedure as follows:

- A general usability evaluation (ISONORM 9241/110-S) questionnaire was used to assess the appropriateness of the peer assessment features (Prümper, 1993). It consists of 21 questions classified into seven main dimensions which are often referred to as the "usability criteria." These criteria include:

  - Suitability for tasks: The system should be designed to support the user in achieving their goals and completing tasks efficiently and effectively.

- Self-descriptiveness: The system should be self-explanatory and easy to understand, so that users can quickly learn how to use it without requiring extensive training.
- Conformity with user expectations: The system should be consistent with users' mental models and expectations of how similar systems work, so that they can easily understand and use it.
- Suitability for learning: The system should be designed to support users' learning and skill development, by providing clear feedback and guidance on how to use it effectively.
- Controllability: Users should be able to control the system and its features, so that they can customize it to their needs and preferences.
- Error tolerance: The system should be designed to minimize errors and support users in recovering from errors when they occur.
- Suitability for individualization: The system should be designed to support individual users' needs and preferences, by providing customizable features and interfaces.

The ISONORM 9241/110-S has a seven-tier, bi-polar rating scale the minimum possible value is 1 ("---"), the maximum possible value is 7 ("+++"). The neutral middle value is 4.

- Measuring the educational effectiveness of peer assessment through a questionnaire designed by Huisman et al. (2019) The instrument included 11 items, as presented in the provided table, which were answered on a 5-point Likert scale. The items were designed to measure the four constructs (VIM, CO, CR, and VPS) identified in the theoretical framework. The questionnaire was designed to measure the following constructs: (1) students' evaluation of peer-feedback as a teaching strategy; (2) students' confidence in the quality and value of the feedback they give to a peer; (3) students' confidence in the quality and value of the feedback they receive from peers; and (4) the degree to which students think peer-feedback is a crucial skill.

Study sample

Participants were purposefully selected from a specific course within the university, which primarily enrols female students in this program. The age of participants ranged from 20 to 23 years. The study sample consisted of 98 students who completed all components of the investigation.

Procedure

The procedure of this study starts with the design step including brainstorming and generating storyboards of peer assessment within connected learning. Several lines of evidence suggest that online peer assessment can be effective when there is a close association with educational theories and projected design plans. This is in addition to the direct interaction that occurs between one student and another, and feedback between the teacher, the learner, and the learning environment (Sun & Chen, 2016).

Moreover, social loafing and unfair assessment marks have been recognized as two major flaws in designing assessment projects (Lin et al., 2021). Considering this evidence, the current study relied on the link between the principles of connected learning identified by Cornwell and Cornwell (2006) and the different peer assessment procedures as presented in Table 1.

Table 1
Mapping the principles of connected learning into a peer assessment procedure.

No	Connected learning framework principles (Cornwell and Cornwell, 2006, pp.18)	How can connected learning framework principles be integrated into peer assessment.
1	The education process must become learner centered.	Students have some opportunity to work at their own pace and explore their own interests.
2	Assessment – diagnostic, and summative – must be improved and deeply integrated into the learning and teaching process.	Students take part in the evaluation of their own learning. The success of the current peer assessment module depends on developing assessments that support learning and motivation.
3	National and state academic standards must be met or exceeded.	The offered courses followed the academic standards of the university, in agreement with the requirements of the system that was designed to achieve the goals of connected learning.
4	Ethnic academic achievement "gaps" must be addressed and eliminated.	Considering the equal opportunities for all course participants, the blind peer review has been adopted in the peer assessment module.
5	Learning must become more active.	Peer assessment depends on the student's activity and the role of the students in the evaluation process.
6	The formation of lifelong learning behaviors must be facilitated.	Enhancing the role of social participation for learners and making them communicate with their peers in various educational fields.
7	Education reform must be guided by empiricism.	Using a rating rubric to meet the assessment literacy requirements.
8	Well-designed system enabled the learning for self-reforming and self-documenting.	Usability is one of the main criteria for good peer assessment design. Screens should be well-designed and consistent with the eLearning interface. The intended users should not require further assistance in order to utilize the module, and the various components should be simple to comprehend.
9	Teaching and learning content must be of the highest possible quality, current and relevant.	Continuous improvement in the learning process, with the availability of integrated tools and methods that assist educational institutions in achieving satisfactory results, and ensuring the specifications and characteristics expected in this peer assessment activities.
10	Proven pedagogical methodologies and the best research from all field with a bearing on learning and teaching must be integrated into education.	Connected learning is a model of learning that applied in this study as a connectivism learning theory (Downes, 2019).
11	The needs of all stakeholders (students, teachers, parents, administration, government, business, etc.) must be served.	The requirements of the university, as well as the course objectives, were considered when designing the peer evaluation to achieve quality standards within the institution.
12	Reform must also address the need to improve the formation and achievement of vocational goals by students.	Each student could progress at his own pace and according to his own capacity.
13	Where minimum standards exist, the goal must be near-universal mastery rather than a standard distribution of achievement.	The description of the educational program was done after reviewing many of the courses in international universities, and it was verified through several reviews that the course objectives are compatible with the universal mastery goals in the same specialization.

