

USING PEER ASSESSMENT FOR FORMATIVE ASSESSMENTS IN LARGE ONLINE CLASSES

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INTRODUCTION

Due to the ever-increasing number of new enrolments and delivery of courses in various modes at The University of the South Pacific (USP), undergraduate programs are faced with the challenges associated with a large and diverse student population. One of these is the large number of assessment tasks to be graded for each topic in a course. USP has four generic courses, which are part of degree programs—two to be undertaken in the first year of study and two in the second year. One of the first-year generic courses offered at USP through online and blended modes is titled “Communication and Information Literacy” (UU100), which has more than 2000 students enrolled each semester. The UU100 course has weekly assessments, and due to large student population, it becomes

very difficult to provide students with timely feedback on their assessments. With the increased use of information and communication technologies (ICT) in higher education institutes (HEIs) in the Pacific (Sharma et al., 2017; Sharma et al., 2018), proposing an ICT-related student-centered solution became evident. The proposed solution decided was to use online peer assessment (PA) through the Moodle workshop tool. The focus was on not compromising the standard of marking and setting a benchmark solution for other undergraduate courses.





PA is one of the 21st century learning and teaching strategies; thus, we wanted to ensure that students do learn through PA. We used the following definition of PA: “where students grade and give feedback about the work of their peers against particular criteria provided by course lecturer” (Adachi, Tai, & Dawson, 2018, p. 295).

Before engaging directly with incorporating online PA into assessments, we began to find suitable funding sources for this project. Meanwhile, the Centre for Flexible Learning (CFL) team in USP had embarked upon their ambitious technology-enabled learning project and sent a call internally to all university staff. We submitted our idea of using online PA through the Moodle workshop tool, and CFL decided to fund this project.

With the approval and support from the course coordinator of UU100, Mr. Gavin Khan, and Acting Dean of Faculty of Science, Technology & Environment Dr. Bibhya Sharma, we were on our way to carry out research work in the field of online PA. The research team comprised Krishan Kumar (project leader), Gavin Khan and Salsabil Nusair (learning designers), Sunaina Nair (assessment designer), and Bibhya Sharma (expert advisor). Since the class size was large, we did not want to face any technical glitches because the online PA strategy would be administered for 2 weeks (Panadero & Alqassab, 2019).

To get started, we checked if other HEIs around the world used an online PA strategy and investigated the best practices of using these strategies. The empirical review paper by Panadero and Alqassab (2019) provided all the latest research publications in the field of online PA and moderating variables to administer an online PA. After a comprehensive literature review, the best practices were outlined and formulated (Table 1) as a working framework to implement online PA in undergraduate courses offered in online and blended modes. For an online PA activity, it is important to select the appropriate moderating variables for setup using the Moodle workshop tool, as the moderating variables guide the successful implementation of online PA. The moderating variables with definitions were PA aids—rubric understanding and marking training on samples before engaging into PA process; PA grading—peers allowed to grade assessments of other peers by providing numeric rating, or a written comment, or a combination of both; anonymity type—bidirectional or unidirectional settings can be selected (Panadero & Alqassab, 2019, p. 1256). Bidirectional anonymity is when both assessor and assessee are anonymous, whereas unidirectional anonymity is when either the assessor or assessee is anonymous (Gielen, Dochy, & Onghena, 2010). The proposal with ethics form was formally submitted to secure the funding and obtain ethical approval to conduct the study.

Table 1. PA framework used.

Assessment selection	PA aids	Design of Moodle workshop phases
<p>Select assessment which both lecturers and students are familiar with. Taking into consideration difficulty of task and level of study. Preferably formative assessment is suggested.</p>	<ul style="list-style-type: none"> • Instructional video, PDF guide for peer grading • Criteria and rubric • Training, i.e., mark the samples before engaging in peer grading • Decide on self-assessment (optional) • Privacy <ul style="list-style-type: none"> - Anonymity of assessor/assessee (bidirectional or unidirectional) - Teacher presence - Whether output of PA is confidential or public. 	<ol style="list-style-type: none"> 1. Setup phase: Initial setup of PA Moodle workshop description.  2. Submission phase: Students allowed to submit their assessment.  3. Assessment phase: Students are given online marking training before they engage with peer grading.  4. Evaluation phase: Lecturers check and confirm grading, Moodle workshop tool calculates final marks for students. 

