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RESEARCH ARTICLE

Exploration of the Workshop activity for peer assessment in online courses of mathematics

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Abstract: This paper explores the use of the Workshop activity in teaching mathematics courses. Using a workshop as a learning and evaluation tool for the MPhil in Mathematics Education's Graph and Network course, the study's goal was to find the best way to get students involved in learning and peer assessment. The Workshop activity in Moodle is, to some extent, robust peer assessment activity for mathematics (but not limited to). Based on specified rubrics, students add their assignments/submissions. These assignments/submissions are later allocated randomly amongst their peers, at least three, to assess with anonymity based on the aspects provided by the course facilitators. Likewise, this tool helps to foster students' assessment skills against peers' submissions. Subscribing teaching experiment as a research methodology under qualitative research, this paper explores practical pedagogical uses of the Workshop activity in three episodes of the mathematics education courses. These three episodes were based on planning, intervening, peer assessment, and evaluation. The learning shows that the Workshop activity is helpful in learning and peer assessment. This paper looks at how key affordances can be used to conduct peer and self-assessment, improve learning engagement, and develop skills like self and peer evaluation. The findings of this study show that the Workshop activity engaged the students to become active constructors of knowledge. It acts as an essential assessment tool to transform students into active learners. In the end, the paper provides several possibilities for the students to learn and correct their learning while assessing peers' submissions.

Keywords: Workshop activity, teaching experiment, episodes, peer-assessment, self-assessment

1 Introduction

Around the world, higher education institutions are becoming more diverse, relying on digital learning platforms and the myriad of tools they offer (Kikilias et al., 2009; Mohammed, 2022). As instructors, for a decade, we have been using web-based course delivery in developing countries like Nepal (*e.g.*, Dahal & Pageni, 2019; Dahal et al., 2020; Dahal et al., 2022a; Dahal et al., 2022b). We use a variety of ways to evaluate students, such as uploading files (like .doc, .docx, .ppt, and .pptx), administrating quizzes, assigning written work, using the collaborative wiki, and letting students take part in forum discussions (Katsaris & Vidakis, 2021). One of the universities in Nepal, Kathmandu University School of Education, has a wide variety of teaching and learning activities and approaches, despite using a wide variety of teaching and learning tools. In Nepal, the school is regarded as a leader in educational technology. Before this study was designed and implemented, only a few interactive learning technologies were used for formative assessment strategies (Alpochoritis et al., 2021). We were curious whether students could more effectively engage in activities such as self-and peer-assessment, reflective writing, and instructor feedback and interaction when using popular tools such as Google Forms and Blackboard (Lazarinis et al., 2022). What if instructors do not prioritize interactive learning and teaching and thus do not need these technologies? Alternatively? Could the technologies at our disposal not be well-suited to facilitating hands-on, collaborative learning and teaching? Is there a tool that can be used with a learning management system or on its own?

Considering the questions and concerns raised above regarding the availability of and ability to make effective use of technology for interactive learning, we decided to go with the Workshop application in order to fill in the blanks and satisfy the demand for services that make practical use of the technology that is currently available. The workshop is a native learning and assessment tool for learning management systems (LMS) (Papadakis et al., 2020). It lets teachers make and use interactive assignments like reading discussions, reflections on term papers, and different types of reflective writing (to name). It offers several opportunities for students to develop interactive learning, reflection, and higher-order thinking. We wanted to see if the interactive tool we chose could be used for an instructor, self, and peer-centred evaluations

and reflective learning among students at our institutions. Research in this area was also aimed at finding ways to improve assessment in mathematics education and reflective learning courses (Papadakis & Kalogiannakis, 2019). Students work quality and the thoughtfulness of their peers' comments were also examined as part of the study's goal to improve the quality of feedback before peers published final grades. This study was created to encourage online assessment tools in higher education (Dahal, 2019) for mathematics classes to learn through peer review. (see in Figure 1)