Peer assessment workflow

In this study, course participants can create a group on a specific topic, solve the learning assignment and come up with a group project. The course instructor wants a way to evaluate projects on an ongoing basis as well as enable group evaluation using a peer assessment module with clear assessment rubrics. In this method, projects are implemented using the university's online portal as shown in Figure 2. The action research component involves close collaboration between the researchers and instructors to iteratively refine the peer assessment process, gather detailed feedback from students, and make improvements based on their experiences and perspectives. This qualitative, participatory approach would shed light on the nuances of implementation and help foster a positive classroom climate conducive to peer feedback. Complementing this, an experimental study with treatment group could quantitatively measure the effects of the peer assessment intervention on student confidence, satisfaction, and perceptions of transparency compared to more traditional assessment methods. Aligning these two approaches - the deeper contextual understanding from action research and the empirical evaluation from the experiment - would provide a robust, multi-faceted evaluation of the impacts of peer assessment and offer actionable insights to improve its implementation in higher education.

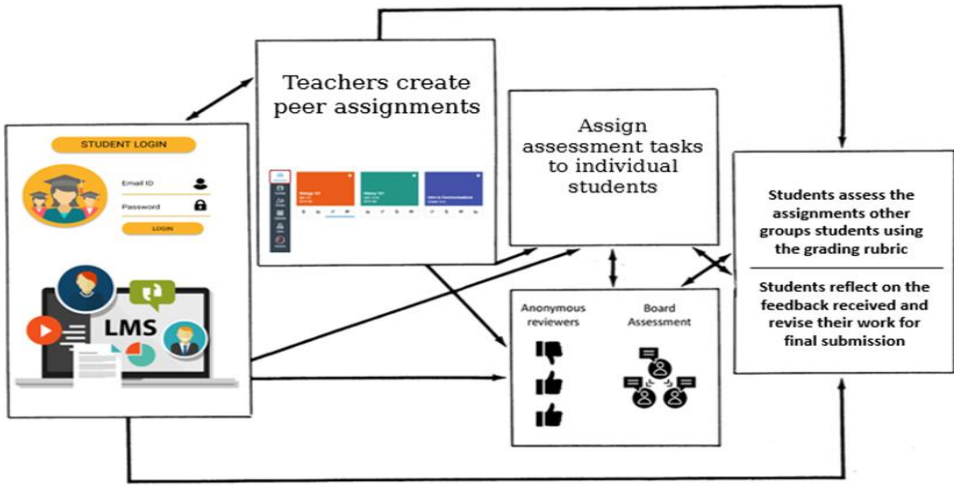

Figure 2
Peer assessment workflow through University LMS

Study Design

The study was conducted from the 1st of January 2023 until the 27th of March 2023 and all data were collected at the final assessment time. Student-centered active learning was used in the university's undergraduate curriculum, using collaborative learning, question-based learning, and problem-based learning as learning and teaching approaches. The research sample consisted of female students from the public administration course at the third level of university study. The participants were specifically selected from this particular course due to the nature of the university,

