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The Impact of TECHNOLOGY-ENABLED LEARNING IMPLEMENTATION at the National University of Samoa

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LE IUNIVESITE AOAO O SAMOA (Faavaeina 1984)

The Impact of TECHNOLOGY-ENABLED LEARNING IMPLEMENTATION at the National University of Samoa

Ioana Chan Mow
National University of Samoa

COMMONWEALTH *of* LEARNING

The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to promote the development and sharing of open learning and distance education knowledge, resources and technologies.

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COMMONWEALTH OF LEARNING
4710 Kingsway, Suite 2500
Burnaby, British Columbia
Canada V5H 4M2
Telephone: +1 604 775 8200
Fax: +1 604 775 8210
Web: www.col.org
E-mail: info@col.org

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Executive Summary

The research study "The Impact of Technology-Enabled Learning Implementation at the National University of Samoa" examined the use of blended learning (BL) in the university and students' learning experiences. It also analysed the experiences of teachers when designing, developing and delivering blended courses within technology-enabled learning (TEL) implementation supported by the Commonwealth of Learning (COL) under the COL TEL project.

The sample for this research comprised 10 lecturers who successfully completed developing their courses begun at the March 2018 Moodle workshop and offered these courses in semester 2. The sample also included the 238 students taught by these lecturers in the 10 courses. Data were collected through a student post-course survey and lecturer interviews.

Evaluation of the impact of training and mentoring was based on lecturer interviews in the following areas: i) pedagogical training and planning; ii) technological preparation, support and integration; iii) collaboration; and iv) teaching impact. Lecturers reported that the training and mentoring given by the COL consultant was useful, adequate and relevant in preparing and developing their courses. They found it easy to adapt to online pedagogy, but there was a need for more planning around BL. The majority of the lecturers felt that they had been given sufficient technical support by the COL consultant to prepare for BL, and that the research team had provided enough technical support during the teaching of the courses. The most critical technical support issue during the teaching of the courses was the lack of access to devices and the Internet.

Lecturers found it easy to coordinate and manage face-to-face and online activities. There was a lot of collaboration during the planning and preparation of the blended courses. However, the degree of collaboration varied across lecturers and during the teaching of the courses. All of the lecturers indicated Moodle had a definite impact on student–teacher interactions in that "students were more active," had "more time to work on their own," "contributed more to discussions" and had "more time to discuss problems." Moodle and BL offered the advantage of catering to different learning styles; students were also more engaged, contributed more, and had access to all the course resources.

However, some lecturers expressed frustration with students who did not take full advantage of the online resources, turned in assignments late, were unengaged in class, and had poor attendance and attitude. Moodle was used to monitor student participation and engagement in class activities. All of the lecturers agreed that using BL created no extra work at all, meant less paperwork and misplacing of assignments and activities, and was very effective. Perhaps the single most pressing and serious issue identified here and previously was access to Moodle, due to the unavailability of computers or access devices at NUS or lack of Internet access within NUS classrooms. Recommendations for improving the future use of Moodle were mostly about the need to increase access to Moodle through better infrastructure and training. There was also a recommendation to develop policies for access to and use of Moodle.

The second source of data for this study was the post-course student survey. The responses of students in the six categories of the modified WEBLEI scale used to evaluate the effectiveness of the BL environment were all highly positive, with category means ranging from 3.69 to 4.2 (on a Likert scale of 1 to 5).

Comparison of the mean achievement scores of TEL students and non-TEL students showed mixed results, i.e., the results were statistically significant in three courses (30%) and not significant in seven other courses (70%).

Analyses of student learning styles using the ATTLS test indicated significant gender differences in the "separate knowing" (SK) scores, with males attaining higher scores than female students. Findings also revealed that the two scores were highly correlated, implying that students with high "connected knowing" (CK) scores also had high SK scores.

Overall, the results of the study are 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, there is a need to provide Internet and Moodle access in classrooms and ensure sufficient technical support.

Finally, the current study also recommends that NUS create an in-house team with adequate staff to motivate teachers and students and to provide continuous professional training to help staff and students with using appropriate pedagogical approaches to online learning and BL. Such an initiative will hopefully create an active community of practice to enable staff and students alike to share their activities and reflect on their experiences (Lim & Wang, 2016; Wenger, 2000). The specific recommendations to NUS are:

- **Recommendation 1:** Address the lack of access devices and the lack of Internet and Moodle access in NUS classrooms.
- **Recommendation 2:** Develop policies to guide Moodle use, administration and access.
- **Recommendation 3:** Establish a technical support team with dedicated staff to provide timely support for 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:** Create an in-house team with adequate staff to motivate teachers and students.

1. Introduction

In recent years, blended learning (BL) has been used extensively across many educational institutions to offer education to a diverse and dispersed student population. According to Castle & McGuire (2010), BL offers the "potential to provide flexible access to content and instruction at any time, from any place and cost-effectiveness for institutions of higher education."

In January 2017, the National University of Samoa (NUS) signed a Contribution Agreement with the Commonwealth of Learning (COL), articulating support to be provided by COL to NUS to undertake a systematic approach to institutionalising technology-enabled learning (TEL) through research, consultation, capacity building, and monitoring and evaluation. TEL was a new initiative introduced by COL as part of its Strategic Plan for 2015–2021. The overall objective of this NUS–COL collaboration was to implement TEL at NUS to improve student engagement and learning through the effective use of information and communication technologies (ICT). In the first year of the NUS–COL TEL project, the main activities were i) conducting baseline studies to evaluate the current status of infrastructure, as well as staff's and students' skills in and perceptions of TEL; ii) developing a TEL policy informed by baseline research to guide TEL development for NUS; and iii) developing capacity in Moodle.

The baseline study revealed several findings: NUS is in the early stages of TEL, with some improvements needed in its technology infrastructure and support services. In terms of skill levels, staff and students were quite proficient in common applications such as word processing, spreadsheets and email. However, further capacity building in teachers and orientation of learners was needed in advanced ICT use for teaching and learning, to make the environment more creative, engaging and learning centred. Teachers also needed more training on the use of open educational resources (OER) and learning management systems (LMSs). In terms of attitudes towards TEL, staff and students showed very positive attitudes towards the use of technology in teaching and learning. Staff and students obviously knew the value, potential uses and benefits of technology. Responses also showed an overwhelming consensus on the need to develop a TEL policy for NUS (Chan Mow, 2017).

In 2018, the second year of the COL TEL project, the main activities were i) building capacity in the use of Moodle for developing blended courses to be delivered to students and ii) evaluating BL courses, which was the subject of the proposed research. In March 2018, a four-day capacity-development workshop was conducted for 20 NUS lecturers. The objectives of the workshop were to i) design and develop a BL course in Moodle to near completion; ii) explore different functionalities of the Moodle LMS; iii) integrate OER with Moodle courses; and iii) create learning activities and assessments in Moodle. Post workshop, continuous mentoring was provided to the lecturers throughout the semester, with the aim of completing the development of courses for offering in the new semester. COL also supported the setting up of an open-access repository using DSpace software at NUS and the building of staff capacity to use the same.

The evaluation of the effectiveness of the above activities in Moodle under the COL TEL project is the subject of the research discussed in this report. The purpose of this research was to investigate how BL courses developed at NUS were received by the students and teachers. This included an investigation of how best to train the teachers in BL pedagogy and online teaching technology, as well as a measure of the students' perceptions of the BL environment with respect to its effectiveness. Finally, the study sought to discover the students' experiences of the lecturers' practice and behaviour, and the extent to which these factors affected students' perceptions of the course and the BL environment in general. The major objective of the current research was to examine the impact of BL, using Moodle, on the lecturers' teaching

experiences, and on the students' learning experiences and learning outcomes. The study also focused on the benefits and challenges of BL for both lecturers and students.

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:

Research Question 1

What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a BL environment?

Research Question 2

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

An effective BL environment is, for the purposes of this study, defined as one in which students can learn and which provides them with a positive learning experience.

A positive learning experience for students is defined as one that meets their values, priorities and needs.

Research Question 3

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

Research Question 4

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

Research Question 5

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

Research Question 6

What are the learning styles of the students in the Moodle training, based on the categories of "connected knowing" and "separate knowing"?

The expectation is that the findings of this research will produce recommendations that will help inform the way forward in institutionalising the use of Moodle and a BL environment at the National University of Samoa.

2. Literature Review

Blended learning has been defined in a variety of ways. Cabero, Llorente and Puentes (2010) explain that "blended learning is a formative action in which online and attending training are combined" (2010, p. 150). Fleck (2012) defines it as a combination of conventional face-to-face elements with online elements. "However, this is at too general a level for in depth analysis, while the term 'blend' perhaps suggests too homogeneous a mix as in practice the mix is more 'lumpy." more a chunky fruit salad than a blended smoothie" (Fleck, 2012, p. 399).

As stated in Owston, York and Murtha (2013) with a few drawbacks, BL offers many benefits to institutions, faculty, and students. Such benefits include classroom space being efficiently used; faculty benefiting from increased flexibility in their teaching schedules; and students appearing to achieve more satisfaction and higher grades than in either fully face-to-face or fully online classes (Cavanagh, 2011; Dziuban, Hartman, Juge, Moskal, & Sorg, 2006).

Extant literature points to the increasing use of BL in education, its acceptance as a pedagogical approach, as well as its transformative power (Bransford, Brown, & Cocking, 2000; Dziuban, Hartman, & Moskal, 2004; Garrison & Kanuka, 2004; Garrison & Vaughan, 2008; Graham, Allen, & Ure, 2005; Osguthorpe & Graham, 2003; Shea, 2007).

Osguthorpe and Graham (2003), as stated in Larsen (2012), identified the following six reasons for using BL:1) pedagogical richness, 2) access to knowledge, 3) social interaction, 4) personal agency, 5) cost-effectiveness and 6) ease of revision. Of these, it was found that in a majority of cases, the main reasons for implementing BL were (i) improved pedagogy, (ii) increased access and flexibility and (iii) increased cost-effectiveness (Graham et al., 2003, 2005).

According to Shea (2007, p. 20), irrespective of the motivation for introducing BL at any given institution, matters of quality and of student and teacher satisfaction are fundamental to a successful implementation. This view is reiterated by Bliuc, Goodyear and Ellis (2007). An overview of the findings from studies of higher education in a blended environment is shown in Table 1.