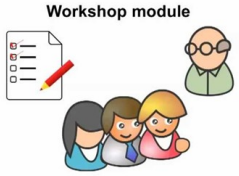

Figure 1 Workshop module

The following research questions were asked to investigate the possible systematic uses of the interactive learning/teaching tool: Teachers and students on the e-learning platform face many challenges when utilizing the workshop as a form of assessment. What are the easiest ways for teachers to explore the potential of a tool like this? How could they use these tools to enhance collaborative learning, peer assessment, and self-reflection? A key finding of our study shows how the Workshop activity tool helps students evaluate their and each other's work using the criteria (rubrics) provided by the course facilitator and significantly improves student evaluation(s). The findings also support a model of teaching and learning that emphasizes dialogue and collaboration among its participants (Papadakis, 2018), which shows that students are actively involved in their knowledge, learner accountability, and meta-cognitive skills.

Put another way; this is an effective strategy for making students more aware of their agency in the classroom (Papadakis & Orfanakis, 2018). For example, Boud (1995) argued that peer assessment can help us determine the expected performance standards and how to evaluate the quality of the performance. Also helping to reduce course facilitator evaluation effort was self-assessment, in which part of this job is meaningfully given to the students (Kalogiannakis & Papadakis, 2017; 2020).

Despite what Tousignant and DesMarchais (2002) claimed, when employing assessment as a learning tool in the classroom, we found that students' perceptions of their performance were often inaccurate. To achieve the desired learning outcomes, we must find a way to combine this strategy with other approaches (Papadakis et al., 2021). For example, through peer evaluation skills, McMillan and Hearn (2008) say that student peer- and self-assessment should be used correctly to promote intrinsic motivation, internally prohibited effort, mastery of goal direction, and deeper learning. The authors depict three aspects of self- and peer-assessment in a schematic diagram: a) self-judgment (Zimmerman, 2002), b) learning targets, and c) self-monitoring. These factors enhance students' critical thinking and information evaluation (Anderson & Krathwohl, 2001). The workshop tool is an example of the advantages of using web-based and web-enhanced teaching and learning tools because it allows students to provide feedback on each other, their work, and the instruction they receive.

2 Workshop activity phases: Context, construction, and reflection

We finished all of the stages of the activity, including the planning stage, the submission stage, the evaluation stage, the grading stage, and the closing stage. Teachers must first set up all the options outlined in the various activity phases for students to select. The initial setup phase is over when each option has been meticulously set up. Course facilitators can use a light bulb icon to switch to submission mode if they wish manually. Instructions for assessment and allocation are critical during the submission phase. The course facilitator can choose to assign students at random or manually based on the evaluation criteria. Students may be allowed to submit late during this stage if the course facilitators choose. Graph and Networks were two of the five aspects we drew from during the course. It is easier for peers to assess each other's work when given a predetermined rating for each aspect. Peer-review submissions were also distributed using random distribution. There were no facilitators involved in the assessment phase. It was an excellent opportunity for students to interact with each other and provide constructive feedback to one another. (see in Figure 2)

Grading the evaluation was the final step before the activity was declared complete. After we graded each student's assessment with final remarks from the course facilitators, the system