Perception of attitudes toward PA

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5. Closed: Online assessment closed, and students get their final marks for submission and assessment with peer graders' feedback comments.
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LITERATURE REVIEW

Assessing large numbers of students in an online and blended course in HEIs is a challenging prospect for educational practitioners in the 21st century. Some of the major responsibilities of lecturers are identifying suitable online assessment methods, ensuring that students have achieved the desired learning outcomes of the course, meeting tight deadlines for marking, and providing timely feedback to students.

Assessments are assistive tools for lecturers in HEIs to assess the learning objectives of the course; they can be either formative or summative. Formative assessment is defined as “activities undertaken by teachers – and by their students in assessing themselves – that provide information to be used as feedback to modify teaching and learning activities” (Black & Wiliam, 2010, p.82), whereas summative assessment is defined as “assessing if the predetermined learning outcomes are achieved according to in-advance programmed objectives or if the requirements are fulfilled to an accreditation or certification to be granted” (Mohamadi, 2018, p. 29). For formative assessments, HEIs in the 21st century commonly use learning management system tools such as quizzes, forum submission, assignment dropboxes, and online PA. It is important for lecturers to understand how formative assessments operate in the online context and whether they are authentic and trustworthy (Baleni, 2015). With this notion, online PA using the Moodle workshop tool

proposed for this study opens up a window of opportunities for investigation in the South Pacific region and the findings will add to the existing knowledge on online PA.

Over the past decades, extensive research has been carried out supporting the use of online PA as an assessment tool (see Table 2). However, researchers have debated the usefulness of PA in tertiary education (Friedman, Cox, & Maher, 2008). In all occupations of life, people learn from and make assessments or judgements about each other—students learning in HEIs are no different. Students learn from explaining their ideas to colleagues and learning collaboratively while at the same time providing feedback on the quality of each other's work. Participation in such activities can occur both informally and formally. PA is a natural extension of the move from a teacher-centered to a student-centered mode of education, which emphasizes the active engagement of students in their learning; learner responsibility; metacognitive skills; and a dialogical, collaborative model of teaching and learning (Spiller, 2012). Students become assessors within the context of participation in practice; that is, the kinds of highly contextualized learning faced in life and work (Boud & Falchikov, 2006). Students mark and make decisions about each other's work and decide what constitutes good work according to assessment criteria and rubrics. Students' learning can be enhanced when students contribute to their marking criteria as they become more aware of the assessment culture. They can learn from others' mistakes and success and develop self-reflection. In addition, students learn to critique the work of peers, provide constructive feedback, and eventually become responsible for their own learning. Some of the application areas of online PA are highlighted in Figure 1.

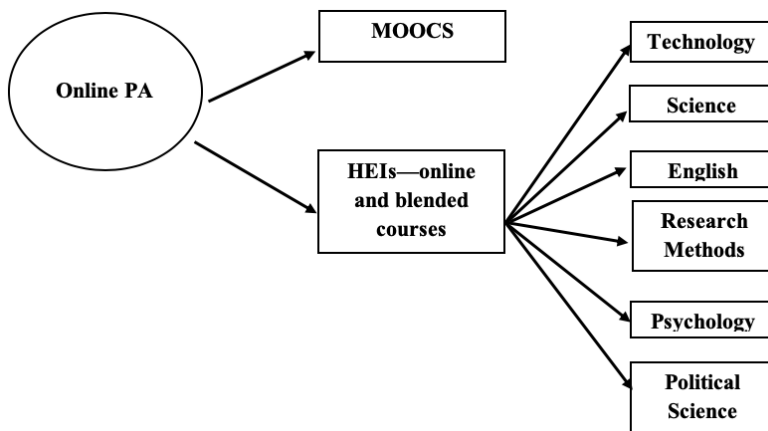


Figure 1. Application areas of online PA.

PA can provide a valuable method for enriching students' learning experiences (English, Brookes, Avery, & Blazeby, 2006; Topping, 2009) and is becoming increasingly used in tertiary education throughout the world, as highlighted in Table 2. Some researchers have found that students grade more leniently than teachers (Burgess, Clark, Chapman, & Mellis, 2013); others have found that students grade accurately and consistently compared to teachers, provided they have received defined marking criteria and sufficient training (Panadero & Alqassab, 2019).

