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Evaluating the Effectiveness of Online Peer Assessment Frameworks for Group-Based Assessment in Higher Institutions of Learning

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ABSTRACT

This study assesses the effectiveness of online peer assessment frameworks in higher institutions of learning through a quantitative analysis. The research explores the relationships between several dimensions of online peer assessment, comprising participant engagement, perceived challenges, and the effectiveness of online collaborative tools. Employing a sample of 154 participants, data were collected via surveys, and statistical methods, including factor analysis, t-tests, and regression analysis, were applied to examine the results. The findings indicate a generally positive perception of online peer assessment, with significant correlations between technical support and user satisfaction. The effects of these results highlight the need for higher institutions of learning to address technical challenges and improve support mechanisms to improve the effectiveness of online peer assessment frameworks.

INTRODUCTION

The rapid growth of the population in Uganda has considerably increased the demand for higher institutions of learning, creating a discrepancy between enrollment statistics and the capacity of existing institutions of learning (Mayende et al., 2015). This discrepancy underscores the urgent need for innovative educational solutions. Online learning has emerged as a sustainable option, allowing students to engage in their studies from various locations, including their homes and offices. Within this context, group-based assessments have gained power as a method to foster collaborative learning and enhance student engagement (Alcarria et al., 2018).

Peer assessment, as a component of formative assessment, encourages students to work together, providing opportunities for collaborative skills development an essential competency sought by employers globally (McKenzie et al., 2008). However, challenges remain, as learners and instructors often experience problems in effectively cooperating and assessing one another's contributions within these frameworks.

Traditional assessment frameworks, which focus predominantly on summative evaluation after a course, often overlook the benefits of formative assessments. Formative assessment not only evaluates student performance but also collects ongoing feedback to enhance learning experiences and course quality (Sridharan & Boud, 2019). Research indicates that formative assessments are particularly effective in online environments, promoting engagement and continuous improvement (Demir, 2018; Demosthenous et al., 2020). By employing formative assessment strategies, educators can foster a more holistic evaluation process, considering the broader learning context rather than just content knowledge (Jaime et al., 2016).

The integration of technology into higher institutions of learning has facilitated collaborative learning, facilitating learners to connect and engage with one another more effectively. Collaborative learning is defined as instructional methods that promote collaboration among learners to solve difficulties collectively (Muyinda et al., 2015). The use of online peer assessment tools aligns with this pedagogical approach, enhancing interactions and

information sharing among students. According to Anderson's online learning framework, meaningful learning occurs through robust interactions among students, teachers, and content (Mota et al., 2019).

Despite these advantages, implementing collaborative assessments in online learning settings poses challenges for educators. While peer assessment has been acknowledged as a valuable learning tool, its successful implementation requires careful planning and support to overcome potential obstacles (Chai et al., 2015).

Our study evaluates the effectiveness of online peer assessment frameworks in higher institutions of learning, focusing on dimensions such as user engagement, perceived challenges, and overall satisfaction. Understanding these elements is critical for instructors and institutions of learning striving to improve student learning experiences and outcomes. By identifying factors influencing satisfaction with online peer assessment, this research contributes valuable insights for optimizing online assessment practices.

Current developed frameworks for peer assessment often lack a clear framework to guide instructors in effectively planning and implementing assessments based on digital formative strategies (Saputra et al., 2020). This study sought to address these gaps, proposing a comprehensive framework that supports educators in leveraging technology to facilitate group-based assessments and improve interactions within online learning environments

Our literature looks at various studies that have considered various frameworks in online peer assessment and collaborative learning. Assessment refers to a variety of methods educators use to evaluate and document students' academic readiness and progress (Rawlusyk, 2018). The relationship between assessment and learning is critical; effective assessment influences student engagement and perceptions of learning (Preira et al., 2016). Assessment can be classified into formative and summative assessment types, each serving different educational purposes. Summative assessment, typically used at the end of courses of learning, focuses on assessing student achievement through methods like final exams and projects. While valuable for grading, these assessments often do not foster deeper learning (Rawlusyk, 2018). Critics argue that summative assessments encourage rote memorization rather than critical thinking (Rust, 2002; Brookhart, 2009).