Table 1. Overview of findings from studies of higher education courses utilising a BL environment (Source: Larsen, 2012)

Findings related to BL use	Studies
Improved learning outcomes: • Reduces drop-out rates • Raises exam pass rates • Raises student grades • Improves student understanding	Amaral & Shank (2010); Boyle, Bradley, Chalk, Jones, & Pickard (2003); Collopy & Arnold (2009); Dziuban et al. (2004); Lei (2010); López-Pérez, Pérez-López, & Rodríguez-Ariza (2011); O'Toole & Absalom (2003); Vaughan (2010)
Confirmed effect on student satisfaction and motivation	Amaral & Shank (2010); Collopy & Arnold (2009); Dziuban et al. (2004); Fulkerth (2010); López-Pérez et al. (2011); Vaughan (2010)
Improved classroom dynamics: • More eager to learn • Greater engagement • Greater participation • Greater involvement • Improved preparedness	Amaral & Shank (2010); López-Pérez et al. (2011); Osguthorpe & Graham (2003); Shroff & Vogel (2010); Singh (2010)
Improved flexibility	Collopy & Arnold (2009); Fulkerth (2010); Graham (2004); Macedo-Rouet, Ney, Charles, & Lallich-Boidin (2009); Oh & Park (2009); So & Bonk (2010)
Stated reasons for introducing BL: • Focus on students' needs and expectations • Desire to enhance the student experience, and student engagement and accessibility • Promote student retention and learning • Develop and use innovative technological approaches to learning	Davis & Fill (2007); Fulkerth (2010); Moore & Gilmartin (2010); Oh & Park (2009); Vaughan (2010)

2.1 Overview of Findings on the Use of BL

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; Collopy & Arnold, 2009; Dziuban et al., 2004; Fulkerth, 2010; Lopez-Perez et al., 2011; Vaughan, 2010); iii) improved classroom dynamics; and iv) improved flexibility (Collopy & Arnold, 2009; Fulkerth, 2010; Graham, 2005; Macedo-Rouet et al., 2009; Oh & Park, 2009; So & Bonk, 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; Lei, 2010; Lopez-Perez et al., 2011; O'Toole & Absalom, 2003; Vaughan, 2010). 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; Lopez-Perez, Perez-Lopez, & Rodriguez-Ariza, 2011; Osguthorpe & Graham, 2003; Shroff & Vogel, 2010; Singh, 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 (Davis & Fill, 2007; Fulkerth, 2010; Moore & Gilmartin, 2010; Oh & Park, 2009; Vaughan, 2010).

The above review of the literature highlights the main benefits of BL that needed to be investigated in the study, such as i) improved learning outcomes; ii) confirmed effect on student satisfaction and motivation; iii) improved classroom dynamics; and iv) improved flexibility. These aspects form part of the evaluations in either the student survey or the lecturer interviews. The review of the literature also informs the discussion of the findings in the later sections of the report.

3. Methodology and Data Analysis

The purpose of this research was to examine how to prepare university lecturers to create a productive BL environment for their students. This included an investigation of how best to train teachers in BL pedagogy and online teaching technology, as well as a measure of the students' perceptions of the BL environment with respect to its effectiveness. Finally, the study sought to discover how students' experience of the lecturers' practice and behaviour and the extent to which these factors affect student perceptions of the courses and the BL environment in general.

For this research, a mixed-methods approach was used—a combination of quantitative and qualitative approaches. Creswell (2009, p. 10) states that quantitative and qualitative data are used "because they work to provide the best understanding of a research problem" (p. 11).

Quantitative data were in the form of pre- and post-course student questionnaires. Qualitative data were gathered using staff interviews. Details of these appear in the Procedures section below.

3.1 Sample

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.

3.2 Procedures

A mixed-methods approach was employed, which involved quantitative and qualitative data collection from 238 students and 10 lecturers. The lecturers had been trained in BL pedagogy and given pedagogical and technical support throughout the previous 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.

A consent form was given to all participants to sign, approving their participation in this research. The consent form also indicated voluntary participation and ensured participants that any information collected would be confidential and not used in anyway detrimental to them. This form was uploaded into Moodle so students could access it and indicate consent.

Early in the semester, in weeks 4 and 5, a pre-course survey—Moodle's internal Attitudes to Thinking and Learning Survey (ATTLS)—was administered to all students in the courses selected to be evaluated in the survey. This survey gauged the students' learning attitudes.

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.

3.3 Research Instruments

A more detailed description of the research evaluation instruments is given below.

a) Pre-survey: Moodle's Attitudes to Thinking and Learning Survey (ATTLS)

Moodle's internal ATTLS is based on the theory of "ways of knowing," originally from the field of gender research (Belenky, Clinchy, Goldberger, & Tarule, 1986), and is a survey tool that evaluates the quality of discourse within a collaborative environment. Developed by Galotti et al. (1999), ATTLS measures the extent to which a person is a "connected knower" (CK) or a "separate knower" (SK). People with higher CK scores tend to find learning more enjoyable and are often more cooperative, congenial and willing to build on the ideas of others, while those with higher SK scores tend to take a more critical and argumentative stance to learning. Studies have shown that these two learning styles are independent of each other (Galotti et al., 1999; Galotti et al., 2001). Additionally, they are only a reflection of learning attitudes, not learning capacities or intellectual power.

b) Lecturer Interviews

Lecturer interviews provided answers to Research Question 1: *What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a BL environment?* Evaluation of the impact of training and mentoring was based on the following areas:

1) Pedagogical Training and Planning: Pedagogical training referred to the training the teachers had received in BL pedagogy and lesson planning during the four-day Moodle workshop. The pedagogical planning aspect referred to several parts of the teachers' experiences. First, it dealt with the preparation of the course syllabus that the COL consultant did for the courses prior to semester 2. Second, it referred to the planning that the teachers had to do to make online and regular face-to-face classes work well together. Third and last, it focused on how teachers had to learn about, and adapt to, online pedagogy.

2) Technological Preparation, Support and Integration: Interviews evaluated whether the lecturer had been given sufficient technical preparation for BL, whether technical support was provided during teaching, andhow easy it was to integrate technology with face-to-face teaching.

3) Collaboration: Interviews also determined whether there had been any collaboration between instructors during planning and preparation for BL.

4) Teaching Impact: Lecturers were asked to share their views on teaching impact, based on the following areas:

    i. Classroom dynamics: This covers student and teacher interactions and student and teacher attitudes to the course activities and to each other.

    ii. Efficiency: This is discussed in terms of student learning and of enabling the teachers to monitor student progress.

    iii. Workload: Interviews also gathered lecturers' views on how BL affected their workload.

c) Post-Course Student Experience Survey

The post-course student survey is adapted from and based on a study by Larsen (2012) which had the same objectives as the current study. The purpose of the Larsen study was to investigate how to prepare ESL teachers to create a productive BL environment for their ESL writing students. This included an investigation of how to best train the teachers in BL pedagogy and online teaching technology and a measure of the students' perceptions of the BL environment with respect to its effectiveness. Finally, the study sought to discover how students

experienced the teacher's practice and behaviour, and the extent to which these factors affected student perceptions of the course and the BL environment in general. The instruments used by Larsen and subsequently the current study arebuilton 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.

Scale I evaluates emancipatory activities. Tobin (1998) listed three main categories of emancipatory activities: convenience, efficiency and autonomy (Chang & Fisher, 2003). Convenience is achieved when students can access the learning activities at convenient times. Efficiency is described as not having to attend on-campus classes, thereby enabling efficient use of time. Autonomy is described as allowing students to decide when and how to access the curriculum (Tobin, 1998, p. 151).

Scale II evaluates co-participatory activities. Tobin (1998) asserts that "co-participation implies the presence of a shared language which can be accessed by all participants to engage the activities of the community, with a goal of facilitating learning." Included under the co-participatory activities are six categories: flexibility, reflection, quality, interaction, feedback and collaboration.

- Flexibility is described as allowing students to meet their goals.
- Reflection is noted as asynchronous interactions that encourage reflective interactions.
- Quality is linked to the learning reflected in the level of activity undertaken by the students.
- Interaction is described as enabling students to interact with each other asynchronously.
- Feedback is described as the availability of feedback from students and the teacher.
- Collaboration enables students to collaborate in a variety of activities (Tobin, 1998, p. 152).

Scale III evaluates qualia. Tobin (1998) defined qualia by describing knowledge that is considered "embodied in neural networks as vectors of electric charge that reflect [the] life experiences of individuals." Tobin (1998) described six categories of qualia: enjoyment, confidence, accomplishments, success, frustration and tedium.

- Enjoyment is associated with academic success and mastery of technology.
- Confidence is associated with successful learning and support for learning.
- Accomplishments are described as allowing students to display their course accomplishments regularly and publicly.

Scale IV evaluates information structure and design elements as results. The fourth scale (results) was added by Chang and Fisher (2003) for the purpose of discovering "whether the materials presented follow accepted instructional design standards, such as stating its purpose, describing its scope, incorporating interactivity, and providing a variety of formats to meet different learning styles" (p. 10). They also state that Scale IV is meant to help students "determine what they have gained . . . from learning in this environment" (p. 11). Thus, Chang and Fisher (2003) claim that "having gone through all the learning activities, from access (Scale I), to interaction (Scale II) to response (Scale III), students should be able to determine what they have gained (Scale IV: Results) from learning in this environment" (p. 11).

In addition to the WEBLEI scales, Larsen (2012) introduced a fifth scale (Facilitation) to evaluate how a teacher's practice and behaviour affect student perceptions of the BL environment. To address this shortcoming, a fifth scale with seven questions was added to the questionnaire.

The post-course student survey is a modified version of the Larsen study's student WEBLEI survey (see Appendix C) and divided into the following sections:

1. Digital skills
2. Infrastructure
3. Access (Scale I)
4. Self-Discipline/Interaction (Scale II)
5. Learner Response (Scale III)
6. Learner Results (Scale IV)
7. Facilitation (Scale V)

Modifications to the Larsen (2012) WEBLEI student survey include the addition of Sections 1 and 2 on digital skills and infrastructure. Research indicates that when using a BL approach, instructors need to make sure that the technology and online materials are well integrated into the course, easy to use, and user friendly (Larsen 2012)—hence the addition of these two sections.

Table 2. Cronbach's alpha reliability index

Categories/Scales	Cronbach's alpha	N of items
ALL	.959	52
Access	.910	13
Interaction	.928	12
Attitude	.840	9
Response/Results	.903	11
Facilitation	.943	7

The scale used has high reliability and validity in previous research settings (Larsen, 2012). For this study, evaluation of the reliability of the post-course survey instrument (internal consistency) was calculated using Cronbach's alpha reliability coefficient for the overall instrument and for individual scales. Cronbach's alpha for the overall is .959 and for the five scales ranged from .840 to .943, thus indicating a high level of reliability (Table 2).