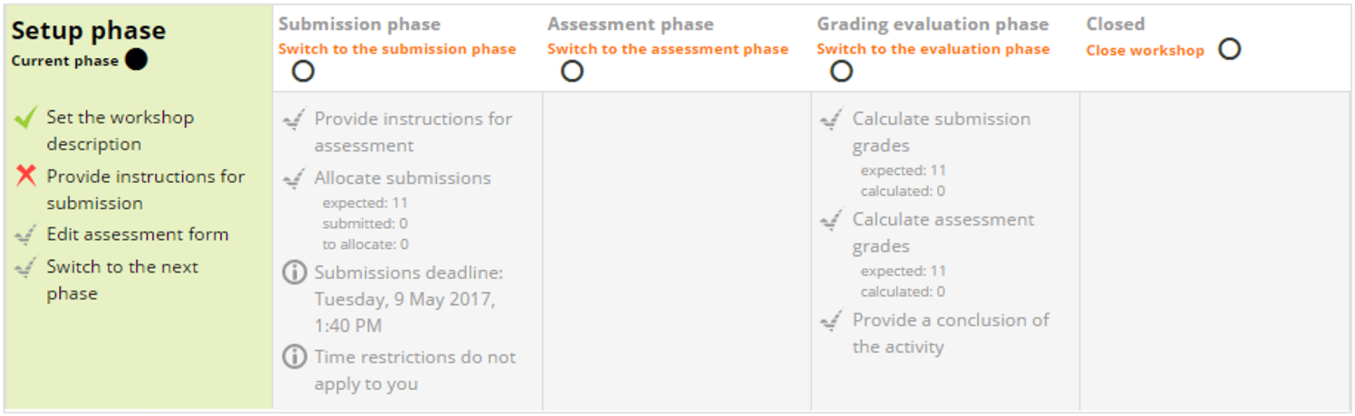

Figure 2 Phases of the workshop activity

recalculated final grades for assessment and submission using the aspects defined in the course facilitator's grade and grading settings. This phase of the activity must be completed before the next phase can begin. We noticed an important feature here: grades are not shown in the students' grade book until the closing phase has been completed. As a result, the workshop contains many valuable tools for students and course facilitators. However, implementing it may not be accessible unless the course facilitators carefully navigate and set up the process. Many course facilitators resist change in many situations. While learning the workshop, they may feel overworked at first. However, by making learning easier as part of the assessment process, this tool has the potential to transform higher education's learning environment.

3 Methods

At Nepal Open University's Faculty of Social Sciences and Education, the MPhil in Mathematics Education, in the year 2019, this study was carried out in the classrooms of the researchers. Throughout the semester, the teaching experiment methodology (Steffe & Thompson, 2000) was used to intervene in the workshop activity. Finally, all three episodes were analyzed regarding planning, intervention, peer assessment and evaluation. We conducted our final evaluation of the e-learning site's online protocols by interacting with participants and observing their self-reflection.

This study relies heavily on the participation of students who have taken the researchers' courses (Dahal & Pangeni, 2019). To make the study more comprehensive at the institution level, all course facilitators and students who wanted to learn about and use the workshop were chosen in different episodes. Researchers' teaching practice was a backdrop for these interventions, which included colleagues. The online students who participated in the research were 22 male and ten female students of the MPhil in Mathematics Education's Graph and Network course.

All data was gathered using a variety of instruments, including qualitative and quantitative methods, to answer the research questions posed. The research questions were answered through a survey, phone calls, and informal discussions. During the course facilitators' orientation, students learned how to use the tool in their online, distance, and face-to-face courses. Documentation and documentation of all procedures were completed. Instead, it was an ongoing process of action during the study's planning, intervention, and peer assessment and evaluation phases.

4 Findings and emerging thoughts

Findings from each episode are discussed and interpreted in this section. The discussion focuses on showing how the workshop can be used in online course platforms and its educational effects, especially in the online, distance, and face-to-face modes of delivery, for higher education in mathematics education.

4.1 Opportunities and challenges of the workshop activity

To begin, learning about students' experiences with peer review assignments was a delight. The various informants assigned to the project were heavily burdened by their conceptualization because it was an enticing one for them. The students all agreed that peer-reviewing was an excellent way to assess learning in a classroom setting. Most students preferred peer review assignments as a means of self-correction. Participants stated that they could observe better and understand how they solve Graph and Network mathematics problems due to the entire activity.

Such assignments have also been credited with fostering a culture of sharing ideas for learning among students (Tzagkaraki et al., 2021).

Most students found the workshop activity process beneficial, based on their challenges. However, it was difficult to justify their mathematical approaches to solving problems. As stated by the students, a lack of understanding of rubrics and a lack of information on how to use them were the most challenging aspects of grading. Some students had a hard time grading their peers because they feared that their peers would complain about their grades. Because of this, they had to work twice as hard on a single assignment. It is a requirement in most traditional assignments to have at least one peer review of your work before it can be submitted to the course facilitators. It necessitates an understanding of all aspects of the assignment and the ability to make good decisions (Barianos et al., 2022).