Conversely, formative assessment occurs throughout a course, promoting student engagement and deeper understanding (Brookhart, 2009; Rawlusyk, 2018; Wanner et al.,2018). Methods such as self-assessment and peer assessment reassure autonomy and offer continuous feedback, which is vital for learning in online environments. Collaborative learning, defined as a process where individuals learn together (Jones et al., 2000), underscores social interaction in knowledge construction. The online learning environment leverages synchronous and asynchronous communication methods, catering to diverse learner preferences and promoting engagement (Rosa et al., 2016).

Despite developments in understanding assessment methods, several gaps remain and existing frameworks prioritize grading criteria over learning outcomes and interactions, indicating a need for more holistic methods. Although the benefits of peer assessment are acknowledged, its execution in online settings is often underemphasized. Additionally, there is insufficient guidance for instructors on how to effectively incorporate digital formative assessment approaches. The specific impacts of peer assessment on group interactions within online learning environments are also underexplored. Furthermore, there is limited research on the practical consequences of technology in enabling peer assessment, highlighting a significant area for further investigation. Moreover, Earlier studies utilizing quantitative methodologies have discovered peer assessment's impact on student performance and satisfaction. However, limited research has focused specifically on the online context, emphasizing the need for further investigation.

In our study, we adapted the DeLone and McLean Model to better understand the effectiveness of peer assessment frameworks in online learning environments. This model considers various dimensions essential for evaluating the success of collaborative tools, including System Quality, Information Quality, Service Quality, User Satisfaction, Intention to Use, and Net Benefits. The DeLone and McLean Information Systems Success Model has significantly developed by offering a

broad framework to evaluate the success of information systems. In recent years, researchers have built upon the original model to address emerging challenges in digital settings. For instance, the model has been expanded to incorporate dimensions such as service quality and user satisfaction, which are particularly relevant in online learning contexts (Petter & McLean, 2016). Recent studies have emphasized the model's applicability in assessing educational technologies. For example, in their 2020 study, Alshahrani et al. demonstrated how the DeLone and McLean framework effectively evaluates e-learning systems by focusing on system quality, information quality, and service quality. They argue that these dimensions are crucial for enhancing user satisfaction and promoting effective learning outcomes. This aligns with our study's objective to investigate the effect of peer assessment tools in online learning settings. Furthermore, the model has been adapted to address specific issues in collaborative learning settings. According to (Tzeng et al.2021), the framework can be used to evaluate the quality of collaborative tools, highlighting the importance of usability, accessibility, and reliability in enhancing user experiences. These factors are particularly relevant to our research, as they directly influence how students engage with peer assessment frameworks. Moreover, recent literature has underscored the importance of perceived usefulness and intention to use as critical outcomes in technology adoption. For instance, a study by Zare et al. (2022) found that the perceived usefulness of e-learning tools significantly affects students' willingness to adopt these technologies. This aspect of the DeLone and McLean model supports our exploration of user acceptance of peer assessment tools in online learning.

METHODS

The study utilized a quantitative research approach to assess the effectiveness of online peer assessment frameworks. Data were collected through structured surveys aimed at measuring various constructs, including engagement, technical support, and satisfaction. The study population entailed students in Information Communication Technology (ICT) courses in two South Western Uganda selected Chartered Universities using Moodle as their eLearning platform and these included Kabale University and Bishop Stuart University. A total of 154 participants from diverse higher education institutions, all of whom had experienced online peer assessment, took part in the study.

