The Impact of Technology Enabled Learning Implementation using Moodle at the National University of Samoa: Analysis of Student Perceptions

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1. INTRODUCTION

This paper is based on a research study "The Impact of Technology Enabled Learning Implementation at the National University of Samoa" which evaluated both lecturer and student experience on the implementation of technology enabled learning (TEL) using Moodle, a blended learning (BL) environment (Chan Mow, 2019). This paper reports on the findings of the student post-course survey. Broadly, the research aimed to answer the following question:

What is the impact of blended learning using Moodle on the lecturers' teaching and the students' learning experiences at the National University of Samoa?

Specifically, the research attempted to answer the following:

How do learners describe the effectiveness of the BL environment in their course of study?

How do students perceive their teachers' practice and behaviour in a BL environment?

How is the learning achievement in a BL course different from in other courses at the university?

How do teachers' practices affect students' perception of BL courses?

2. LITERATURE REVIEW

In recent years, blended learning (BL) has been used extensively across many educational institutions to offer education to a diverse and dispersed student population. In an overview put together by Larsen (2012) on the findings from higher education studies on the use of BL, the main benefits were i) improved learning outcomes; ii) confirmed effect on student satisfaction and motivation (Amaral & Shank (2010); iii) improved classroom dynamics; and iv) improved flexibility (Collopy & Arnold (2009); Fulkerth (2010)).

Improvements in learning outcomes as identified in the research include a reduction in drop-out rates; elevation of exam pass rates; enhanced student grades and improved student understanding (Amaral & Shank (2010); Boyle et al. (2003); Collopy & Arnold (2009); Dziuban et al. (2004)). As quoted in Owston et al. (2013), an often-cited U.S. Department of Education 2010 meta-analysis of empirical studies comparing learning in face-to-face and online courses supports Dziuban et al.'s finding by concluding that "students who took all or part [e.g., blended] of their class online performed better, on average, than those taking the same course through traditional face-to-face instruction."

Improved classroom dynamics include aspects such as i) students more eager to learn; ii) greater engagement; iii) greater participation; iv) greater involvement and v) improved preparedness (Amaral & Shank (2010).
Included as well in the research findings are the reasons for introducing BL which include i) a focus on student needs and expectations; ii) the desire to enhance the student experience, iii) and student engagement and accessibility; iv) promoting student retention and learning; and v) developing and using innovative technological approaches to learning (Fulkerth (2010)).

3. METHODOLOGY

For the overall study, a mixed-methods approach was employed, which involved quantitative and qualitative data collection. The sample for this research comprised the 10 lecturers who successfully completed developing their courses from the March 2018 Moodle workshop as well as offered these courses in semester 2. The sample also included the 238 students taught by these lecturers in these 10 courses. The research was conducted over 2 semesters. The lecturers had been trained in BL pedagogy and given pedagogical and technical support throughout the first semester. In the following semester, these courses were taught using Moodle. Classroom activities included offering lectures and tutorials in face-to-face mode and then supplementing it with online quizzes and exercises, and the use of bulletin boards and chat to help coordinate activities. Students would also typically upload assignments into Moodle, and some of the lecturers uploaded assessment results into Moodle.

Over the course of the semester, the research team liaised with the lecturers to provide support and encourage their use of Moodle in teaching. At the end of the semester, students were given post-course surveys to determine their experiences in the BL environment. The surveys were loaded into Moodle, and students filled in the forms online. Lecturer interviews were also conducted to capture and evaluate their experiences with course development in Moodle and with teaching using Moodle. Student achievement data for the 10 classes used in the study were collected from the previous year as well as the current year. These were used to evaluate any differences in student achievement between when the course was offered in non-BL mode and its current offering in BL mode.

Research Instruments
Post-Course Student Experience Survey

The post-course student survey was adapted from and based on a study by Larsen (2012) which had the same objectives as the current study. The instruments used by Larsen and subsequently the current study is built on the Web-based Learning Environment Instrument (WEBLEI), developed by Chang and Fisher of Curtin University (Chang & Fisher, 2003). WEBLEI is based on four main scales. Scales I to III (emancipatory, co-participatory and qualia) are built upon the work of Tobin (1998). Scale IV focuses on information structure and the design of online material.

Data Analysis

Survey and interview data were analysed using SPSS. Data from each of the pre and post-course student survey sections were coded according to their Likert scale responses. For example, the WEBLEI scales were measured using a scale of 1 (almost never), 2 (seldom), 3 (sometimes), 4 (often) and 5 (almost always) *or* 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree).

4. RESULTS AND DISCUSSION

The results and discussion of this research are reported along the lines of the research questions. Participants in the student post-course survey consisted of 238 students from the 10 classes taught by the 10 lecturers selected for the BL study. However, only 165 students completed the survey, giving a 69% response rate. Students were aged 15 to 58, with an average age of 22.9. There were 119 males and 44 females in the sample.