The field of online PA has been studied around the world, as highlighted in Table 2. Most of the studies were carried out in the United States of America and in HEIs where subject domain varied. It was noted that smaller sample sizes are not significant to generalize the findings, as rigorous statistical analysis requires adequate sample size to prove hypotheses so that generalization is possible. Further research is needed in online PA with a larger sample size. Given that more than 50% of participants were females, studies with male opinions are also needed in literature on online PA. Researchers have tried testing the effects of anonymity and non-anonymity of peer graders on online PA (Table 2). The findings were mixed, with reports of positive effects of anonymity, where participants' performance,

perceptions, and attitudes were favorable under anonymous settings (Howard, Barrett, & Frick, 2010; Omelicheva, 2005; Raes, Vanderhoven, & Schellens, 2013; Rotsaert, Panadero, & Schellens, 2018; Vanderhoven, Raes, Montrieux, Rotsaert, & Schellens, 2015) and reports of negative effects of anonymity, where participants' performance, perceptions, and attitudes were not favorable under anonymous settings (Li, 2017; Peterson & Peterson, 2011; Yu & Wu, 2011). Two studies (Bloom & Hautaluoma, 1987; Yu & Sung, 2015) noted that there were no significant differences when comparing anonymous and non-anonymous groups in online PA.

Table 2. Best practices of studies carried out on online PA.

Study	Sample size	Education level	Gender distribution	Subject domain	Country
Bloom & Hautaluoma, 1987	96	HEI	50% female	Psychology	USA
Omeliicheva, 2005	110	HEI	46% female from primary study and 40% female from secondary study	Political Sciences	USA
R. Lu & Bol, 2007	92	HEI	Not reported	English	USA
Howard et al., 2010	72	HEI	74% female	Technology for pre-service teachers	USA
Peterson & Peterson, 2011	86	HEI	88% female	Education or Research methods	USA
Yu & Wu, 2011	243	Primary education	51% female	Science	China

Raes et al., 2013	51	HEI	92% female	Education or Instructional Design	Belgium
Vanderhoven et al., 2015	69	Secondary education	72% female	Presentation skills	Belgium
Yu & Sung, 2015	65	Primary education	52% female	Science	China
Li, 2017	77	HEI	72% female	Technology	USA
Rotsaert et al., 2018	46	HEI	72% female	Education or Instructional Design	Belgium

Taking the findings in Table 2 into consideration, our study focused on anonymous online PA, as shown in Figure 1, since there has been no such study on online PA carried out in the South Pacific. Online PA has been a technological solution to online formative assessments; it is also in line with the sustainable development goals (United Nations, 2019), where each Pacific Island country invests heavily in quality education for all its people. Therefore, HEIs in the South Pacific region are continuously looking for ways in which ICT can be utilized to deliver quality education equitably throughout the region.

SETTING

This study involved participants from USP, which is a premier institution of higher learning for the Pacific region. The university is jointly owned by the Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Samoa; it has campuses in all member countries, of which the main campus is located in Fiji (Figure 2).