Table 3. Summary of research questions, data sources and analysis focus

Research question	Data source	Analysis focus
Research Question 1 What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a BL environment?	Lecturer interviews Researcher notes	All questions
Research Question 2 How do learners describe the effectiveness of the BL environment in their course of study?	Student post-course survey	Post-course survey, ALL questions in Sections 1 to 6
Research Question 3 How do students perceive their teachers' practice and behaviour in a BL environment?	Student post-course survey	Post-course survey, Section 7, facilitation. (The mean and standard deviation scores on Scale V, facilitation, of the WEBLEI questionnaire were calculated. The scores for each teacher, assigned by the class students, will indicate how the teachers compare across the courses.)
Research Question 4 How is the learning achievement in a BL course different from other courses in the university?	Student results for TEL and non-TEL	*t*-test for TEL and non-TEL means
Research Question 5 How do teachers' practices affect students' perception of BL courses?	Investigate whether any correlations between students' perceptions of their courses and their perceptions of their teachers	WEBLEI scale averages I–IV. Calculating the means of the student ratings for each scale and conducting a one-way ANOVA with the scale means as the dependent factors and the teacher as the independent factor.
Research Question 6 What are the learning styles of the students in the Moodle training, using two categories: "separate knowing" and "connected knowing"?	Investigate whether any correlation between SKs and CKs	Correlation between SK scores and CK scores. One-way ANOVA of gender and CK and SK scores.

A summary of the research questions, the data source and the analysis focus is in Table 3.

3.4 Data Analysis

Survey and interview data were analysed using SPSS. Interviews with lecturers provided important qualitative data on their Moodle experience that were used in recommendations to inform the future direction of Moodle use at NUS. Data from each of the 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). Graphs and frequency tables were generated to display numerical data. The analysis involved descriptive and inferential methods such as ANOVA, *t*-tests and correlation.

3.5 Limitations

Perhaps the first limitation encountered in this study was the sample size for the instructor or lecturer participants. The initial number of participants was 20, but this dropped to 10 by the end of the first semester. Hence, it was decided that only a qualitative evaluation using lecturer interviews was feasible. Another limitation of this study is the timing, as the study was conducted in the very early phases of TEL implementation at NUS. As well, the amount of time participants spent on using the blended mode, particularly using Moodle, was confined to a few weeks in total duration, as the online component was only used to supplement face-to-face interactions, and teaching was predominantly done face-to-face. Another critical factor for this study was Internet availability in the classrooms, which proved problematic at times and might have restricted full access to and usage of Moodle.

4. Results and Discussion

The results and discussion of this research are reported along the lines of the research questions. As mentioned earlier, research question 1 used lecturer interviews to evaluate the impact of the training and mentoring programme on lecturers' experience of designing and teaching in the blended mode. The remaining research questions 2 to 5 evaluated, through a pre- and post-course survey, student experiences of the blended environment using Moodle.

4.1 Demographic Profile

Interview participants were 10 lecturers aged 28 to 64, two males and eight females. Of the 10 lecturers, three were from the Science department, three from Computing, and one each from Sociology, Education, and the Schools of Medicine and Nursing.

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 (Table 4). Students were aged 15 to 58, with an average age of 22.9. There were 119 males and 44 females in the sample.

Table 4. Distribution of study sample across programmes

Programme type	Total no. of students	Number of responses	Response rate
BA	16	15	93.75
BSc	63	21	33.33
BCom	47	30	63.82
BEd	20	20	100
BNS	82	69	84.14
MBBS	8	8	100
PGSCI	2	2	100
Total	238	165	69.3

4.2 Impact of Training and Mentoring Programme on Teachers' Experience of Designing and Teaching in a Blended Environment

Research Question 1

What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a BL environment?

As mentioned earlier, evaluation of the impact of training and mentoring was based on the following areas: i) Pedagogical Training and Planning; ii) Technological Preparation, Support and Integration; iii) Collaboration; and iv) Teaching Impact.

4.2.1 Pedagogical Training and Planning

The pedagogical planning aspect referred to several parts of the teachers' experiences. First, it dealt with the preparation of the course syllabus that the COL consultant had done for the courses prior to semester 2. Second, it referred to the planning that the teachers had to do to make online and regular face-to-face classes work well together. Third and last, it focused on how teachers had to learn about, and adapt to, online pedagogy.

How relevant and how adequate were the training and mentoring given by the COL consultant for preparing/developing your courses to use in second semester?

All of the lecturers were in agreement that the training and mentoring given by the COL consultant was useful, adequate and relevant in preparing and developing courses. It was agreed that for those who had weak technological skills, the training was a challenge. Some lecturers suggested things that could be improved, such as the timing of the training, its duration, and better coverage of certain commands (e.g., link, reprint, copyright). However, one lecturer did comment that in light of the important role of BL in improving student learning, this initiative was quite timely.

One of the lecturers remarked:

The mentoring and the training for Moodle given by the COL consultant were very adequate in preparing my course to be delivered using the blended learning method. I have been able to design and develop the course on Moodle to completion with the knowledge that I have gained from the training as well as the blueprint of the course that was required before the training started. Before the course started and throughout the semester, I have explored and learnt about the different functionalities of the Moodle learning system, create[d] learning activities and assessments online, and integrate[d] open education resources with my course.

What was your experience of trying to make online and regular face-to-face work well together?

According to lecturer responses, *"Integrating these two modes was not that complex as the online mode complements the face-to-face mode. This was in terms of the student's accessibility to course materials, extra readings and interactive activities online that can enhance the students' learning."*

Was there a balance between online and classroom activities?

In terms of balance between online and classroom activities, lecturers had to work out what was best for their class situation. While all of them taught in face-to-face mode, there was some variation in how much online activity was used to supplement face-to-face. For example, the availability of lecture notes online enabled students to readup on work before coming to class. Lecturers were also able to communicate with students via email and bulletin boards. Some typical responses are below:

Yes, once I started using Moodle I uploaded everything resources to use, so that when I was face-to-face with my students they had their laptops with them and we were able to discuss what has been uploaded. At times, we communicated through email not through Moodle because we are still learning.

Yes, because the good thing about online and face-to-face was that having all this information going into Moodle, by the time you come to meet your students they have already know and familiarize[d] themselves with the documents, all you do is prepare yourself for their questions and things that need[ed] clarity, but sometimes, you don't really need to work hard through Moodle. Students can also send questions based on things that needs clarification.

Did the online and classroom activities integrate well?

Most of the lecturers agreed that the online and classroom activities integrated well, as reflected in the responses below.

Yes, my students were happy that they access [to] the materials before they had the face-to-face sessions and all of them work full-time so they could not make to class because of work commitments and after hours like the meetings or travelling and they were happy they could access the materials outside the classroom.

I do feel it worked well having my lectures face-to-face and my tutorials via Moodle.

How much planning did you have to do for this integration?

There was mixed reaction in terms of how much planning was needed to integrate online with face-to-face activities. While a few felt that there was less or the same amount of planning needed as when teaching face-to-face, most of the lecturers found there was a need for more planning in BL. Most of the lecturers felt it was a lot more challenging, for a variety of reasons, particularly those who had not used Moodle before. Some typical responses appear below:

In terms of planning, I had to do extensive work beforehand so that all the necessary reading materials, assessments are timed perfectly so that at the start of the course the students will be able to view, know and understand all the course contents and proceedings.

Planning wise, was pretty much the same effort I put into preparing my face-to-face lecturers and tutorials. The good thing about Moodle [is] you may change slides in just a click of a button.

Not given much time to plan. I found that it needs to have time to plan in advance.

At first I did not have ample time to complete organizing my course on Moodle. I improvised my planning based on a short time. Instead of developing the entire course on Moodle, I only

planned tutorial activities for students, hence, I didn't find it complicated to do.

Not really, not enough time because of other work commitments, you really need to be in front of your computer not only to learn as you go long and to be familiar with the features of Moodle.

I had to learn as I went along, a lot more preparation to get used to Moodle not the content of the course because I'm familiar with [that] but with using the various parts of Moodle, I know there are many features of Moodle that I have been told about and I still need to learn those to make full use of the Moodle.

There was a lot of planning compared to face-to-face learning. Familiarizing how to work with Moodle environment, planning the course was easy but integrating them into Moodle was a lot of work, especially with people like [myself] that was my first time, it was a lot of work.

What were your experiences in learning to adapt to online pedagogy?

There was an interesting mix of experiences in adapting to online pedagogy. Most of the lecturers found it easy to adapt; those with previous experience in using online technology found that was an added advantage. Others mentioned finding difference among their students, with younger ones finding technology more relevant than older ones did. Moodle helped shy students interact in online discussions.

It was difficult, as most of the older students found using online teaching irrelevant, as they are laggards—do not believe in change and all. The younger students found it very relevant as most of them were from rural areas and found it better, instead of looking for a transport to go home after lecturers.

I was eager to learn Moodle. I thought that it was about time we had a system in place in doing online teaching besides Google Classroom. Consultant from COL (Philip) gave accurate information on the process of Moodle and also gave extra information on how to shorten URL[s] and other relevant information.

Moodle had made my quiet and shy students talk out more than they would during face-to-face classes. If you see in my logs on our forum I have three students who never talk[ed] during class [but] actually participate[d] during the forum.

As I mentioned earlier, some of my students (10% of the class) found it hard to adapt to online teaching. I found Moodle very useful. Example, when I have announcements to make, most students will say that they didn't receive my email, or they didn't get my text (missing letter or number for address), but with Moodle, they can all go online and the announcement[s] are there. I have to encourage my class to use Moodle, in submitting assignments and projects, and getting lecture notes from there. I haven't used videos yet on Moodle as I haven't got a good camera to upload my lectures but that is something that I will try next year for my HMK101 course.

The tool is very user-friendly; it didn't take long to play around with the features to learn how things worked, so only positive experiences with learning to use the tool. I picked up very quickly on how to use Moodle given the training and I was also already familiar with using Moodle given my times as a USP student. Apart from the training, I explored the various Moodle functions on my own and my knowledge of Moodle heightened when I started using it with my students because I was able to also learn through the queries and challenges of my students. The challenges they encountered helped me manoeuver my way with Moodle as well.

Just to sit in front of the computer to familiarize with Moodle, manage your time, and once you get the hang of it then it would help a lot with communication with you and the students.