which predominantly enrolled female students in this program. The age range of the participants was between 20 and 23 years old. The sample size of the study included a total of 98 students who completed all aspects of the investigation. These students provided valuable insights into the effects of peer assessment on confidence, satisfaction, and perception of fairness and objectivity within the context of public administration education. The students collaborated in groups to generate content knowledge and develop self-directed learning abilities in connected learning environments using the university's online portal. Students were involved in the assessment of their own learning. The existing peer assessment module's success hinges on establishing assessment that promotes learning and motivation. To assess the effectiveness of the student-centered active learning approach, a peer assessment module was implemented. The module was designed to promote learning and motivation among students, and it was aligned with the learning objectives of the course. In addition to the mid-term and final assessments, formative activities were planned throughout the semester, including quizzes, group discussions, and reflective journaling. These activities were designed to provide students with opportunities to engage with the material, receive feedback, and reflect on their learning. The authors obtained informed consent from all participants prior to their involvement in the study. This process ensured that students understood the purpose of the research, the data collection procedures, and their right to withdraw without consequence. By securing informed consent, the authors demonstrated respect for participant autonomy and upheld ethical standards in the evaluation of the peer assessment implementation.

FINDINGS

This section provides the results of the students' confidence, satisfaction, and the transparency of the peer assessment module using action research included the analysis of the focus group interview. The evaluation process involved assessing the outcomes of the implemented changes and determining their impact on students' confidence, satisfaction, and perception of fairness and objectivity.

Satisfaction

Usability evaluation is the method to measure how students are satisfied with a peer assessment module in a connected learning environment. A general usability evaluation (ISONORM 9241/110-S) questionnaire was used to assess the appropriateness of the peer assessment features (Prümper, 1993). It consists of 21 questions classified into seven main dimensions. A total of 98 subjects out of 109 filled out the questionnaire as illustrated in Table 2. What stands out in Table 2 is that the peer assessment module has obtained a high mean score in the ISONORM 9241/110-S. The overall score 104 and that can be translated into: "Congratulations! your software is perfectly matched to their users!" (Prümper, 1993). There are several possible explanations for this result: firstly, the integration of all stakeholders, i.e., students, teachers, providers in the design iterations. Secondly, a designing of paper prototype that fits well with the design requirements helps gather effective feedback from students about the peer assessment module. Thirdly, conducting several interviews during the actual development of the peer assessment module with students to test the accuracy, completeness, and acceptability which students achieved can provide a sense of justification.

The ISONORM 9241/110-S standardized questionnaire provides a reliable and validated instrument to assess the user experience of interactive systems, making it well-suited for evaluating the implementation of peer assessment processes in higher education. This questionnaire covers key dimensions such as suitability for the task, self-descriptiveness, conformity with user expectations, controllability, error tolerance, and user-friendliness. By using this standardized measure, researchers can ensure the reliability and applicability of the results, allowing for meaningful comparisons across different peer assessment implementations and settings. The ISONORM 9241/110-S questionnaire's established psychometric properties and wide adoption in human-computer interaction research lend credibility to the assessment of the transparency, usability, and overall user experience of the peer feedback system from the student's perspective (Spanke et al., 2024). Incorporating this standardized instrument as part of a mixed-methods approach, combining it with qualitative action research, would provide a comprehensive evaluation of the peer assessment implementation and its impact on student confidence, satisfaction, and the overall evaluation process.

Table 2
ISONORM 9241/110-S evaluation results for peer assessment module (N=98).

ISONORM Dimensions	Usability Items	Peer assessment module	
		Mean	Sum
Suitability for tasks	Integrity	4.2	12.5
	Streamlining	4.1	
	Fitting	4.2	
Self- descriptiveness	Information content	4.9	15.2
	Potential support	6.1	
	Automatic support	4.2	
Conformity with user expectations	Layout conformity	4.8	14.4
	Transparency	5.3	
	Operation conformity	4.3	
Suitability for learning	Learnability	4.7	16.3
	Visibility	5.9	
	Deducibility	5.7	
Controllability	Flexibility	4.6	14.7
	Changeability	5.6	
	Continuity	4.5	
Error tolerance	Comprehensibility	5.3	17
	Correct ability	5.5	
	Correction support	6.2	
Suitability for individualization	Extensibility	4.2	13.9
	Personalization	5.4	
	Flexibility	4.3	
ISONORM score			104

Confidence and transparency of the peer assessment

The evaluation aimed to assess the students' confidence and the perceived transparency of the peer assessment process. The research utilized the Huisman et al. (2019) questionnaire, as indicated in Table 3, to gather data related to these aspects. Table 3 presents the scales and items used in the questionnaire, with the corresponding mean (M) and standard deviation (SD) scores. The findings reveal that there was a consensus among the students regarding the significance of peer assessment as an evaluation

method in higher education. The participants acknowledged that relying solely on teacher evaluation is insufficient, as evidenced by the low rating (2.2) and low standard deviation (0.4) of statement No. 3, which states, "Feedback should only be provided by the teaching staff."