4.2 Students and teachers' experiences

To get to the submission phase, teachers create a workshop activity with rubrics in the course block of their LMS and then grade their peers' work. The student did their best to evaluate following the conditions set forth by the instructor. In this case, getting people's thoughts and feedback is also essential. The problem was that many students had difficulty evaluating their peers' work aspects. Their grades were higher, and the comments and feedback they gave were generic. Students did not give a damn about the specifics of any of the assessments they were given as they analyzed their results, comments, and feedback. Each word and even the summation of the comments are too general. The most important aspect of this kind of activity would be the fairness with which one student marks, comments, and provides feedback to others. Teachers are allowed to disclose their students' grades only when it is necessary to do so (Aguayo et al., 2022; Can & Bardakci, 2022).

According to this research, teachers play a more significant role in creating and implementing workshop activities. The teacher must devote time to the activity's conceptual and technological aspects. The teacher will have much less to do as soon as everything is in places, such as submission instructions, assessment instructions, scoring guidelines, deadlines for both submission and review/assessment, and a sample assignment. Peer evaluations and switching between workshop phases must be carefully handled to ensure that workshop activities' tools function smoothly. Keeping grades, submitting work for review, and receiving grades, comments, and student feedback is time-consuming for teachers (Mamolo, 2022; Papadakis, 2022).

In the same way, the average overall grade is automatically calculated for both submission and assessment. Teachers would not have to deal with considerable manual labor to implement this learning and assessment activity. Because he felt that email communication was more accessible, one of the teachers decided to distribute students' submissions to other teachers and collect their feedback via email instead of setting up the activity (Nugroho et al., 2022).

4.3 Instructional support for teachers and students

In this study, we discovered that the activity's design, creation, and implementation are closely tied to the course facilitators. The facilitator(s) of the course must conceptualize and technologically set up the activity with possible evaluation aspects. Once the activity has been set up with all the necessary components, such as submission instructions, assessment, score guidelines, submission deadlines, sample submission, etc., the facilitator's role diminishes significantly. There should, however, be a careful implementation of manual or automatic allocation and switching between phases of the activity to ensure that the activity runs smoothly.

In addition, the workload of course facilitators is lessened due to this kind of activity because it entails maintaining grade records, dividing up submissions for peer review, and grading and commenting on each other's respective works. In the same way, the average overall grade is automatically calculated for both submission and assessment. As a result, reducing the number of students in each class or increasing the number of students in each class reduces the manual work required of the course facilitators. On the other hand, some instructors opted not to include the activity because they believed the email was an adequate means of communication. Instead, they used email to disseminate student work to a broader audience and gathered feedback from those recipients.

Another exciting feature is that course facilitators can include grades for submissions and evaluations of those submissions. The course facilitators must add individual students' grades if they do not want to assign grades. Lastly, teachers can stop students from giving their peers complete grades if they randomly hide the author's and reviewer's names when reviewing assignments. Students are more confident in their evaluations of the mathematical algorithm problem of Graph and Network concerning online learning culture when they cannot see the author's or reviewer's names. On the other hand, teachers must be sure of all the steps involved in setting up an activity (Lazarinis et al., 2022).

4.4 Researchers and participants' reflections as part of the workshop activity

Learned lessons from this research process are discussed in this section. Configuring the Workshop in LMS to display the appropriate icon and other customization options was a breeze. After the initial setting, it was challenging to switch between phases if you did not know what phase you were in. We were excited to continue using the system after learning about the various icons and what they represented. Workshop facilitators initially expressed interest in an agreement with implementation but later decided against doing so due to a lack of necessary skill sets. Students were assessed in various ways, including online, via distance education, and face-to-face, when the activity was used in a graduate course. For example, this research process has been much fun. This activity can engage students in peer and self-evaluation in any higher education course, whether online, distance, or face-to-face.