Need more time to play with it[. A]fter Philip, it was very hard for me to go back to it, because

I thought, not only because my students had no idea what Moodle was and it was my first time with Moodle, to me, to be able to have an interest in working with Moodle, I had to visit Moodle all the time, share my ideas and talk to some colleagues who are currently using Moodle and learn from them. Because if I share to the ones who are not using Moodle for their teaching, they might get lost and my interest will go to waste as well. I had to look for people who are doing Moodle and the other thing that helps me is to talk it out with my staff members and my dean and we are planning to have a Moodle workshop because for me now, I want to see my previous experience using Google Classroom therefore I was able to adapt quickly to the features of Moodle. It is also from the workshop that we developed our curriculums on Moodle with the assistance of our facilitator, that had also helped in learning the different features of Moodle for online pedagogy.

4.2.2 Technological Preparation, Support and Integration

Interviews examined whether the lecturer had been given sufficient technical preparation for BL, whether technical support was provided during teaching, and how easy it was to integrate technology with face-to-face teaching.

Were lecturers given sufficient technical support in preparation for BL in Moodle?

With one exception, all of the lecturers felt that they had been given sufficient technical support by the COL consultant in preparation for BL.

Yes, I was given sufficient technical support in preparation for my BL. The only problem that I had was students forgetting their password every single week. The training was delivered adequately. Yes, I was given sufficient technical support prior to blended learning.

Partly yes, because I have used it before, I forgot it and with Moodle you need to be regularly in contact.

Were you given sufficient technical support during teaching for BL in Moodle?

The majority of lecturers indicated that the research team gave sufficient technical support, although one felt there was more support given to lecturers on the main campus. The most serious issue in technical support during the teaching of the courses was the lack of Internet access, and this was mentioned by all lecturers in their interviews. Hence, an important recommendation is to provide reliable Internet access for students. Currently, the Internet is required to access Moodle online and is available only in the computer labs, and the library, with no Internet access in the lecture theatres and classrooms. Outside of the labs and in the classrooms, students had to provide their own devices for access.

How easy was it for you to integrate technology with face-to-face teaching?

All of the lecturers interviewed agreed that it was relatively easy to integrate technology with face-to-face teaching. Again, being computer literate and having prior knowledge and use of Moodle or other online platforms helped. However, the issue was access to Moodle due to lack of Internet access in the classrooms. This prevented some classes from utilising Moodle online. Lecturers enjoyed experimenting with the features of Moodle to enhance their teaching, and "students were keen to use something different from face-to-face." Online assistance with Moodle was also available, which helped as well.

How easy was it to manage online activities?

As mentioned earlier, the main issue in managing online activities was access to the Internet and Moodle. In some cases, the lack of Moodle training for students was flagged as a factor. In addition, only students who had mobile phone data credit were able to access Moodle. Another issue was a technical limitation: Moodle's

upload capacity is limited to 8 MB, so resources and assignments above this limit could not be uploaded.

How easy was it to manage face-to-face course activities?

All of the lecturers indicated that it was easy to manage face-to-face course activities. This came as no surprise, as this was the mode of teaching lecturers were most accustomed to. As one lecturer put it:

> *It was eas[ier] than online, the reason why because you don't have to write a lot down to explain what you are supposed to do because they are right there, you talk and they ask questions for clarifications and all that, unlike Moodle (online) they need to log in and once they are in, you the lecturer should have a lot of information to explain the subject or lesson.*

4.2.3 Collaboration

Lecturer interviews also determined whether there was any collaboration between instructors during the planning and preparation for BL.

Was there any collaboration between you and other lecturers during the planning and preparation for BL using Moodle?

Lecturers reported that *"there was a lot of collaboration between us during planning and preparation of our blended courses. This was mainly in terms of seeking assistance of others who are Moodle savvy or others seeking my assistance with the development of their course."*

Did you enjoy sharing ideas with other lecturers on the use of BL in your teaching?

Reactions were mixed about the degree of collaboration during their teaching, depending on the lecturer. Whereas some indicated they had extensive collaboration with fellow lecturers, sharing ideas and Moodle experiences, others experienced little collaboration and only collaborated with the Moodle administrator and the COL TEL research team.

For those who indicated they had undergone some collaboration with other lecturers, there was a sharing of ideas with other lecturers on the use of Moodle, as shown by the responses below.

> *Yes! I was surprised especially with [name withheld], she explained and talked excitedly about Moodle like she was the creator of Moodle training, and she sounded like Philip, so she got her students to program their phones by retrieving the Moodle program (app). She showed them how to add, remove and how to go into Moodle, and I thought I should also be able to do that as well.*

> *. . . [S]haring ideas with what other lecturers experienced [was helpful]; for example, someone was saying that they can sit in their offices and deliver the lecture to the students in the lecture theatre. That's an idea and I want to pursue further wherever they are.*

> *Yes, because we have a couple of staff members who are currently using Moodle for their teaching.*

4.2.4 Teaching Impact

Lecturers were asked to share their views on teaching impact based on the following areas: a) classroom dynamics, which covered student–teacher interactions and students' and teachers' attitudes to the course activities and each other; b) efficiency, discussed in terms of student learning and in terms of enabling the teachers to monitor students' progress; and c) the effect of BL on lecturers' workload.

Classroom dynamics: student–teacher interactions

With the exception of one lecturer, who did not see much difference in student–teacher interactions, all of the lecturers indicated that there was definite impact of Moodle on student–teacher interactions in that "students were more active"; "[Moodle] gave them more time to work on their own, which they enjoyed"; "students contributed more to

discussions on Moodle than when face to face"; and "[there was]more time to discuss problems which did not have time in class to discuss." One lecturer "used Facebook Messenger to guide my students on how to use Moodle and constantly send them reminders to attend to Moodle for their tutorial."

Other interesting observations are below.

> *Greatest impact is the speed of information between me and the students. I limit my emails to students, usually, I email them twice or three times a week to explain everything, but now with Moodle, with all the information on Moodle, the students are to read and they can contact [me] if they have any questions.*

> *One thing I can say for sure is that students are more active in using BL. For examples in marketing, the lecturer has to provide as much examples as possible, for TV ad, thinks of posters and billboards, celebrity endorsement and all. With BL students can just go online and search for examples and they will have a fair idea about the topic or content.*

Classroom dynamics: students' and teachers' attitudes to the course activities and each other

There were mixed responses on the subject of students' and teachers' attitudes towards course activities. Some indicated that there had been no impact, as *"[s]tudents still turned in assignments late and would not ask me about anything even when they really do not understand anything."* Others indicated that there was no impact on the classroom dynamics as students had no Internet access there, but they agreed that with access, this could work efficiently.

One lecturer indicated commented:*"Students have learned more technical skills through the use of Moodle, for instance, uploading an assignment; reading instructions carefully is something key that I feel my students have learned since using Moodle and also changed the behaviour of dependency. What I mean is that, I mark my students' tutorial attendance and participation based on whether or not they have attended to Moodle within the week. At the beginning I had to remind them constantly via Facebook Messenger to attend to Moodle but only for a short while and encouraged them to be proactive."*

Additional positive responses in terms of improved relationships and improved communication with students are below.

> *Yes, I was able to communicate more with them. Because they are not familiar with Moodle they don't reply back but they do read the notices that I put on Moodle; it's also good because it allows me to give several reminders without emailing or calling them so I have been using that to remind them of the deadlines and sending them interesting readings that they need.*

> *There is an improved relationship between myself and my students where we can freely discuss any issue or problem with our course content or in class. Some students do not have the confidence to ask during classes but can post what they really want to understand on discussion forums. Their attitude to activities online is positive as they like the interactive activities and receiving instant grades or feedbacks to their online assessments.*

Efficiency is discussed in terms of student learning

Lecturers reported that Moodle or BL provided the advantage of catering for different learning styles. Plus, students were more engaged and contributed more in this blended mode; an analysis of student learning styles appears later on in the report. Another advantage was the provision of access to all the course resources. However, some lecturers also reported frustration that despite being provided with all the course resources online, students were still not taking full advantage of them, still turning in assignments late and still unengaged in class; attendance and attitudes also remained poor.

Efficiency is discussed in terms of enabling the teachers to monitor students' progress

Whilst some lecturers indicated they had not used Moodle to monitor students' progress, the majority indicated they had used Moodle to monitor student participation and engagement in class activities. Lecturers were able to use grading on Moodle, display student grades, and monitor student logins assignment uploads. However, it was also recommended that for effective use of Moodle, access and enforcement (i.e., making its use mandatory) are essential to ensure student usage.

Here is an example of a positive response: *"When using Moodle to assess the students it is very efficient in terms of students receiving their marks instantly, and at the same time receive feedback on the solutions. It is also from their activity on Moodle, when they post on forums and attempting all the activities and assessments given online that I can monitor how the student is progressing."*

Lecturer workload

All of the lecturers agreed that using BL was no extra work at all and meant less paperwork and fewer misplaced assignments or activities, and overall was very effective. Initially, the lecturers' workload increased, as they needed more time to explain concepts rather than simply teaching. As one lecturer described: *"This tool has been extremely handy in decreasing workload. Before, I had to print out multiple copies and spent quite a lot of time on stapling them afterward."*

Another lecturer indicated: *"As long as I have tutorial activities planned out and know exactly what I plan for students via Moodle, the workload is not an issue. Not having a face-to-face tutorial gives me extra time to attend to other necessary tasks, and Moodle functions make the monitoring easy."*

A typical response was: *"This learning system has helped in easing the workload as sometimes one-hour tutorials and lecture times are not enough to cover the course content. If we missed out on classes, all the resources are available for the students to access and even download. Here, we are in constant contact with the students to provide guidance, assistance in whatever matters or issues pertaining the course."*

4.2.5 Issues/Challenges Lecturers Encountered while Using Moodle

Perhaps some of the most important outcomes of this study were the identification of the issues and challenges lecturers encountered while using Moodle, as these identify aspects that need to be addressed if we are to progress with TEL at NUS. Perhaps the single most pressing and serious issue identified here and previously was access to Moodle due either to the unavailability of computers or access devices at NUS or the lack of Internet access. A typical response was: *"The main issue that is constantly brought up is the unavailability of computers in NUS for the students to access Moodle. When they are in the confines of their home, they have to buy data, which can be an expensive expenditure to them as students."*

Other issues identified included:*"students forgetting their password," "grades not being able to change to correct one" and "time and the Moodle features, environment, because in the training, we didn't touch on other features on Moodle that are useful for blended learning like video recording, distance lecturing. I would like to do that, because my students all work full-time and sometimes work after hours; if I can do the live streaming of the lecture then maybe they don't have to come to the classroom and they sit from wherever to join the class[. B]ut I need something to monitor them that they are actually joining me in that live stream."*

The issue of access was perhaps the biggest challenge in implementing this research and is probably the biggest threat to sustaining the

promotion of TEL at NUS. Currently, students can only access the Internet and Moodle in the computer labs, the library and selected other sites, such as the NUS foyer. Hence, classes taught within the classrooms using Moodle became an issue, as students had to rely on personal devices and their personal purchased data to access Moodle.