How do learners describe the effectiveness of the BL environment for their course of study?

The students' ratings of the environment on the four scales of the modified WEBLEI provided a detailed picture of how they felt about the issues of access, interaction, response and results. Evaluation of how learners describe the effectiveness of the BL environment is based on all the items of the student post-course survey. The overall means ranged from 3.69 to 4.44. The lowest mean response was for the infrastructure category, which is consistent with the data from lecturer interviews. The highest mean response was in the facilitation category, indicating students rated their lecturers' performance highly.

4.1 Digital skills and infrastructure

In terms of digital skills, responses were positive, all above the average or midpoint of 3 and ranging from 3.58 to 3.92, with an overall average of 3.76. This indicated that students had fairly good ICT skills. Independent sample *t*-tests revealed significant gender differences in the responses to items 1 and 2, with female students ranking their digital skills more highly than male students.

Responses on infrastructure, although positive, had the lowest rating, with an overall mean of 3.69 and a range from 3.52 to 3.89 (Table 1). This is consistent with responses from the lecturer interviews and researcher observations, which identified infrastructure as the most pressing challenge in implementing BL.

Table 1. Summary of results of digital skills, infrastructure and access (category 1)

Items	1 = strongly disagree	2 = somewhat disagree	3 = neither disagree nor agree	4 = somewhat agree	5 = strongly agree	Mean	Std. dev.	N
(1) Digital skills						3.76	1.02	165
1. I have basic ICT skills.	14	10	39	71	31	3.58	1.12	165
2. I have good ICT skills to use my laptop and MS Office and browse the Web for learning resources relevant to my course.	8	9	26	65	57	3.93	1.07	165
(2) Infrastructure						3.69	.94	165
3. I have a usable laptop.	18	13	23	32	78	3.85	1.38	164
4. Internet connectivity was reliable.	10	14	29	59	52	3.79	1.16	164
5. I did not have any issues with Internet bandwidth when accessing the Moodle Learner Management System (LMS) and participating in blended learning.	13	19	37	61	35	3.52	1.17	165
6. I did not have issues with the Moodle system response time (site loading).	6	30	29	53	47	3.64	1.18	165
(3) Access						3.89	.81	165
7. I can access the learning activities at times convenient for me.	7	15	23	58	59	3.91	1.12	162
8. The online material is available at locations suitable for me.	7	12	20	62	63	3.99	1.09	164
9. I am allowed to work at my own speed to achieve the learning objectives.	5	10	25	60	64	3.99	1.09	164
10. I decide how much I want to learn in a given period.	7	11	31	67	48	3.84	1.06	164
11. I decide when I want to learn.	13	15	28	61	47	3.7	1.2	164
12. Using blended learning allows me to meet my learning goals.	7	9	26	74	48	3.9	1.03	164
13. Using blended learning allows me to explore my own areas of interest.	5	13	32	65	50	3.86	1.04	165

4.2 Access

In the access category, students were evaluated on the convenience with which they could learn and the efficient use of time that BL allowed for. In the access category, the responses were also fairly positive, with an overall mean of 3.89 and ranging from 3.7 to 3.99 (Table1). This indicated students were satisfied that lessons were convenient and available at suitable locations, and gave them the independence to work at their own pace and meet their learning goals. Independent sample t-tests revealed significant gender differences in the access scale for item 13, "using BL allows me to explore my own area of interest," with female students feeling more positive about BL than males ($F = 3.876$, $p = .05$, $n = 162$).

4.3 Interaction

The results for the interaction scale, which covers learners' interactions with each other for the purpose of achieving the stated learning outcomes, appear in Table 2. The overall mean of 4.04 and the means for the individual items ranged from 3.59 to 4.39, indicating most students showed a highly positive response in terms of interaction and achieving their learning outcomes.

Table 2. Results for the interaction scale

Item	1 = strongly disagree	2 = somewhat disagree	3 = neither disagree nor agree	4 = somewhat agree	5 = strongly agree	Mean	Std. dev.	N
(4) Self-discipline/Interaction						4.04	.75	165
14. I communicate with other students in this subject electronically using email and discussion forums.	9	13	36	52	55	3.79	1.15	165
15. In this blended learning environment, I have to be self-disciplined in order to learn.	4	2	17	44	98	4.39	0.9	165
16. I have the freedom to ask my lecturer about what I do not understand.	6	3	21	43	91	4.28	1.01	164
17. I have the freedom to ask other students about what I do not understand.	7	6	35	56	61	3.96	1.06	165
18. Other students respond promptly to my requests for help.	3	6	42	55	58	3.97	.96	164
19. I am regularly asked to evaluate my own work.	6	14	43	52	50	3.76	1.09	165
20. My classmates and I regularly evaluate each other's work.	5	11	25	59	65	4.02	1.05	165
21. I was supported by a positive attitude from my classmates.	6	6	29	51	73	4.08	1.04	165
22. The amount of my interactions with other students increased.	3	5	34	59	64	4.12	0.92	165
23. The quality of my interactions with other students was better.	4	4	25	68	64	4.12	0.92	165
24. The amount of my interaction with the instructor increased.	3	4	32	69	57	4.05	0.9	165
25. The quality of my interactions with the instructor was better.	7	7	69	42	37	3.59	1.03	162