Students who took part had never done a self- and peer-review before. Peer review and assessment were rewarding experiences for them. Such self-awareness included a willingness to acknowledge and accept their shortcomings and a willingness to accept that their friends' performance was no less impressive than that of their own, as well as a willingness to work on multiple projects simultaneously. Additionally, they face the challenge of critiquing and comparing their work to that of their peers. Peer review was a new experience for some participants, so they could not compare the Workshop feature of LMS with other peer review experiences. Some participants were at ease, while others were baffled about what, when, and how to proceed. Nevertheless, as already stated, the participants' overall experience was that the current workshop gave them chances to learn. It is also possible for students to learn by comparing their work with their peers and observing how their peers approach their assignments.

Students reported having similar experiences when submitting and reviewing their work. According to what they said, they were able to submit their work on time. All participants turned in their work on time and perfect condition. Nonetheless, some participants struggled with the peer review because they were assigned to evaluate three others.

They were unable to evaluate the work of three peers simultaneously. When evaluating peers' work, it was not easy to evaluate the content's depth and compare it to previous concepts and the learning process. Nonetheless, according to a few participants, the process was simplified by the clear review guidelines and outlined aspects for required scoring.

5 Conclusions and ways forward

The main objective was to see if the same process could be used to create an online workshop for math educators. The results of this study show that extracurricular activities like these help college students learn, no matter what they are studying. (see in Figure 3)

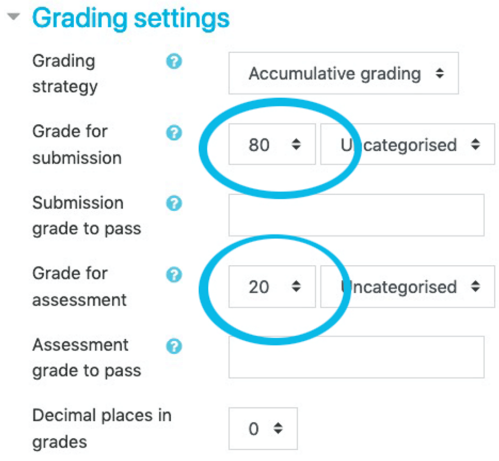

Figure 3 Grading interface

Despite its brief duration, this study has helped me better understand problems and implement interventions in the three episodes based on the Moodle-based assessment system and involved planning, intervening, and peer assessment and evaluation. The workshop was introduced and tested for its functionality and effectiveness in this study's initial intervention. For example, students can upload a file (*e.g.*, .docx), administer quizzes and assign written work, use the Moodle learning management system, and participate in forum discussions. However, the workshop is unique because it allows students to engage in self-and peer assessment through

collaborative wikis and the Moodle learning management system. In addition to being functional, it has no drawbacks and is simple to implement. This reduces the course facilitators' workload while allowing students to learn from reading and evaluating the work of their peers.

Students and instructors benefit from such activities in various ways(s). As a result, all courses must be assessed at least once a semester in the future. Using the self- and peer-review process and the workshop, we hope to motivate students and the course facilitators to work together toward common goals. Finally, a more comprehensive study would prove its efficacy in all mathematics education courses offered in the upcoming semesters.

In addition, the workshop's technological tools are innovative and have the potential to change pedagogical practices, and the course facilitator is the major challenge(s). Facilitators should be able to design, create or implement an activity themselves. An in-house training session for course facilitators is necessary to begin the process of strengthening the workshop. Designing and implementing activities like these to enhance student learning is not difficult. Learning to evaluate one's and peers' work creatively and innovatively is essential for improving evaluation skills in higher education, regardless of the subject matter or context.

Workshop in Moodle has both benefits and drawbacks, with the most significant challenge being that many course facilitators are unaware of this important and valuable feature. As a result, students in higher education are missing out on a crucial learning tool: peer and self-assessment. This means that all course facilitators at Nepal Open University and other universities worldwide can be trained to design, develop, and implement peer- and self-assessment activities in mathematics education programs. Universities can help with this by providing in-house faculty workshops and professional development sharing sessions. These activities would motivate the course instructors to expand their knowledge of student assessment methods. Students can learn about the evaluation procedures for a Workshop after it has been created in the LMS by the course facilitator(s).

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