4.2.6 Benefits of Using Moodle

The benefits of using Moodle cited by respondents were as follows:

Saves a lot of money (in transportation) for students.

Shy students can participate without feeling shy.

Very useful with places with limited faculty. Staff only need to follow the model, self-directed learning.

Increases technical skills in using online tools and mechanisms; eases my workload and time management.

Using blended learning saves resources, no printing, saves me from taking the projector down, now that they download materials on their own devices.

[S]peed of information, collaboration, provides better communication and provides successful evaluations of students as well as my work, it also increase[s] student engagement regardless of all the problems, Moodle is an excellent idea for teaching, but these are the benefits, from using online teaching that's if these students have some knowledge and understanding of how to use Moodle to their advantage in terms of learning, collaboration, enable for you to collaborate with your students at any time, that if we—me and my students have Internet access because sometimes if some of these students have any problems from Savaii, they have my personal phone number for them to contact, if we both have Internet they wouldn't use a lot of money.

Using Moodle I have found that it has a lot of benefits. It has features such as discussion forums, grading, online quizzes, etc. that gives the students a creative and innovative environment that enhances their knowledge. It is also easy to use, both for the teacher and the student, provides accessibility to resources uploaded by the teacher and those available online.

Using Moodle, the printing of notes has decreased thus saves paper, ink and energy.

4.2.7 How Can We Improve the Future Use of Moodle?

Recommendations for improvement of the future use of Moodle are listed below:

In the area of training:

1. More training not only for lecturers but also for students.
2. Increase length of training to more than just one week; that way learners could explore more about Moodle and its effects on different areas.
3. "Further training to explore other features of Moodle and a lot of practice during those training hands-on rather than presentations and what to do, guided learning on the use of Moodle."
4. "[I]f we ever have another workshop, very important that we have a local trainer like the computing department to accompany these trainers from overseas."
5. "I also feel that it would have been more effective [if] the training was conducted during semester break whereby ample time is not only given to learning how to use Moodle but ample time to develop and design our courses with COL on the ground."

In the area of infrastructure:

6. Have an Internet connection not only for

lecturers but also for students—partner with Digicel or BlueSky to provide this and to provide mobile phone credit for Internet access.

7. Develop policies.

8. Review the infrastructure.

9. Increase the speed and capacity (sometimes, computers log the user out before completing a download).

10. Improve the login process for students.

11. Free Wi-Fi is needed on campus, so every student is able to access Moodle. They don't necessarily have data every day, and it is not always easy to find a free computer to use in the computer labs.

12. Have efficient technical support on the ground; this would be a better approach for engaging students and preparing them for using Moodle.

It needs to be pointed out that under the COL TEL project, NUS has already developed a TEL framework/policy (in 2017) as a guiding policy for BL. However, more detailed guidelines need to be developed.

4.3 Effectiveness of the BL Environment for Students

Research Question 2

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

This question sought to determine how well students think they learn in a BL environment. The data source for this question was the quantitative data from the student post-course survey questionnaire. 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. For each scale, the mean and standard deviation are listed in Table 5, together with the mean and standard deviation for each of the items that make up that scale. Evaluation of how learners describe the effectiveness of the BL environment is based on all the items of the student post-course survey. Excluding demographic data, the student survey comprised 52 items and five sections, based on the WEBLEI scales.

As can be seen from Table 5, 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.

Table 5. Summary of overall means for each category in post-course student survey

Categories/Scales	Mean	Std. dev.	N
Digital skills	3.76	1.02	165
Infrastructure	3.69	.94	165
Access	3.89	.81	165
Interaction	4.04	.75	165
Attitude	3.72	.72	165
Response/Results	4.2	.68	165
Facilitation	4.44	.81	165

The students' ratings of the environment on the five scales of the modified WEBLEI provided a detailed picture of how they felt about the issues of access, interaction, attitude, response/

results and facilitation. For each scale, the mean and standard deviation are listed in a table, together with the mean and standard deviation for each of the items that make up that scale. Items are numbered as they appear in the post-course survey. With each table, individual items that contribute to, or detract from, the ratings are discussed. In addition, items 1–11 of the questions are presented together with the relevant WEBLEI parts. These items are not part of the WEBLEI but are student demographic data added to help triangulate the WEBLEI data.

4.3.1 Digital Skills and Infrastructure

The first section of the survey is a version of Scale 1 WEBLEI, modified to include digital skills infrastructure in addition to the three categories of convenience, efficiency and autonomy. Thus, the learners were evaluated on their level of ICT skills and the appropriate level of technology required to give them access to BL.

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 (Table 6). This indicates 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 6). This is consistent with responses from the lecturer interviews and researcher observations, which identified infrastructure as the most pressing challenge in implementing BL.

Table 6. 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

There were no gender differences in responses to the evaluation of infrastructure. One-way ANOVA did reveal significant differences in responses across programmes (in items 2, 3, 5 and 6), as shown in Table 6. Students from the programmes in the Faculty of Science consistently scored higher in digital skills and infrastructure than students from other programmes. As indicated by the responses to items 2, 3, 5 and 6, Faculty of Science students felt more confident about having good ICT skills, were more likely to have a usable laptop and did not have any issues with accessing Moodle and adequate Internet bandwidth.

4.3.2 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. The category of access centres on student access to the learning materials. It is composed of several sub-topics, such as study pacing, perceived convenience, and study conditions. Items evaluating learner autonomy centred on the students' ability to learn at their own pace and to set their own goals for their learning.

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 (Table 7). 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).

Table 7. ANOVA of mean responses on infrastructure, across programmes

		Sum of squares	Df	Mean square	F	Sig. (*p*)
2. I have good ICT skills to use my laptop and MS Office and to browse the Web for course-relevant learning resources.	Between groups	16.140	6	2.690	2.441	.028
	Within groups	174.126	158	1.102		
	Total	190.267	164			
3. I have a usable laptop.	Between groups	26.556	6	4.426	2.441	.028
	Within groups	284.633	157	1.813		
	Total	311.189	163			
5. I did not have any issues with Internet bandwidth when accessing Moodle Learner Management.	Between groups	18.287	6	3.048	2.305	.037
	Within groups	208.889	158	1.322		
	Total	227.176	164			
6. I did not have issues with the Moodle system response time.	Between groups	21.414	6	3.569	2.727	.015
	Within groups	206.768	158	1.309		
	Total	228.182	164			

One-way ANOVA revealed significant differences in responses across programmes (in items 7 and 13). With item 7, on accessibility of learning materials, the highest response was from postgraduate Science and the lowest from Nursing. For item 13, on allowance to explore areas of interest, the highest was from postgraduate Science and the lowest from the BCom programme. ANOVA procedures also revealed significant differences in responses across lecturers and courses for item 7 (F = 2.214, df = 9, *p* = .028). One possible reason for the variation in accessibility could have been that Internet connectivity challenges prevented regular access to BL resources.

4.3.3 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 8. 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 8. 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

Levene's test was used to determine any significant gender differences in the interaction category of the WEBLEI scale. Independent *t* testing revealed significant gender differences on responses to items 15, 16, 17 and 19, with females scoring more positive than males in all four items (Table 9).

Table 9. Independent *t*-test showing items with significant gender differences in the interaction category

		Levene's Test for Equality of Variances				
		F	Sig.	*t*	df	Sig. (two-tailed)
15. In this blended learning environment, I have to be self-disciplined in order to learn.	Equal variances assumed	.237	.627	–1.961	160	.052
	Equal variances not assumed			–2.174	96.186	.032
16. I have the freedom to ask my lecturer about what I do not understand.	Equal variances assumed	19.562	.000	–3.360	161	.001
	Equal variances not assumed			–4.516	150.011	.000
17. I have the freedom to ask other students about what I do not understand.	Equal variances assumed	9.108	.003	–2.096	161	.038
	Equal variances not assumed			–2.667	133.726	.009
19. I am regularly asked to evaluate my own work.	Equal variances assumed	1.054	.306	–2.154	160	.033
	Equal variances not assumed			–2.337	91.585	.022

These results suggest that in terms of interaction, females on average felt more self-disciplined in the BL environment, felt freer to ask the lecturer or students when they didn't understand, and felt they were regularly asked to self-evaluate. A one-way ANOVA using lecturer (or course title) as an independent factor revealed a significant difference for item 14 across courses ($F = 2.303$, $df = 9$, $p = .019$), with course means ranging from 2.62 to 4.05. This indicated significant variation across courses and lecturers in the amount of communication amongst students using electronic means (email, discussion forums).

4.3.4 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 10).

Table 10. 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." An independent samples *t*-test did not reveal any significant gender differences in learner responses.

4.3.5 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 11). 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.

An independent samples *t*-test revealed a significant gender difference for item 35 ($t = -3.156$, df = 158, $p = .002$) "I like online learning activities," with female students liking online activities much more than male students. A point of concern was the response for item 34 ("I felt bored with this course when we got to end of the semester"), where 35% of the students responded they were "often" or "almost always" bored (Table 10).

Table 11. 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
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

Research question 2 evaluated student perceptions of the effectiveness of the BL environment in their course of study. In summary, the students' responses in the six categories of the modified WEBLEI scale used to evaluate the effectiveness of the BL environment were all highly positive, with category means ranging from 3.69 to 4.2.

4.4 Students' Perceptions of Teachers' Practice in a BL Environment

Research Question 3

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.

Of the various factors and elements that combine to form a successful learning environment, the teacher is one of the most important. Statements 16, 25 and 46 to 52 elicited students' perceptions of their teachers' practice and behaviour in a BL environment.

Table 12. 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), the students' ratings for all of the teachers combined are presented first (Table 12). Second, the mean and standard deviation values for each teacher are presented (Table 13). Third, the teachers' individual ratings for each item on Scale V are listed in Table 14.

The mean responses for facilitation are very high, with an overall mean of 4.44 and individual means ranging from 4.36 to 4.55. 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. As can be seen in Table 13, 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.