4.4 Learner attitude/response

The response scale measured the students' sense of satisfaction, enjoyment, ability to collaborate and boredom while learning in the BL environment. The overall mean for learner response was 3.72, with means for individual items ranging from 3.02 to 4.08 (Table 3).

Table 3. Results of the response scale

Item	1 = almost never	2 = seldom	3 = sometimes	4 = often	5 = almost always	Mean	Std. dev.	N
(5) Learner Attitude/Response						3.72	.72	165
26. Using blended learning makes me able to interact with other students and the lecturer asynchronously.	7	7	69	42	37	3.59	1.03	162
27. I felt a sense of satisfaction and achievement about this blended learning environment.	6	6	55	54	44	3.75	1.0	165
28. I enjoy learning in this blended learning environment.	5	7	48	46	58	3.88	1.04	164
29. I could learn more in this blended learning environment.	5	7	43	50	58	3.91	1.03	163
30. It is easy to organise a group for a project.	7	18	41	48	51	3.72	1.14	163
31. It is easy to work together with other students involved in a group project.	7	15	38	51	53	3.78	1.12	164
32. The blended learning environment held my interest throughout the course.	8	14	38	51	52	3.77	1.14	163
33. I am more engaged in this course.	8	3	30	51	73	4.08	1.06	165
34. I felt bored with this course when we got to the end of the semester.	29	24	55	29	28	3.02	1.31	165

This indicated that most students showed a positive response, with the majority selecting close to "often."

4.5 Learner results

For the results scale, which elicited students' opinions about what they gained from learning in a BL environment, the overall mean was 4.2 (SD = .68; see Table 4). The means for the individual items were highly positive and ranged from 4.02 to 4.2, indicating students rated highly the structure and organisation of the course, its presentation and content, and the online activities, assignments and quizzes.

Table 4. Student responses on learner results

Item	1 = almost never	2 = seldom	3 = sometimes	4 = often	5 = almost always	Mean	Std. dev.	N
(6) Learner Results						4.2	.68	165
35. I liked the online activities.	9	13	40	41	59	3.79	1.2	162
36. I liked the classroom activities.	2	5	24	40	93	4.3	.92	164

Item	1 = almost never	2 = seldom	3 = sometimes	4 = often	5 = almost always	Mean	Std. dev.	N
37. I like learning in the classroom	3	3	17	41	100	4.41	.89	164
38. The learning objectives were clearly stated in each lesson.	2	5	14	44	99	4.42	.87	164
39. The organisation of each lesson was easy to follow.	4	2	22	45	92	4.33	.93	165
40. The structure of the blended learning environment kept me focused on what is to be learned.	4	6	38	50	65	4.02	1.0	163
41. Expectations of assignments were clearly stated.	3	5	21	47	88	4.29	.93	164
42. Activities were planned carefully.	3	7	21	43	90	4.28	.93	164
43. The content of my course worked well in a blended learning environment.	2	2	36	61	64	4.11	.87	165
44. The presentation of my course was clear.	2	4	18	48	93	4.37	.86	165
45. The quizzes enhanced my learning process.	3	7	23	46	85	4.24	.97	164

How do students perceive their teachers' practice and behaviour in a BL environment?

This question sought to determine how students viewed their teacher's practice and behaviour in the classroom. The goal was to try to determine whether students' perceptions of their teacher affected how they viewed and rated their BL environment. To answer the third research question the mean and standard deviation scores on Scale V, facilitation, of the WEBLEI questionnaire were calculated. The scores for each teacher, assigned by the students in that class, indicate how the teachers compared across the courses.

Table 5. Student responses on facilitation

Item	1 = almost never	2 = seldom	3 = sometimes	4 = often	5 = almost always	Mean	Std. dev.	N
(7) Facilitation						4.44	.81	165
46. The lecturer is prepared and available to answer my questions.	3	2	21	33	104	4.43	.89	163
47. The lecturer encourages students to work together and help each other.	3	4	16	37	105	4.44	.89	165
48. The lecturer encourages me to learn in different ways.	4	5	12	42	102	4.41	.93	165
49. The lecturer gives me quick comments on my work.	3	5	18	42	95	4.36	.93	163
50. The lecturer is focused on our work during class time.	5	7	11	31	111	4.43	1.0	165
51. The lecturer expects me to do my best.	3	4	12	27	119	4.55	.87	165
52. The lecturer respects my individual way of learning.	5	5	15	22	116	4.47	.97	163

For the facilitation scale (Scale V), inspection of students' ratings for all of the teachers combined revealed the mean responses for facilitation were very high, with an overall mean of 4.44 and individual means ranging from 4.36 to 4.55 (Table 5). In fact, the responses for this scale are the highest and most positive of all the scales. This indicates very positive evaluations of lecturer practice and behaviour by students in a blended environment.