Inclusion criteria: Students who are in there second and third year studying ICT-related programs. **Exclusion criteria**: Those that don't meet the inclusion criteria were excluded. The online survey included Likert-scale items that gauged engagement levels, the effectiveness of collaborative tools, and perceived challenges within the online peer assessment process. Analytical techniques involved factor analysis to uncover underlying dimensions, t-tests to compare mean scores, and regression analysis to identify predictors of overall satisfaction with the online peer assessment framework

RESULTS AND DISCUSSION

The results reveal a broad picture of participants' experiences with online collaborative learning (OCL), representing a generally positive but nuanced perspective. Out of 154 survey responses, 151 were valid, yielding a high response rate of 97.4%. This robust dataset improves the reliability of the analyses, with a Cronbach's Alpha of 0.857 indicating excellent internal consistency among survey items included in the study. Engagement levels varied significantly; those rating their experience as "Good" reported a mean engagement score of 4.27, while those rating it as "Very Good" had a lower score of 3.59. This recommends that satisfaction does not necessarily equate to high engagement, revealing differing analyses of engagement among participants.

In assessing the effectiveness of collaborative tools, the mean score for the "Good" group was 2.53, slightly increasing to 2.88 for the "Very Good" group, indicating a recognition of the tools' utility but also highlighting significant room for improvement. Feedback mechanisms, however, received consistently low scores, with both groups averaging 1.00, indicating that effective feedback is a critical area needing improvement. Participants acknowledged some benefits of group work, with mean scores of 1.20 and 1.48 for the "Good" and "Very Good" groups respectively, signifying a need for better facilitation of meaningful group interactions.

Challenges that came across were similarly rated, with means of 1.20 for the "Good" group and 1.24 for the "Very Good" group, suggesting common difficulties that could be addressed through targeted interventions. The overall mean rating for engagement in OCL was 3.85, aiming for positive experiences yet indicating substantial potential for improvement. Preferences for instructional methods and suggestions for improvement received a unanimous mean score of 1.00, reflecting a strong consensus among participants and indicating an opportunity for instructors to optimize the OCL framework.

Furthermore, the readiness to commend OCL varied, with neutral participants scoring an engagement mean of 5.00, while those likely to recommend OCL had a mean engagement score of 4.13, highlighting a relationship between satisfaction and engagement. Those who felt satisfactorily ready for real-world collaboration reported higher engagement levels, reinforcing the importance of aligning OCL with real-world applications.

Technical support emerged as a critical factor in improving participant experiences. Those rating technical support as "Very essential" informed higher engagement levels and a perception of more effective tools, suggesting a correlation between adequate support and positive learning experiences. Conversely, low feedback reception scores across all groups indicate a pervasive issue that must be addressed to foster effective communication and enhance the overall learning environment.

Table 1. Summary of Results by DeLone and McLean Factors

DeLone & McLean Factor	Sub-Factor	Rating (Mean Score)
System Quality	Usability	3.75
	Reliability	3.50
	Accessibility	4.00
Information Quality	Relevance	4.25
	Accuracy	3.00
	Timeliness	4.00
Service Quality	Technical Support	3.50
	Training and Resources	4.00
User Satisfaction	Overall Experience	4.25
	Ease of Use	3.75
Intention to Use	Willingness to Adopt	4.00
	Perceived Usefulness	4.50
Net Benefits	Learning Outcomes	4.25
	Efficiency Gains	4.00
	Challenges	3.00

The findings summarized in the tables highpoint critical aspects of the online peer assessment framework as analyzed through the adapted DeLone and McLean framework. In terms of system quality, usability emerged as a significant concern, with participants highlighting the need for intuitive designs to mitigate the steep learning curve associated with new technologies. Reliability issues were also prevalent, particularly regarding technical stability and internet connectivity, which affected user engagement. While accessibility was mainly viewed positively, discrepancies in access to technology among learners were identified as a notable barrier. Information quality was generally regarded as high, especially concerning the relevance of peer assessments to learning objectives, which participants found beneficial for enhancing their understanding of the subject matter. However, concerns about accuracy due to potential biases in evaluations highlighted the need for structured rubrics to guide assessments effectively. The timeliness of feedback was recognized as crucial, underpinning the importance of quick turnaround times to maintain learner engagement and enhance learning outcomes.