Table 13. Lecturer means for responses on facilitation

Lecturer	Mean	N	SD
A	4.43	7	0.47
B	5	1	0.00
C	4.09	16	0.79
D	4.3	9	0.99
E	4.67	12	0.38
F	4.48	31	0.65
G	4.95	8	0.07
H	4.36	69	0.98
I	4.5	2	0.71
J	4.85	10	0.24
Total	4.44	165	0.81

Table 14. Lecturer means for individual items in the facilitation scale

Facilitation	Lecturer	N	Mean	Std. dev.
46. The lecturer was prepared and was able to answer my questions.	A	7	4.00	.816
	B	1	5.00	0.0
	C	16	4.12	.885
	D	9	3.89	1.269
	E	12	4.67	.492
	F	31	4.58	.720
	G	7	5.00	.000
	H	69	4.36	1.014
	I	2	4.50	.707
	J	9	5.00	.000
	Total	163	4.43	.896
47. The lecturer encouraged students to work together and help each other.	A	7	4.43	.535
	B	1	5.00	0.0
	C	16	4.12	1.025
	D	9	4.56	.726
	E	12	4.67	.492
	F	31	4.32	1.013
	G	8	5.00	.000
	H	69	4.39	.973
	I	2	4.00	1.414
	J	10	4.80	.632
	Total	165	4.44	.899

48. The lecturer encouraged me to learn in different ways.	A	7	4.14	.690
	B	1	5.00	0.0
	C	16	3.69	1.302
	D	9	4.22	.972
	E	12	4.67	.492
	F	31	4.52	.851
	G	8	5.00	.000
	H	69	4.41	.960
	I	2	4.00	1.414
	J	10	4.90	.316
	Total	165	4.41	.930
49. The lecturer gave me quick comments on my work.	A	7	4.29	.756
	B	1	5.00	0.0
	C	16	3.88	1.025
	D	8	3.88	1.356
	E	12	4.58	.515
	F	31	4.42	.848
	G	8	4.62	.518
	H	68	4.38	1.023
	I	2	4.50	.707
	J	10	4.60	.516
	Total	163	4.36	.928
50. The lecturer focused on our work during classtime.	A	7	4.43	.787
	B	1	5.00	0.0
	C	16	4.06	.998
	D	9	4.44	1.014
	E	12	4.58	.515
	F	31	4.55	1.028
	G	8	5.00	.000
	H	69	4.29	1.164
	I	2	5.00	.000
	J	10	4.80	.422
	Total	165	4.43	1.001

51. The lecturer expected me to do my best.	A	7	4.86	.378
	B	1	5.00	0.0
	C	16	4.50	.816
	D	9	4.44	1.014
	E	12	4.83	.389
	F	31	4.61	.615
	G	8	5.00	.000
	H	69	4.33	1.107
	I	2	4.50	.707
	J	10	5.00	.000
	Total	165	4.55	.873
52. The lecturer respected my individual way of learning.	A	7	4.86	.378
	B	1	5.00	0.0
	C	15	4.33	.900
	D	9	4.56	1.014
	E	12	4.67	.651
	F	30	4.33	1.061
	G	8	5.00	.000
	H	69	4.32	1.169
	I	2	5.00	.000
	J	10	4.90	.316
	Total	163	4.47	.996

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.

Research question 3 evaluated how students perceived their teachers' practice and behaviour in a BL environment. All of the student ratings of lecturers were very highly positive, with means ranging from 4.09 to 5. This demonstrated that students' perceptions of teachers' behaviour and practices in the BL environment were highly favourable and positive. 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.

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 about whether lecturers encouraged them to learn in different ways ($F = 2.215$, $df = 9$, $p = .024$).

4.5 Achievement in BL Courses versus Non-BL Courses

Research Question 4

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).

Table 15. Learning achievement in BL courses compared to non-BL courses

Class	Non-BL Average	BL Average	*t*	*p*
HSO302	52.7	61.2	–.2083	.055
HED260	60.1	57.7	5.955	.000
HMK105	69.7	59.6	2.219	.032
HCH132	66.4	62.8	.486	.642
HCH232	65.7	52	2.105	.062
HCS182	62	68	–.37	.615
HCS188	69.9	60.7	1.141	.272
HSC583	68	59	*	*
HNS364	64.3	62	–.381	.704
HMS205	84	79.1	1.26	.255

**Could not be computed.*

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.

4.6 Students' Perceptions of Teachers' Practice of BL

Research Question 5

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 (Table 16) 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.

Table 16. Results of ANOVA of lecturer versus scale means

	Scale	Df	F	Sig.
Access	Between Groups	9	1.788	.075
	Within Groups	155		
	Total	164		
Digital	Between Groups	9	1.179	.312
	Within Groups	155		
	Total	164		
Infrastructure	Between Groups	9	1.564	.131
	Within Groups	155		
	Total	164		
Interaction	Between Groups	9	.966	.471
	Within Groups	155		
	Total	164		
Response	Between Groups	9	3.148	.002
	Within Groups	155		
	Total	164		
Result	Between Groups	9	1.164	.322
	Within Groups	155		
	Total	164		
Facilitation	Between Groups	9	1.286	.249
	Within Groups	155		
	Total	164		

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.

4.7 Students' Ways of Learning: "Connected Knowing" and "Separate Knowing"

Research Question 6

What are the learning styles of the students in the Moodle training, based on the categories of "connected knowing" and "separate knowing"?

Students were evaluated on their learning styles based on the ATTLS pre-test. The pre-test had 20 questions, 10 items on "connected knowing" and 10 items on "separate knowing." An analysis of learning styles by course using one-way ANOVA did not reveal any significant differences between connected knowing (CK) and separate knowing (SK) across courses.

Table 17. Correlation between CK and SK learning styles

Correlations			
		Connected knower	**Separate knower**
Connected knower	Pearson correlation	1	.777**
	Sig. (two-tailed)		.000
	N	131	131
Separate knower	Pearson correlation	.777**	1
	Sig. (two-tailed)	.000	
	N	131	131
**Correlation is significant at the 0.01 level (two-tailed).			

However, analysis of learning styles by gender revealed a significant gender difference in the SK category, with males showing significantly higher SK scores than females (t = 2.207, df = 129, p = .023). Correlation testing showed a Pearson correlation of 0.777 at the .01 level, indicating that for this sample of students, the two learning styles were highly correlated and not mutually exclusive (Table 17). Hence, students with high CK scores also had high SK scores. These findings are contrary to the findings of some previous studies (Galotti et al., 1999, 2001) which indicates that these learning styles are independent of each other.

4.8 Discussion

In summary, the results of the current study have provided several insights into the use of a BL environment, specifically Moodle, on the development and teaching of courses at the National University of Samoa. The findings for each of the research goals have been summarised by research question.

Research question 1 investigated the impact of a training and mentoring programme on the teachers' experience of designing and teaching in a BL environment. The evaluation of impact of training and mentoring was based on the following areas: i) Pedagogical Training and Planning; ii) Technological Preparation, Support, and Integration; iii) Collaboration; and iv) Teaching Impact.

i) Lecturers found the training and mentoring given by the COL consultant to be useful, adequate and relevant for preparing and developing courses. Those with weak technology skills found the training a challenge. Their issue with technology skills is similar to the findings of Coryell and Chlup (2007) as well as Hong and Saminy (2010), where students with weak technology skills found BL a challenge and were fearful of using technology in their learning. Another issue identified by lecturers in the study was the timing and duration of their BL training. Training would have been more effective if it had been held at a less busy time and had been longer.

ii) Lecturers found it easy to adapt to online pedagogy, with previous experience being an advantage. Lecturers also noted that younger students found technology more relevant and easier compared to older students. These findings are similar to those of Coryell and Chlup (2007), who described age being a factor in successful BL implementation and remarked that it can be more difficult to get buy-in from older students. Another experience shared by lecturers was that Moodle helped shy students interact in online discussions.

iii) Most of the lecturers found that BL required more planning and was a lot more challenging due to time constraints. This is understandable given the lecturers had to learn new pedagogy and needed time to prepare; this is supported by findings from Kaleta, Skibba and Joosten (2007).

iv) The majority of the lecturers felt they had been given sufficient technical support by the COL consultant in preparation for BL. The research team also gave sufficient technical support during the teaching of the courses.The most serious issue in technical support was the lack of Internet access in classrooms.

v) Lecturers found it easy to coordinate, integrate and manage face-to-face and online activities. These results indicate that Kaleta, Skibba and Joosten's (2007) advice to "integrate face-to-face and online activities to avoid teaching two parallel and unconnected courses" helped lecturers avoid the problem of treating the online parts as merely add-ons to face-to-face teaching (Hoffman, 2006).

vi) Lecturers reported that "*there was a lot of collaboration between us during planning and preparation of our blended courses.*" These findings support Hubbard's (2008) recommendation that teachers form a community of practice to support their learning. However, findings also showed that not all teachers liked to collaborate; the same emerged in the Larsen study (2012). Furthermore, the degree of collaboration during the teaching of the courses varied across lecturers.

vii) All of the lecturers indicated Moodle had a definite impact on student–teacher interactions in that "*students were more active*," had "*more time to work on their own*," "*contributed more to discussions*" and had "*more time to discuss problems.*" Such positive outcomes of BL reiterate earlier findings by Amaral and Shank (2010) and by Shroff and Vogel (2010). But there were also challenges, as some lecturers indicated there had been no impact—for example: "*Students still turned in assignments late and would not ask me about anything.*"

viii) In terms of student learning, lecturers reported that Moodle or BL provided the advantage of catering for different learning styles, that students were more engaged and contributed more, and that students had access to all the course resources. That technology can facilitate student access to course resources was also part of the findings of Cartner (2009), Sagarra and Zapata (2008) and Sanprasert (2010). Further, such experiences of increased instructional flexibility mirrored earlier findings by So and Bonk (2010). However, some lecturers also reported frustration with students not taking full advantage of online resources, turning in assignments late, not engaging in class, and having poor attendance and attitude.

ix) The majority of lecturers used Moodle to monitor students' participation and engagement in class activities. Lecturers were able to use grading on Moodle, display students' grades, as well as monitor students' logins and assignment uploads.

x) In terms of workload, all of the lecturers agreed that using BL was no extra work at all and meant less paperwork, fewer misplaced assignments or activities and greater effectiveness.

xi) Perhaps the single most pressing issue identified here and previously is insufficient access to Moodle, due either to the unavailability of computers or access devices at NUS or to a lack of Internet access. This supports assertions by Andersson (2008) that limited bandwidth and inadequate network connectivity affect users' ability to fully utilise BL resources.

xii) Recommendations for improving the future use of Moodle focused mostly on the need to improve access to Moodle through better infrastructure and training, but there was also a recommendation to develop policies for accessing and using Moodle. NUS has adopted a TEL framework that covers the use of BL in all its courses. However, to operationalise this, more detailed guidelines for implementing BL and OER need to be developed.