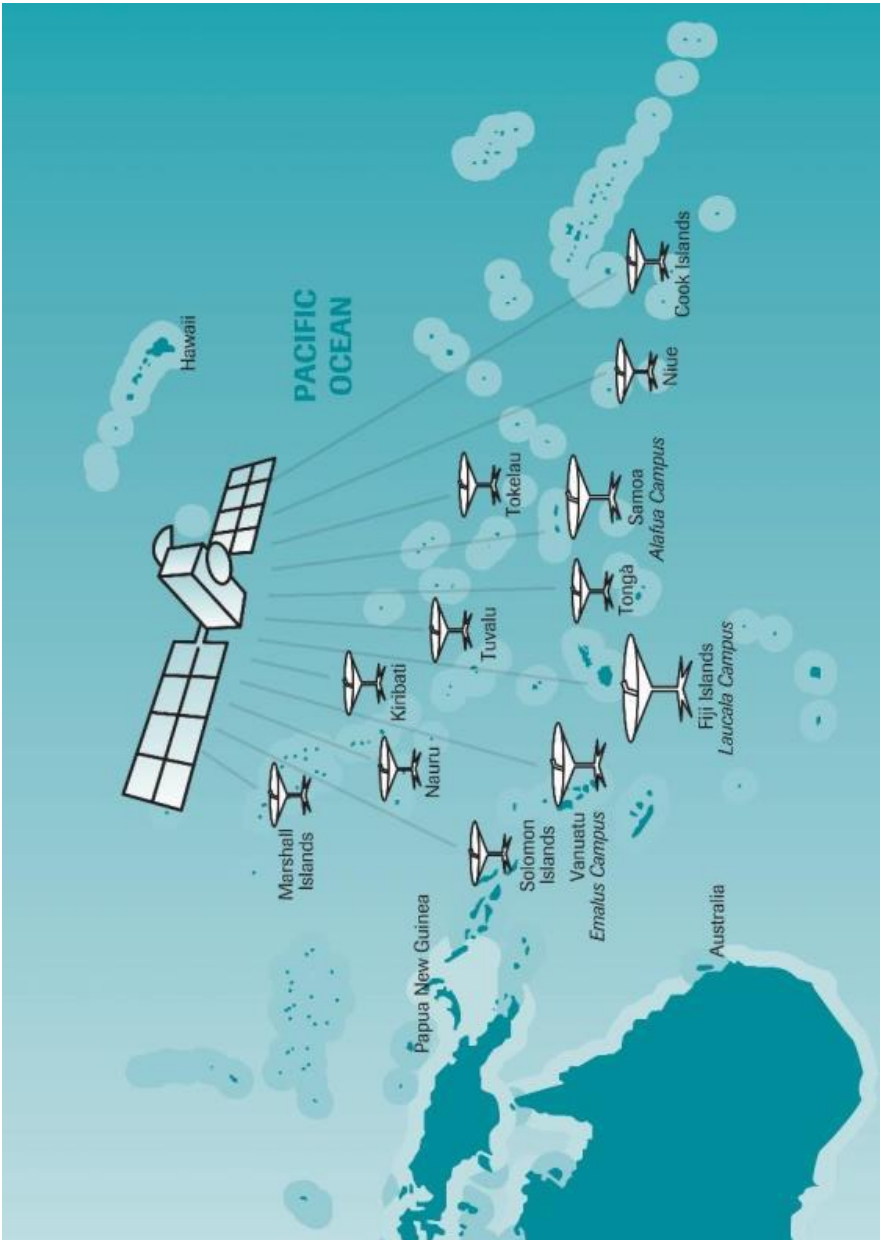


Figure 2. Member countries of USP connected through USPNet (USP, 2019, p. 48).

As mentioned, the first-year compulsory course chosen is UU100. It is a generic course where students from all undergraduate programs (with some exceptions) are required to complete this course. It is a semester-based 14-week course offered in Semesters 1 and 2 through online and blended modes. Students studying full-time from the main Laucala Campus (Fiji) are required to study through blended mode, and students from the other 13 campuses and 11 countries study it through online mode. The aim of UU100 is to ensure all incoming students develop competence and knowledge in information technology and information research (literacy) skills.

UU100 has no final exam; it comprises a number of formative and summative assessment components. Its formative assessments are 13 weekly topic assessments, online quizzes, and assignments, while summative assessments are ePortfolio activities. Assignments, ePortfolio activities, and the majority of weekly topic assessments have to be submitted online through the assignment and forum dropboxes in the learning management system (Moodle). The dropboxes are configured with the Turnitin plagiarism detection service (<https://www.turnitin.com/>), for which USP has a subscription.

Two weekly topics were selected for the online PA task. The first topic, titled “Simple text-based reports”, comprised an information technology assessment testing procedural knowledge in Microsoft Word 2016. The second topic, titled “Critically evaluating information resources”, comprised an information literacy assessment where students were tested on critically evaluating and selecting the best resources for their assignments.

The following PA aids were selected: instructional video and PDF guide for peer grading, criteria and rubric, training before engaging into peer grading, inclusion of self-assessment, and privacy of the peer graders. Under the privacy option, the anonymity of the assessor and assessee was bidirectional, as shown in Figure 1.

Since the major investigation of the study (research questions RQ 1 and RQ2) was on the reliability and validity of peer graders, only assessments with five graders were used for analysis. For the assessment titled “Simple text-based reports”, 326 submissions were extracted, and for the “Critically evaluating information resources” assessment, 114 submissions were exacted. For the purpose of understanding, Table 3 shows a sample of eight online PA records with grades of the “Simple text-based reports” assessment from the peer graders’ and the facilitator as well as that from Moodle, extracted from Moodle MySQL database. The total mark allocated for this assessment was 16. A similar format was also extracted for the “Critically evaluating information resources” assessment.

All assessments were also graded by a group of facilitators as an independent variable for comparison. The Moodle grade (the average grade from the five graders) was a dependent variable, and the grades of each peer grader and facilitator grade as independent variables. The moderating variables were gender and mode of study (online or blended). The difficulty of the task and the level of support provided were the same for both blended and online mode as control variables.

Table 3. Online PA data set for the “Simple text-based reports assessment” extracted from Moodle.