The data suggests that connected learning environments necessitate increased student participation, as demonstrated by the high mean score (approximately 4.3) for the fourth statement, which emphasizes the instructive nature of involving students in feedback through peer assessment.

The questionnaire also assessed students' confidence in their own peer-feedback quality (CO) and the quality of peer-feedback received (CR). The results indicate a high level of confidence in both aspects. The students reported a mean score of 4.6 for their confidence in providing good-quality peer-feedback (item 5) and a mean score of 4.7 for their confidence in the effectiveness of their peer-feedback in helping others improve their work (item 6).

Regarding the confidence in the quality of received peer-feedback (CR), the students expressed a slightly lower level of confidence, with a mean score of 3.8 for the statement assessing the quality of peer-feedback received (item 7) and a mean score of 3.2 for the statement gauging the perceived effectiveness of received peer-feedback in improving their own work (item 8). Furthermore, the students highly valued peer-feedback as an important skill (VPS), with mean scores ranging from 4.6 to 4.8 for the three statements assessing the importance of giving constructive feedback, dealing with critical feedback, and improving one's work based on received feedback.

Table 3
Scales and items for the beliefs about the peer-feedback questionnaire (N=98)

Scale	Item text	M	SD
Valuation of peer-feedback as an instructional method ('VIM')			
1	Involving students in feedback using peer-feedback is meaningful	4.2	0.5
2	Peer-feedback within database course is useful	4.0	0.7
3	Feedback should only be provided by the teaching staff	2.2	0.4
4	Involving students in feedback through the use of peer-feedback is instructive	4.3	0.9
Confidence in own peer-feedback quality ('CO')			
5	In general, I am confident that the peer-feedback I provide to other students is of good quality	4.6	0.7
6	In general, I am confident that the peer-feedback I provide to other students helps them to improve their work	4.7	0.8
Confidence in quality of received peer-feedback ('CR')			
7	In general, I am confident that the peer-feedback I receive from other students is of good quality	3.8	0.9
8	In general, I am confident that the peer-feedback I receive from other students helps me to improve my work	3.2	1.2
Valuation of peer-feedback as an important skill ('VPS')			
9	Being capable of giving constructive peer-feedback is an important skill	4.8	0.3
10	Being capable of dealing with critical peer-feedback is an important skill	4.8	0.4
11	Being capable of improving one's work based on received peer-feedback is an important skill	4.6	0.6

Note: All items answered through 5-point Likert scale; For the scales VIM and VPS, the labels range from 1 (completely disagree) to 5 (completely agree); For scales CO and CR the labels range from 1 (completely not applicable to me) to 5 (completely applicable to me).

Focus Group Results

A focus group interview was conducted to explore the experiences and perceptions of 12 students who had participated in peer assessment activities as part of their coursework. The goal of the interview was to understand how peer assessment impacted students' confidence, satisfaction, and their views on the transparency of the evaluation process. During the interview, students shared their thoughts on the advantages and challenges of peer assessment, as well as recommendations for how it could be better implemented in the classroom as summarized in Figure 3.