Research question 2 evaluated students' perceptions about the effectiveness of the BL environment in their course of study. The responses for the six categories of the modified WEBLEI scale were all highly positive, with category means ranging from 3.69 to 4.2.

In the area of digital skills, positive responses indicated students rated their computer skills highly, with female students rating their skills more positively than males. Across programmes, science students gave their skills the highest rating. Responses in the infrastructure category, although positive, had the lowest rating across all categories.

In the access category, the responses were also fairly positive, indicating students were satisfied that lessons were convenient and available at suitable locations, and allowed them the independence to work at their own pace and meet their learning goals. As mentioned in the earlier discussion on lecturer responses, facilitating student access to different kinds of learning materials was also part of the findings of Cartner (2009), Sagarra and Zapata (2008) and Sanprasert (2010). Tests also revealed that female students more than males felt BL gave them greater flexibility in learning.

Most students showed highly positive responses about interactions and achieving their learning outcomes. As pointed out by Larsen (2012), such increased interaction can be regarded as a precondition for greater student engagement and improved preparedness, which are all positive attributes of BL courses found by researchers Amaral and Shank (2010), Osguthorpe and Graham (2003), Shroff and Vogel (2010) and Singh (2010). Analysis also showed that females on average felt more self-disciplined in the BL environment, felt free to ask the lecturer or students when they didn't understand, and felt they were regularly asked to self-evaluate. Further testing also indicated significant variation across courses and lecturers in the amount of communication among students via electronic means (e.g., email, discussion forums).

The response scale measured the students' sense of satisfaction, enjoyment, ability to collaborate and sense of boredom while learning in the BL environment. Most students responded positively, with the majority selecting close to "often." Again, these results reiterate and reaffirm the positive outcomes of BL, as discussed earlier.

The means for the individual items of the results scale 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, the online activities, the assignments and the quizzes. These findings are very positive and mirror earlier findings by Larsen (2012), indicating that lecturers did a good job of planning and presenting course content and were clear when conveying their expectations and directions to their students.

Research question 3 evaluated how students perceived their teachers' practice and behaviour in a BL environment. All of the student ratings for lecturers were very highly positive, with means ranging from 4.09 to 5. This demonstrated that students' perceptions of teachers' behaviour and practices in the BL environment were highly favourable. 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. Again, as detailed in the findings, such good practice is consistent with recommended practice as outlined by Chickering and Gamson (1987). Results showed no significant teacher differences for most items in Scale V, facilitation, except for item 48, where there was a significant difference between students' responses to whether lecturers encouraged them to learn in different ways ($F = 2.215$, $df = 9$, $p = .024$).

Research question 4 evaluated how the learning achievement in a BL course is different

from in other NUS courses. Comparison of the mean achievement scores of TEL students and non-TEL students showed mixed results—the results were statistically significant in three courses (30%) and not significant in the other seven courses (70%). However, it needs to be noted that a more valid assessment of the impact of BL on achievement would require measuring it over time as well as having students exposed to a BL environment for longer than in the current study.

Research question 5 investigated how teachers' practices affected students' perceptions of BL courses. Results indicated that the only scale of student perceptions in which lecturer practice and behaviour had a significant impact was on the response scale ($F = 3.148$, $df = 9$, $p = .002$). These results indicated that lecturer practice and behaviour had a significant effect on students' sense of satisfaction, enjoyment, ability to collaborate and sense of boredom/engagement in a BL environment.

Research question 6 evaluated students' learning styles and attitudes to learning based on two categories: "connected knowing" and "separate knowing." Analyses indicated significant gender differences in the SK scores, with males attaining higher scores than females. Findings also revealed that the two scores were highly correlated, implying that students with high CK scores also had high SK scores. As indicated earlier, these findings are contrary to the findings of some previous studies (Galotti et al., 1999, 2001), indicating that these learning styles are independent of each other.

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 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.

An ancillary recommendation is the need for policies to guide Moodle use and access. The National University of Samoa already has in place a TEL and OER policy developed as part of the COL TEL project. Guidelines on the acceptable use of Moodle will help facilitate the administration of Moodle services at the university.

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

The COL consultant helped provide training to faculty on BL design and delivery. However, TEL teachers felt there should be a local team to provide ongoing training and timely technical support. These sentiments were corroborated by the research team, who also identified technical support as a critical issue.

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.

As identified in a similar study on TEL implementation at Rajiv Gandhi University of Knowledge Technologies (RGUKT; Koneru, 2019), one of the prime challenges that institutions face is building staff capacity to integrate technology, manage and facilitate their online courses and interactions, and play multiple roles as learning designers, content and process facilitators, technologists, managers, mentors, motivators, co-learners, assessors and researchers (Mallinson & Krull, 2013; Wilson & Stacey, 2004). Like the RGUKT study, the current study also recommends that NUS create an in-house team with adequate staff to motivate teachers and students, and to provide continuous professional training to help staff and students with using appropriate pedagogical approaches to online and blended learning. Such an initiative will hopefully create an active community of practice, enabling staff and students alike to share their activities and reflect on their experiences (Lim & Wang, 2016; Wenger, 2000).

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

The team would provide continuous professional training for both staff and students to help them with using appropriate pedagogical approaches to online and blended learning. With the TEL framework already adopted at the university, it is expected that the recommendations of this study will receive adequate attention and support.

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Appendix A: ATTLS Survey (Online)

1 In evaluating what someone says, I focus on the quality of their argument, not on the person who's presenting it.

2 I like playing devil's advocate—arguing the opposite of what someone is saying.

3 I like to understand where other people are "coming from," what experiences have led them to feel the way they do.

4 The most important part of my education has been learning to understand people who are very different to me.

5 I feel that the best way for me to achieve my own identity is to interact with a variety of other people.

6 I enjoy hearing the opinions of people who come from backgrounds different to mine—it helps me to understand how the same things can be seen in such different ways.

7 I find that I can strengthen my own position through arguing with someone who disagrees with me.

8 I am always interested in knowing why people say and believe the things they do.

9 I often find myself arguing with the authors of books that I read, trying to logically figure out why they're wrong.

10 It's important for me to remain as objective as possible when I analyse something.

11 I try to think with people instead of against them.

12 I have certain criteria I use in evaluating arguments.

13 I'm more likely to try to understand someone else's opinion than to try to evaluate it.

14 I try to point out weaknesses in other people's thinking to help them clarify their arguments.

15 I tend to put myself in other people's shoes when discussing controversial issues, to see why they think the way they do.

16 One could call my way of analysing things "putting them on trial" because I am careful to consider all the evidence.

17 I value the use of logic and reason over the incorporation of my own concerns when solving problems.

18 I can obtain insight into opinions that differ from mine through empathy.

19 When I encounter people whose opinions seem alien to me, I make a deliberate effort to "extend" myself into that person, to try to see how they could have those opinions.

20 I spend time figuring out what's "wrong" with things. For example, I'll look for something in a literary interpretation that isn't argued well enough.

Appendix B: Lecturer Interview Guide on Blended Learning (Moodle)

Lecturer Interview Guide

The following is a guide for lecturer interviews. Lecturer interviews will provide answers to Research Question 1: What impact does a training and mentoring programme have on the teachers' experience of designing and teaching in a blended learning (BL) environment?

The following are the key areas:

1) **Pedagogical Training and Planning**
   Pedagogical training refers to the training the teachers were given. The teachers were trained on blended learning pedagogy and lesson planning during the four-day Moodle workshop either last year or in May. The pedagogical planning aspect refers to several parts of the teachers' experiences. First, it deals with the preparation of the course syllabus that the COL consultant did for the courses prior to second semester. Second, it refers to the planning that the teachers had to do to make online and regular face-to-face classes work well together. Third and last, it focuses on how teachers had to learn about, and adapt to, online pedagogy.

   a) How relevant and how adequate were the training and mentoring given by the COL consultant in preparing/developing your courses for use in the second semester?
      - Did you feel pedagogically prepared in BL to teach this course?
      - Did you get sufficient BL pedagogical support to teach this course?

   b) What was your experience in trying to make online and regular face-to-face work well together?
      - Was there a good balance between online and classroom activities?
      - Did the online and classroom activities integrate well?
      - How much planning did you have to do for this integration?
      - Can you please share your experiences of learning and adapting to online pedagogy?

2) **Technological Preparation, Support and Integration**

   Interviews will examine whether the lecturer was given sufficient technical preparation for BL, whether technical support was provided during teaching and to determine how easy it was to integrate technology with face-to-face teaching.

   a) Were you technically prepared to teach this course?
   b) Were you given sufficient technical support in preparation for BL in Moodle?
   c) How easy was it for you to integrate technology with face-to-face teaching?
   d) How easy was it to manage online activities?
   e) How easy was it to manage face-to-face course activities?

3) Collaboration

a) Was there any collaboration between you and other lecturers during planning and preparation for BL using Moodle?

b) Did you enjoy sharing ideas with other lecturers on the use of BL in your teaching?

c) Did collaborating with other lecturers help in solving problems and resolving challenges in BL?

d) Was there sufficient support from the COL TEL research and support team?

4) Teaching Impact

Please share your views on the impact of BL using Moodle on the following :

a) Classroom dynamics

i. Was there any impact on student and teacher interactions?

- Did BL allow for personalised learning?

ii. Was there any impact on students' and teachers' attitudes to the course activities?

iii. Did the use of BL make students more responsible for their own learning? More independent?

iv. Was there any impact on students' and teachers' attitudes towards each other?

b) Efficiency

i. Did BL bring about any efficiency in student learning?

ii. Did BL enable the teachers to monitor students' progress?

c) Was there any impact on lecturer workload?

5. Benefits, Issues and Challenges

a) What are the benefits of using BL to teach your course?

b) What are the issues and challenges when using BL to teach your course?

c) Would you use BL to teach your other courses?

d) Do you have any further recommendations on how to improve BL using Moodle?

Appendix C: Post-Course Student Survey (Online)

Post-Course Student Survey on Blended Learning (Moodle)

The purpose of this questionnaire is to help us understand how well the Moodle delivery of this course enabled you to learn. There are no "right" or "wrong" answers; we are interested only in your opinion. Please be assured that your responses will be treated with a high degree of confidentiality and will not affect your assessment. Your carefully considered responses will help us improve the Moodle/blended learning environment.

Thanks very much.

Instructions: Please fill in the best answer for each item by typing in the answer or clicking on the right radio button.