This research question also aimed to discover whether there were any differences between individual teachers. Results indicated, there were differences between the lecturers' average scores. However, it needs to be noted that all the ratings for lecturers were very highly positive, with means ranging from 4.09 to 5. This demonstrates that students' perceptions of teachers' behaviour and practices in the BL environment were highly favourable, which suggests that the lecturers often behaved in ways consistent with good practice in the classroom as outlined by Chickering and Gamson (1987). Results showed that lecturers were well prepared and available to answer questions, encouraged students to work together and help each other, encouraged different ways of learning, gave students quick feedback, expected students to do their best and respected their individual ways of learning.

To determine whether there was a statistically significant difference between how the students rated their teachers on Scale V, an ANOVA was performed. Results showed no significant teacher differences for most items in Scale V, except for item 48, where there was a significant difference between student responses in whether lecturers encouraged them to learn in different ways (F = 2.215, df = 9, p = .024). For item 48, despite the means for all lecturers being in the range of 4 to 5, there was one exception with a mean of 3.69. However, it needs to be noted that overall, students rated their lecturers very highly, with an overall mean of 4.44 and individual lecturer means ranging from 4.09 to 5.

How is the learning achievement in a BL course different from in other courses at the university?

To analyse the differences in students' academic achievement between BL and non-BL, the scores of the 2018 semester 2 BL students were compared with the scores of students in semester 2 of 2017 — non-BL students taught by the same faculty. The 2018 end-of-semester scores for the 10 blended courses were collected, and these marks were compared with the non-BL marks in the previous batch (i.e., semester 2, 2017).

A two-sample t test assuming unequal variances was used. Comparison of the mean achievement scores of BL students and non-BL students showed mixed results: they were statistically significant in three courses (30%) and not significant in seven other courses (70%). However, it needs to be noted that a more valid assessment of the impact of BL on achievement would require achievement measured over time as well as a longer exposure of students to a BL environment than in the current study.

How do teachers' practices affect students' perception of BL courses?

This question evaluated to what extent the practice and behaviour of teachers teaching in a BL environment are factors in students' opinions of courses taught in a BL environment. In other words, do the individual teachers have any influence on the students' ratings of the individual WEBLEI scales? To answer this question, the means of the student ratings for each scale were calculated and a one-way ANOVA was conducted, with the scale means as the dependent factors and the teacher as the independent factor. The ANOVA results indicated that the only scale of student perceptions in which the lecturer's practice and behaviour had a significant impact was on the response scale (F = 3.148, df = 9, p = .002). As mentioned earlier, the response scale measured the students' sense of satisfaction, enjoyment, ability to collaborate and sense of boredom while learning in the BL environment. Hence, these results indicate that lecturers' practice and behaviour had a significant effect on students' sense of satisfaction, enjoyment, ability to collaborate and sense of engagement in a BL environment.

5. CONCLUSION AND RECOMMENDATIONS

Overall, the results of the study were positive in many ways and provide the necessary evidence to streamline and scale up TEL at NUS. Students' high levels of satisfaction revealed that the BL environment and teachers' practices were effective. However, the study also highlighted several challenges, the most critical being an insufficient infrastructure and a lack of Internet access in the classrooms to enable Moodle access. At NUS, the Internet and hence Moodle can be accessed only in selected spaces, such as the computer labs, the library and the foyer. There is no Internet access and hence no Moodle in the classrooms, and this was the main barrier to implementing BL. The lack of access devices, insufficient Internet connectivity and bandwidth, and LMS access issues are barriers to effectively implementing BL. Hence, it is strongly recommended that NUS look seriously at resolving these infrastructure issues.

With a TEL framework already adopted at the university, it is expected that the following recommendations of this study will receive adequate attention and support.

Recommendation 1: NUS should address the lack of access devices, and the lack of Internet and Moodle access in NUS classrooms.

Recommendation 2: NUS should develop guidelines on access to, use of and administration of Moodle.

Recommendation 3: NUS should establish a technical support team with dedicated staff to provide timely support for solving and troubleshooting hardware, software and operating system problems and to address technology limitations as well as access and connectivity issues in the shortest possible time.

Recommendation 4: NUS should create an in-house team with adequate staff to motivate teachers and students.

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