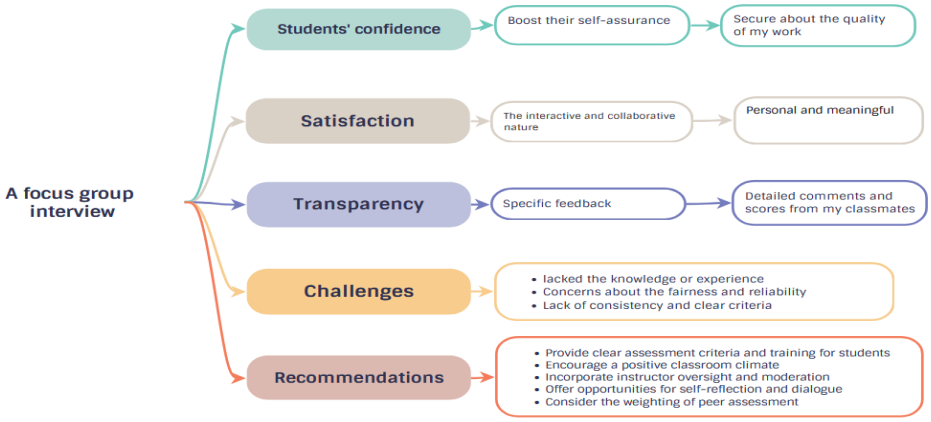

Figure 3
The focus group summary

In response to the impact of peer assessment on students' confidence, a key finding from the focus group was that peer assessment had a significant impact on students' confidence, though this impact was mixed. Several students reported that receiving feedback from their peers helped boost their self-assurance and belief in their abilities. These results reflect those of DuCoin *et al*. (2022) who also found a significant increase in confidence in performing the tested items and comfort with peer assessment.

One interviewee argued that "Getting feedback from my classmates made me feel more secure about the quality of my work. Hearing that they thought I did a good job on the project really lifted my confidence." However, other participants expressed that peer assessment could sometimes undermine their confidence, particularly if the feedback was overly critical or if they felt their peers lacked the knowledge or experience to provide meaningful evaluations. This view was echoed by another informant who noted, "When students who I didn't think were as strong in the subject matter gave me feedback, it made me second-guess myself and question whether I was really grasping the concepts well enough." Thus, the focus group revealed that the impact on confidence seemed to depend on factors such as the clarity of assessment criteria, the level of training and preparation provided to students for giving feedback, and the overall classroom climate and culture around peer assessment.

In terms of satisfaction, the students had mixed views on the peer assessment experience. Some appreciated the interactive and collaborative nature of peer feedback,

feeling that it enhanced their engagement and investment in the learning process. The majority of participants agreed with the statement that, "I liked that peer assessment made me more accountable to my classmates. It felt more personal and meaningful than just getting a grade from the professor." However, other participants expressed frustration with the peer assessment process, citing concerns about the fairness and reliability of their peers' evaluations. One student shared, "I didn't always agree with the feedback I received, and I worried that my grade was going to be influenced by my classmates' personal biases or lack of understanding." This sentiment was echoed by several other students, who felt that peer assessment introduced unnecessary subjectivity into the grading process. Additionally, some students reported feeling uncomfortable providing critical feedback to their peers, either out of concern for hurting relationships or a lack of confidence in their own ability to judge others' work. One participant reported that, "I didn't want to give negative feedback because I didn't want to damage my relationships with my classmates. It made the whole process feel awkward and forced." This concern is in line with the results of Van Rompay-Bartels & Geessink (2023) who argue that peer assessment, when used as an evaluation method, requires specific training and feedback awareness of students regarding cultural differences, values and understanding.

With regards to the transparency of the evaluation process, the focus group participants had mixed perspectives. Some students felt that peer assessment increased the transparency of how they were being evaluated, as they could see the specific feedback and reasoning behind their peers' assessments. As one of the course participants noted, "I appreciated being able to see the detailed comments and scores from my classmates. It helped me understand where I was succeeding and where I needed to improve." However, other students expressed concerns about the lack of consistency and clear criteria in the peer evaluation process. The overwhelming majority of students stated that, "Without clear guidelines from the professor, I wasn't always sure what my peers were basing their assessments on. It felt like a bit of a black box." This sentiment was echoed by several participants, who felt that the transparency of peer assessment could be improved through better training, rubrics, and oversight from instructors. Additionally, some students were uncomfortable with the idea of their peers having such a significant influence on their grades, feeling that this undermined the transparency of the overall evaluation process. As there were some remarks that, "I didn't like that my grade was partly in the hands of my classmates. I felt like the professor should be the one making those decisions, not my peers."