Regarding service quality, dedicated technical support teams were appreciated, although their effectiveness varied, mainly during peak usage periods. This inconsistency pointed to the necessity for ongoing training and resources to ensure that faculty and students can effectively utilize the peer assessment framework. Most respondents reported a generally positive overall experience with online collaborative technologies, noting increased flexibility and accessibility, but experiences varied based on individual technical issues. As far as intention to use, a majority of respondents expressed a willingness to continue using these tools, driven by the perceived usefulness of peer assessments in improving learning outcomes. However, concerns about reliability and the quality of evaluations influenced some participants' hesitance. The net benefits of implementing peer assessments were widely recognized, with most agreeing that these frameworks could lead to improved learning outcomes and foster collaborative skills among students. Nonetheless, some challenges were stressed, particularly regarding potential biases in evaluations, emphasizing the importance of establishing clear guidelines. Therefore, the recommendations drawn from the findings advocate for improving system usability through user-friendly interfaces and onboarding processes, addressing reliability issues to minimize disruptions, and developing structured guidelines to improve assessment accuracy. Investing in ongoing training for faculty and students is also crucial to maximize the effectiveness of collaborative tools. Finally, establishing regular feedback mechanisms will help identify areas for enhancement, ensuring that the online learning environment continually evolves to meet the needs of its users.

Conclusively, while participants recognized the potential of OCL to enhance collaborative learning, the data indicate critical areas for improvement, particularly in feedback mechanisms, tool effectiveness, and technical support. Addressing these weaknesses could significantly enrich the collaborative learning experience, enabling participants to engage more fully and derive greater benefits from their online interactions.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.442	.000		.	.
	Likelihood to recommend OCL to peers	.043	.000	.059	.	.
	How essential is the availability of technical support for a successful online course	.287	.000	.417	.	.
	Satisfaction with technical support provided during your online collaborative learning activities	.469	.000	.545	.	.
	Positive influence on the ability to collaborate with peers in online courses	.671	.000	1.050	.	.
	the impact of technical issues on your engagement in online collaborative learning	-.709	.000	-1.091	.	.
	Preference for a variety of assessment methods in online collaborative learning	-.151	.000	-.152	.	.
	Comfort in Using collaborative tools that involve real-time interaction like chat and video conferencing	.543	.000	.909	.	.
	To what extent do collaborative tools enhance your engagement in the learning process	.554	.000	.439	.	.
	OCL positive impact on understanding course materials	-.500	.000	-.745	.	.
	TO what extent do OCL activities enhance your motivation to actively engage in the course	-.345	.000	-.637	.	.

Participants generally recognized the importance of peer assessment in improving collaborative learning, with a mean score of 3.85 reflecting moderate to strong appreciation. However, they expressed challenges in participation and emphasized the need for clearer guidelines and procedures. Satisfaction with online collaborative learning (OCL) activities varies, demonstrated by a neutral mean score of 3.25 for some, while satisfied participants rated their experience significantly higher at 4.36. This suggested that the effectiveness of OCL is contingent on the engagement and quality of tools utilized. Usage of online forums shows occasional participation (mean score of 3.48), indicating underutilization that may affect overall learning outcomes. Mixed responses regarding the effectiveness of collaborative tools, with an average score of 3.85, highlighted the necessity for better integration into group projects. Comfort levels with technology are generally moderate to high, indicating readiness for real-time collaboration, however, some participants sought additional support. Discussion boards are viewed positively as vital for fostering student interactions, further underlining their role in collaboration.

ANOVA results reveal a strong model fit, indicating that the predictors fully explain participants' experiences in OCL, with a regression sum of squares equaling the total variability observed. Coefficient analysis shows that the positive influence of effective peer collaboration is the strongest contributor to a positive experience, while technical issues detract significantly from engagement. Despite some participants' acknowledgment of challenges in online collaborative learning, the overall high engagement level (mean score of 3.85) suggests a generally favorable outlook. Regression analysis confirms that technical support, collaboration quality, and technical issues are critical factors affecting satisfaction and engagement.

A factor analysis was conducted to explore dimensions related to online peer assessment. The analysis included variables such as engagement, challenges faced, and perceptions of various collaborative tools.

Findings from factor analysis revealed an R-squared value of 0.017, demonstrating that challenges accounted for a small proportion of the variance in satisfaction. However, these findings underscore the importance of understanding the barriers participants face in online peer assessment settings.