Assessment	Grader 1	Grader 2	Grader 3	Grader 4	Grader 5	Facilitator grade	Moodle grade
A1	13.9	11.2	14.4	13.7	12.4	13.5	13.1
A2	15.4	15.1	14.9	15.1	14.6	12	15
A3	7.6	12.2	16	6.7	11.8	10	10.9
A4	15.7	13.1	13.6	14.3	13.1	14	14
A5	8.8	9.6	7.2	10.9	7.6	10.5	8.8
A6	15.4	11.4	13.9	14.7	13.3	12.5	13.8
A7	15.1	11	12.3	16	13.4	15.5	13.6
A8	12.3	14.9	14.3	13.7	13.5	12	13.7

To continue using online PA in UU100 in other semesters, we had to run a post survey to capture students' perceptions of and attitudes toward online PA. UU100 is compulsory course and comprises students from various programs; therefore, a survey would capture the views of a variety of students. There were three sections to the survey: section 1 captured demographic information of the participants, comprising education level, mode of study (online or blended), study type (full-time or part-time working or part-time not working), program of study, and previous experience of online PA, whereas sections 2 and 3 captured students' perceptions of and attitudes toward the online PA strategy. The survey was administered online using Google Forms survey module after pilot testing. The survey was opened in Week 12 for a period of one month, and students who completed it were rewarded a bonus 1% mark toward their course work. Students who completed both assessments ("Simple-text based reports" and "Critically evaluating information resources") were allowed to participate only on a voluntary basis. The survey captured a total of 846 responses out of 1160 participants who completed both online PA activities.

The subsections and item constructs with descriptive analysis of sections 2 and 3 are shown in Table 4.

Students' perceptions of and attitudes with average mean (M) and standard deviation (SD) of each sections are as follows: adequacy of support and training provided ($M = 4.30, SD = 0.75$), feedback given to peer's mark ($M = 4.00, SD = 0.73$), usefulness of feedback received ($M = 4.19, SD = 0.75$), validity and fairness of peer marking ($M = 3.90, SD = 0.75$), and attitudes ($M = 4.00, SD = 0.87$). Overall, the students recorded a higher mean on adequacy of support and training provided, feedback given to peer's mark, and usefulness of feedback received. Thus, the results indicate that students had a positive experience as online PA enabled them to broaden their skills and knowledge and learn from their mistakes and those of their peers. However, a lower mean for validity and fairness of peer marking indicates that not all students perceived that online PA grades were valid and fair.

The attitudes of students toward online PA were positive as they preferred online PA strategy as an alternative form of assessment and had a voice in the assessment process. Students also stated that anonymity is important for online PA and recommended that other courses use this assessment strategy.

Table 4. Survey results on perception and attitude of students, adopted from Kumar et al. (2019).

Constructs, individual items, and Cronbach alpha values (N = 846, overall alpha = 0.870)		
Perception of adequacy of support and training provided (alpha = 0.84)	Mean	Std deviation
I found video and user guide instructions useful in grading my peers' work.	4.37	0.74
I referred to the peer assessment training instructions and rubric when commenting on and grading my peers' assessment.	4.26	0.77
For each of the two assessments, I found grading the samples useful before engaging in actual grading.	4.33	0.75
For each of the two assessments, I followed the guidelines provided during training for commenting on and grading peers' lab submission.	4.28	0.75
For each of the two assessments, I followed the rubrics for grading peers' lab submission.	4.27	0.76
Perception of feedback given to peer's mark (alpha = 0.705)	Mean	Std deviation
The feedback I gave my peers on their assessments for this course included critical comments about any mistakes students	4.14	0.70

made or any instructions they had not followed.		
The feedback I gave my peers on their assessments for this course was thorough and constructive.	3.93	0.75
Given the responsibility of grading my peers I felt empowered with a sense of providing fair grading	3.83	0.73
Perception of usefulness of feedback received (alpha = 0.777)	Mean	Std deviation
Feedback from peers on both assessments helped me improve my skills in completing major assessments, i.e., e-portfolios and assignments, to the best of my ability.	4.19	0.77
Feedback from peers on both assessments helped me better understand the key concepts of topics titled “Simple text-based reports” and “Critically evaluating information resources”.	4.19	0.73
Perceptions on validity and fairness of peer marking (alpha = 0.81)	Mean	Std deviation
The marks I got from all peers for both assessments respectively were accurate.	3.82	0.74
Peers gave me fair grades for both of my assessment.	3.88	0.74
Moodle workshop peer assessment tool allocated me a fair final grade.	4.00	0.75
I felt qualified to give feedback and grade my peers' assessment for this course.	3.96	0.76
I think my peers were qualified to grade and provide feedback on my assessments.	3.84	0.76