DISCUSSION

The results of the study provide valuable insights into the impact of peer assessment on students' confidence, satisfaction, and the transparency of the evaluation process. The findings reveal that students generally viewed peer feedback as a meaningful and useful instructional method. They perceived involving students in the feedback process as instructive, suggesting a preference for peer involvement in the evaluation process. This aligns with the principles of social connectivism, where students actively engage in the co-construction of knowledge through peer interaction and feedback (Alsuwaida, 2022).

What is interesting about the data in this table 3, (CO) items is that students expressed a high level of confidence in the quality and helpfulness of the peer feedback they provided. This suggests that students feel empowered and capable of delivering constructive and meaningful feedback to their peers. This finding is consistent with the notion of self-regulation, where students' beliefs and perceptions about their own abilities play a crucial role in their learning and performance (Miao & Ma, 2023).

In contrast, the students were only moderately confident in the quality and helpfulness of the peer feedback they received. This discrepancy between the confidence in providing and receiving peer feedback suggests that students may perceive the peer assessment process as lacking transparency or consistency.

The study found that students strongly believed that the skills related to providing constructive peer feedback, dealing with critical peer feedback, and improving one's work based on received peer feedback are important. This suggests that students recognize the significance of these competencies for their learning and development, which presents an opportunity for instructors to leverage this awareness and integrate explicit instruction and practice opportunities within the course curriculum (Polmear et al., 2023).

The existing literature has yielded no data on the association between peer assessment and connected learning (Tong et al., 2023). However, the current study results are in agreement with the study of Yu and Hu (2017), which confirmed that peer feedback practices were situated in students' distinct sociocultural context. Moreover, as for the students' self-confidence level when expressing opinions to their colleagues through peer assessment items 5 and 6, it was high with an average of 4.6 and 4.7, respectively. LEE and Evans (2019) reported greater favorable increases in writing self-efficacy, and the perceived utility of offering (but not receiving) peer feedback directly and via a mediating system incorporating writing self-regulatory efficacy and apprehension boosted writing self-efficacy. These findings are consistent with the findings of the current study, as despite the students' self-confidence while providing feedback to their peers, their confidence in their peers' opinions was lower, as evidenced by the results of statements 7 and 8. This can be explained by the fact that the students are afraid that the feedback of their colleagues will affect their final grades in the tests, as many students have expressed their disapproval of this, and confirmed that peer assessment is very useful for developing their performance, especially during the Covid-19 pandemic, but they preferred not to use their colleagues' grades as a criterion to determine the extent of their successful completion of the course. Thus, peer assessment should not be used as a summative assessment method (Li et al., 2021).

Furthermore, when giving feedback to their peers, students need to be able to analyze information and accept other points of view in addition to enhancing the individual's ability to question, ascertain credibility, and organize ideas and results. Thus, for peer assessment to be applied in a correct manner, a set of critical thinking skills must be used, the most important of which are: the ability to reach suggested results. Also, it is possible to choose between them as a set of alternatives that help peers solve the learning assignments (Ma, 2020).

Rubrics for assessment represent the basic basis for performance-based assessment

processes (Reynders et al., 2020). These rubrics are derived from content standards in order to detail what the student should know and be able to perform, determine the required levels, and evaluate peers. The current study found that rubric-based assessment is demonstrated by giving students feedback that identifies their performance's strengths and weaknesses in order to give them feedback that will help him strengthen and consolidate his learning. In addition, rubric can also be used to promote student learning by providing feedback on specific areas of strength and areas for improvement. By using rubrics to evaluate student work, instructors can provide targeted feedback that helps students understand the expectations for performance and identify areas where they need to focus their efforts to improve. Thus, peer assessment could be a valuable tool for promoting transparency in the assessment process. By involving students in the assessment process, peer assessment can help to make the assessment criteria more explicit and provide students with a better understanding of what is expected of them. When using peer assessment, it is important to provide students with clear assessment rubrics and guidelines for evaluating their peers' work. This can help to ensure that the assessment is fair and consistent, and that students are evaluating each other based on the same criteria. This finding is consistent with that of Harwood et al. (2020) who indicated that assessment shifts from isolated events to activities that take place in ongoing, interactive situations. In the rubric-based assessment, every student receives thorough attention to help each of them reach the highest level that their abilities can qualify them to reach in light of a supportive and stimulating educational context, revealing the students' learning patterns and increase the evaluation transparency (Harwood et al., 2020). However, it is important to note that peer assessment may not be appropriate for all types of assessments or all students (Concina, 2022). Some students may feel uncomfortable evaluating their peers' work, and there may be concerns about bias or subjectivity in the assessment process. Therefore, it is important to carefully consider the use of peer assessment and to provide students with appropriate training and support to ensure that they can evaluate their peers' work in a fair and objective manner (Cheong et al., 2023). Subsequently, by promoting transparency in the assessment process and involving students in the evaluation of their own and their peers' work, educators can help to create a more engaging and effective learning environment.