Also, a one-sample t-test was conducted to evaluate participant perceptions of engagement and effectiveness.

Table 2. One-Sample T-Test Results

Measure	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval
Engagement in Online Peer Assessment	32.461	153	0.000	3.851	(3.62, 4.09)
Effectiveness of Online Collaborative Tools	57.821	154	0.000	2.742	(2.65, 2.84)
Perceived Challenges in Peer Assessment	36.382	154	0.000	1.226	(1.16, 1.29)

The t-test results revealed a generally positive perception of engagement and effectiveness of tools used in online peer assessment. All measures showed statistical significance ($p < 0.001$), indicating that participants felt positive about their experiences. A regression analysis was conducted to identify predictors of overall satisfaction with the online peer assessment framework.

Predictor	Coefficient (B)	Standardized Coefficient (Beta)
(Constant)	-0.442	-
Likelihood to recommend peer assessment	0.043	0.059
Availability of technical support	0.287	0.417
Satisfaction with technical support	0.469	0.545
Positive influence on collaboration	0.671	1.050
Impact of technical issues on engagement	-0.709	-1.091

The regression analysis revealed an R-squared value of 1.000, indicating a perfect fit where the predictors account for all variability in the overall satisfaction. Notably, "Positive influence on collaboration" had the highest positive coefficient (0.671), suggesting that effective collaboration significantly improves satisfaction with the peer assessment framework. Conversely, "Impact of technical issues" showed a negative coefficient (-0.709), stressing the detrimental impact of technical challenges on user satisfaction. The findings of this study underscore the significant role of engagement and collaboration in the online peer assessment framework, aligning with existing literature that emphasizes the significance of these elements for effective online learning. Participants reported a high level of engagement, with a mean score of 3.85, which reflects findings from previous studies that highpoint how active participation improves learning outcomes (Garrison et al., 2000). Furthermore, the positive influence of collaboration, indicated by the regression analysis, resonates with research suggesting that collaborative learning experiences promote deeper understanding and retention of knowledge (Johnson & Johnson, 2009).

However, the factor analysis revealed that the challenges faced by participants accounted for a minimal variance in satisfaction, with an R-squared value of 0.017. These results suggest that while barriers exist, their overall impact on satisfaction may not be as evident as previously thought. This observation is consistent with studies that indicate a complex relationship between challenges and satisfaction in online learning environments, where factors such as support and usability can mitigate the negative effects of barriers (Mayer et al., 2014). Therefore, addressing challenges alone may not be sufficient; enhancing support systems and usability is equally critical.

The one-sample t-test results demonstrated statistical significance across all measures of engagement and effectiveness, reinforcing the notion that participants generally perceive online collaborative tools positively. This aligns with findings from previous research that advocate for the use of collaborative technologies to foster student engagement and improve learning experiences (Zheng et al., 2016). The overall satisfaction expressed by participants indicates a readiness to adopt peer assessment methods, further supported by their familiarity with these practices.

The regression analysis highlighted the substantial impact of technical support on participant satisfaction, echoing the findings of studies that emphasize the necessity of robust technical assistance in online learning environments (Bates, 2015). The coefficient of 0.469 for satisfaction with technical support suggests that providing adequate resources and support can significantly enhance user experiences, an insight that educators and institutions should consider in their implementation strategies. Conversely, the negative coefficient associated with technical issues (-0.709) underlines the potential hindrance these challenges pose to effective learning, aligning with research that points to technical difficulties as a significant barrier to online education (Liu et al., 2017).

CONCLUSION

In conclusion, this study contributes to the existing body of literature by providing empirical evidence on the factors influencing satisfaction within an online peer assessment framework. The findings also support the idea that promoting collaboration and ensuring effective technical support are vital for improving participant experiences. As institutions increasingly implement online learning modalities, it becomes imperative to address these factors to maximize the benefits of collaborative assessments, ultimately leading to improved educational outcomes. Future research could further explore the long-term impacts of peer assessment on learning retention and student engagement across different disciplines.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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