Attitude toward peer assessment strategy (alpha = 0.80)	Mean	Std deviation
I prefer peer assessment strategy over other methods of assessment.	3.61	0.96
I would like to see other courses also use peer assessment strategy.	3.85	1.00
I feel that peer assessment gives me a voice in the assessment process.	4.08	0.83
I find peer assessment strategy to be an alternative learning approach for applying the concepts taught in this course.	4.12	0.76
I think it is important that I do not know whose work it is that I am marking in peer assessment.	3.99	0.97
By engaging in self-assessment (i.e., assessing my own work and peers' work against a predefined solutions rubric), I was able to compare my solution with other peers' solution and improve my learning.	4.34	0.70

Due to the diversity of students in UU100 and larger sample size, the findings of the study can be generalized to the South Pacific and other regions provided online PA is carefully orchestrated. The research questions (RQ) were derived from literature, and relevant hypotheses (H) were then formulated to prove and answer the RQ. These were as follows:

- RQ1. How reliable is online PA in online and blended modes of delivery course?
- RQ2. How valid is the grade given by peers for the allocated assessment to grade?

- RQ3. What is the effect on student grades allocated by Moodle, with and without self-assessment?
- RQ4. How do the study modes of online and blended affect the grades of students, when PA is included?
- RQ5. Is there any significant difference in the Moodle grade of male and female students against the facilitator grade, when online PA is included?
- RQ6: What are effects of anonymity of assessor and assessee on students' perceptions?
- RQ7: What are the effects of anonymity of the assessor and assessee on students' attitudes toward online peer assessment?
- H1. PA data follows normal distribution.
- H2. There is no statistical correlation between peer graders and facilitator grade.
- H3. Student PA grades will be valid at the 0.8 inter-rater agreement.
- H4. The mean student grades or Moodle grade will be consistent with the facilitator grade.
- H5. There is no statistical significance between the online and blended mode Moodle grade and the facilitator grade.

The above research questions and hypotheses are not part of this reflective chapter but are provided for the purpose of understanding the research topic and how the study was carried out. The survey findings for RQ6 and RQ7 have been submitted for publication (Kumar, Sharma, Nusair, & Khan, 2019), whereas for RQ1 to RQ5 we are currently in the writing phase for publication in a journal.

CONCLUSION AND REFLECTION

This online PA study is the first of its kind from the South Pacific region and provides a contribution to the current knowledge of literature on online PA. The result of the post survey on students' perceptions of and attitudes toward online PA is disclosed in this chapter. Overall, the students had a positive experience provided they received support and training before engaging in online PA. Furthermore, the feedback given to the peer's mark and the usefulness of feedback enabled students to improve their learning. Students also had a positive attitude towards online PA but were a little concerned about the validity and fairness of marking. Therefore, with reference to the results of this study, HEIs in South Pacific region could adopt online PA strategy in their online and blended courses as a form of automated online formative assessment.

From the observations in this study, it is recommended that while designing online PA activities, it is very important to ensure that the activity is set to the standard of student understanding as students might have no or very little knowledge of this form of assessment. Furthermore, students must have mandatory *a priori* training and support sessions so that they understand the purpose of the activity and their roles and expectations. Students must be taught to interpret and use rubrics, argue opinions, and compare information. When designing an online PA activity, coordinators or lecturers must ensure that the assessment chosen is one that is familiar to both the students and staff; furthermore, that there is proper and structured monitoring of the entire cycle, such that there is no bias while the distribution of peer grading is undertaken; student dissatisfaction with the marks is recorded; and most of all, that the grades given by peers are valued. Students' perceptions of and attitudes toward online PA are totally dependent on the cycle of the activity, the knowledge the students have, and the support they receive during the entire process of online PA. However, this study has also shown that the benefits students receive from online PA greatly align to the graduate attributes of USP outlined

in every course (USP, 2004–2019). Future work recommended is to explore academics' perspectives of the use of online PA as a form of automated online formative assessment.

Finally, by engaging with the project, we were able to gain research skills, including writing proposals to securing funding and using web-based Microsoft Agile software for planning and scheduling task within the research group. We also experienced and learnt data analysis methods, including understanding and conducting content and construct validity and reliability of dataset. The handling of research funding budgets as per USP procedures and regulations was also another important learning experience. Finally, it was the effective teamwork which led to the successful completion of the research project.

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