Furthermore, based on the feedback gathered in the focus group, several recommendations emerged for how peer assessment could be better implemented and supported in higher education settings, including: providing clear assessment criteria and training for students, encouraging a positive classroom climate to mitigate concerns about bias or conflicts, incorporating instructor oversight and moderation to ensure consistency and fairness, offering opportunities for self-reflection and dialogue, and considering the weighting of peer assessment, particularly for students uncomfortable with their peers influencing their grades.

CONCLUSIONS

Connected learning provides students with the opportunity to interact in ways that enable them to relate their personal interests to opportunities and relationships with their peers. Connected learning methodologies have been particularly successful in

educational settings, especially during the Covid-19 pandemic. The challenges of evaluating students are one of the obstacles that limit the spread of connected learning, so peer assessment is a good way to avoid these issues. This study aimed to assess the effectiveness of a peer assessment module in connected learning environments, with a particular focus on cognitive achievement and reliability. Additionally, it sought to investigate the impact of transparency in the evaluation process on students' perception of the fairness and objectivity of peer assessment. Usability and effectiveness questionnaires and their sources and on perceived feedback usefulness were collected. This study, despite its exploratory nature, provides valuable insights into the use of peer assessment. It suggests that incorporating peer assessment into formative evaluation activities has the potential to enhance the educational process in connected learning environments. The results of the study also emphasize the significance of openness in fostering students' trust and belief in the assessment process. It enables educational institutions to compare students' performance with that of their peers, facilitating opportunities for improvement. Additionally, the findings shed light on the effectiveness of peer assessment as a valuable learning tool. By recognizing the importance of transparency and utilizing peer assessment, educators and institutions can enhance the quality of assessment practices and promote a more productive and equitable learning environment.

IMPLICATIONS AND RECOMMENDATIONS

The findings of this study offer several important implications for enhancing the effectiveness of peer assessment in educational settings:

1. Addressing the confidence gap in received peer feedback, the discrepancy between students' confidence in providing and receiving peer feedback indicates a need to address factors that may contribute to this perception.

2. Instructors should consider implementing strategies to improve the transparency and consistency of the peer assessment process, such as providing clear assessment criteria, modeling effective feedback delivery, and creating opportunities for peer discussion and reflection.

3. Promoting a supportive and constructive peer feedback culture, by fostering a positive and empowering peer feedback culture can help mitigate the concerns about the transparency of the evaluation process. Instructors should encourage a collaborative and constructive approach to peer feedback, where students feel safe to provide and receive feedback without the fear of being judged or criticized.

4. Given the strong valuation of peer feedback skills by students, instructors should capitalize on this by incorporating explicit instruction and practice opportunities related to providing, receiving, and utilizing peer feedback within the course curriculum. This can include workshops, role-playing exercises, and feedback reflection activities to help students develop these essential competencies.

The current study was limited to a small sample of students, so the research needs to be applied on a larger scale. The study should be repeated using control group and applying different levels of peer assessment rubrics. Future research could explore the impact of peer assessment on student learning outcomes, investigate the role of peer

feedback training, and examine the influence of contextual factors on students' perceptions and experiences with peer assessment.

DATA AVAILABILITY STATEMENT

All relevant data is contained within the article: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

INFORMED CONSENT

The authors obtained informed consent from all participants prior to their involvement in the study. This process ensured that students understood the purpose of the research, the data collection procedures, and their right to withdraw without consequence. By securing informed consent, the authors demonstrated respect for participant autonomy and upheld ethical standards in the evaluation of the peer assessment implementation.

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COMPETING INTERESTS

The authors declare that they have no competing interests.

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