SECTION A BACKGROUND INFORMATION

Researcher Allocated Code _____(do not fill this in) Age _____

Gender: 1. Male 2. Female Program of Study_____

Year of Study 1. 2. 3. 4. > 4. Course Title/Code _____

SECTION B

(1) Strongly Disagree, (2) Somewhat Disagree, (3) Neither Agree or Disagree, (4) Somewhat Agree and (5) Strongly Agree

Areas of focus	1	2	3	4	5
1. Digital Skills					
1. I have basic ICT skills.					
2. I have good ICT skills to use my laptop and MS Office and to browse the Web for course-relevant learning resources.					
2. Infrastructure					
3. I have a usable laptop.					
4. Internet connectivity was reliable.					
5. I did not have any issues of Internet bandwidth for accessing the Moodle Learner Management System (LMS) and participating in blended learning.					
6. I did not have issues with the Moodle system response time (site loading).					
3. Access					
7. I can access the learning activities at times convenient to me.					
8. The online material is available at locations suitable for me.					
9. I am allowed to work at my own speed to achieve learning objectives.					
10. I decide how much I want to learn in a given period.					
11. I decide when I want to learn.					

12. Using blended learning allows me to meet my learning goals.					
13. Using blended learning allows me to explore my own areas of interest.					
4. Self-Discipline/Interaction					
14. I communicate with other students in this subject electronically (email, discussion forums).					
15. In this blended learning environment, I have to be self-disciplined in order to learn.					
16. I have the freedom to ask my lecturer about what I do not understand.					
17. I have the freedom to ask other students about what I do not understand.					
18. Other students respond promptly to my requests for help.					
19. I am regularly asked to evaluate my own work.					
20. My classmates and I regularly evaluate each other's work.					
21. I was supported by a positive attitude from my classmates.					
22. The amount of my interaction with other students increased.					
23. The quality of my interaction with other students was better.					
(1) Almost Never, (2) Seldom, (3) Sometimes, (4) Often and (5) Almost Always					
5. Learner Attitude					
24. Using blended learning makes me able to interact with other students and the lecturer asynchronously.					
25. I felt a sense of satisfaction and achievement about this blended learning environment.					
26. I enjoy learning in this blended learning environment.					
27. I could learn more in this blended learning environment.					
28. It is easy to organise a group for a project.					
29. It is easy to work together with other students involved in a group project.					
30. The blended learning environment held my interest throughout the course.					
31. I am more engaged in this course.					
32. I felt bored with this course when we got to the end of the semester.					
6. Learner Response					
33. I liked the online activities.					
34. I liked the classroom activities.					
35. I liked learning in the classroom.					
36. The learning objectives are clearly stated in each lesson.					
37. The organisation of each lesson is easy to follow.					
38. The structure of the blended learning environment keeps me focused on what is to be learned.					
39. Expectations of assignments are clearly stated.					
40. Activities are planned carefully.					

41. The content of my course worked well in a blended learning environment.					
42. The presentation of my course was clear.					
43. The quizzes enhance my learning process.					
7. Facilitation					
44. The lecturer is prepared and available to answer my questions.					
45. The lecturer encourages students to work together and help each other.					
46. The lecturer encourages me to learn in different ways.					
47. The lecturer gives me comments on my work quickly.					
48. The lecturer is focused on our work during class time.					
49. The lecturer expects me to do my best.					
50. The lecturer respects my individual way of learning.					

Appendix D: Consent Forms for Lecturers and Students

THE NATIONAL UNIVERSITY OF SAMOA
University Research & Ethics Committee

INFORMED CONSENT FORM FOR LECTURERS

I have read the Information Sheet and I understand that:

- I will be interviewed and audiotaped.
- I will be given a copy of the interview schedule before the interview.
- I will be sent a copy of the interview transcript to confirm.

I also understand that:

- I will not receive any payment or direct benefits from this study.
- I can withdraw from the study anytime up to the time of my confirmation of the interview transcripts.
- Even if I withdraw, any data already collected from me will still be used for the study anonymously.
- I have the right to refuse to answer any of the interview questions.
- The data will be reported in a way to maximise confidentiality and anonymity.
- The data will be stored securely and only the researcher and his/her team can access it.
- No harm (whether it be physical, social, emotional, economical, psychological or otherwise) shall befall me as a result of my participation in this study.
- My signature means that I agree to participate in this study.

BY MY SIGNATURE, I AM DECLARING THAT I FULLY UNDERSTOOD THE INFORMATION PROVIDED ABOUT THE STUDY AND THAT I HAVE CONSENTED TO PARTICIPATE.

_____ _____
Signature of Participant Date

_____ _____
Signature of University Researcher Date

A COPY OF THIS CONSENT FORM WILL BE GIVEN TO ME TO KEEP

Appendix E: Information Sheet for Participants

Purpose

The purpose of this study is to investigate how to prepare university lecturers to create a productive BL environment for their students. This includes an investigation of how to best train the teachers in BL pedagogy and online teaching technology, as well as a measure of the students' perceptions of the BL environment with respect to its effectiveness. Finally, the study seeks to discover how students experience the lecturer's practice and behaviour, and the extent to which these factors affect student perceptions of the course and the BL environment in general. The major objective of the proposed research is to examine the impact of BL using Moodle on the lecturer's teaching experiences and on students' learning experiences and learning outcomes. It will focus on the benefits and challenges of BL for both lecturers and students.

Use of Findings

The findings from this study will be used for improving the Moodle learning environment for both teaching and learning at the National University of Samoa (NUS). The findings of this study will provide data to inform future actions and strategies at NUS in the area of technology-enabled learning through the use of Moodle.

Participant's Role

Lecturers

Your participation (if you so choose) will involve taking part in an interview on your experience of developing your course and teaching that course within the Moodle environment.

Ethical Principles Governing this Research

Your participation in this study is voluntary, and you are free to withdraw your consent at any time up until you confirm your interview transcript. There is no payment or direct benefits from your participation and there is NO physical, social, emotional, economical or psychological harm to your health, safety or reputation as a result of your participation in this study. You will be granted anonymity, and all information solicited from you, including recordings, will be treated as confidential and will not be divulged to any third parties. You will be asked to sign an informed consent form to agree to your participation and to agree to the use of data from you (audio, transcript, video images, etc.) strictly for the purpose of the study.

Please feel free to ask the researcher any additional questions or concerns that you may still have about this research.

Ioana Chan Mow

_____ _____

Researcher's Name Researcher's Signature

Telephone Number: ____7246969___ Email: i.chanmow@nus.edu.ws

Appendix F: Informed Consent Form for Students

THE NATIONAL UNIVERSITY OF SAMOA
University Research & Ethics Committee

INFORMED CONSENT FORM FOR LECTURERS

I have read the Information Sheet and I understand that:

- I will be (surveyed/observed).

I also understand that:

- I will not receive any payment or direct benefits from this study.
- I can withdraw from the study anytime.
- Even if I withdraw, any data already collected from me will still be used for the study anonymously.
- I have the right to refuse to answer any of the survey questions.
- The data will be reported in a way to maximise confidentiality and anonymity.
- The data will be stored securely, and only the researcher and his/her team can access it.
- No harm (whether it be physical, social, emotional, economical, psychological or otherwise) shall befall me as a result of my participation in this study.
- Selecting the agree option below means that I agree to participate in this study.

BY SELECTING THE AGREE OPTION, I AM DECLARING THAT I FULLY UNDERSTOOD THE INFORMATION PROVIDED ABOUT THE STUDY AND THAT I HAVE CONSENTED TO PARTICIPATE.

I agree ◯ I don't agree ◯

A COPY OF THIS CONSENT FORM WILL BE GIVEN TO ME TO KEEP

Appendix G: Information Sheet for Participants

THE NATIONAL UNIVERSITY OF SAMOA
University Research & Ethics Committee

Purpose

The purpose of this study is to investigate how to prepare university lecturers to create a productive BL environment for their students. This includes an investigation of how to best train the teachers in BL pedagogy and online teaching technology, as well as a measure of the students' perceptions of the BL environment with respect to its effectiveness. Finally, the study seeks to discover how students experience the lecturer's practice and behaviour, and the extent to which these factors affect student perceptions of the course and the BL environment in general. The major objective of the proposed research is to examine the impact of BL using Moodle on the lecturer's teaching experiences and on students' learning experiences and learning outcomes. It will focus on the benefits and challenges of BL for both lecturers and students.

Use of Findings

The findings from this study will be used for improving the Moodle learning environment for both teaching and learning at the National University of Samoa (NUS). The findings of this study will provide data to inform future actions and strategies at NUS in the area of technology-enabled learning through the use of Moodle.

Participant's Role

Students

Your participation (if you so choose) will involve taking part in a pre-course ATTLS survey and then completing a post-course student experience survey.

Ethical Principles Governing this Research

Your participation in this study is voluntary, and you are free to withdraw your consent at any time up until you confirm your interview transcript. There is no payment or direct benefits from your participation and there is NO physical, social, emotional, economical or psychological harm to your health, safety or reputation as a result of your participation in this study. You will be granted anonymity, and all information solicited from you, including recordings, will be treated as confidential and will not be divulged to any third parties. You will be asked to sign an informed consent form to agree to your participation and to agree to the use of data from you (audio, transcript, video images, etc.) strictly for the purpose of the study.

Please feel free to ask the researcher any additional questions or concerns that you may still have about this research.

Ioana Chan Mow

_____ _____

Researcher's Name Researcher's Signature

Telephone Number: ____7246969___ Email: i.chanmow@nus.edu.ws

Appendix H: Timeline of the Study

Semester 1

May 2018	Four-day Moodle workshop conducted on instructional design
May–July 2018	Lecturers continue on design of Moodle courses. Mentoring provided by COL consultant.

Semester 2

July	Lecturers start teaching courses using Moodle.
August–September, week 2	Pre-course survey (ATTLS) conducted on all students in their courses.
August–October	Moodle research team provides support to lecturers and students in using Moodle.
October, weeks 3 & 4	Post-course student experience survey. Post-course interviews of lecturers.
October–November	Data analysis.
December–January 2019	Writing of research report.
February 2019	Report to NUS Senate.

LEARNING FOR SUSTAINABLE DEVELOPMENT

COL is an intergovernmental organisation created by Commonwealth Heads of Government to encourage the development and sharing of open learning and distance education knowledge, resources and technologies.

VISION: To be the foremost global agency that promotes learning for sustainable development

MISSION: To help governments and institutions to expand the scale, efficiency and quality of learning by using open, distance and technology-based approaches

COMMONWEALTH of LEARNING (COL)

4710 Kingsway, Suite 2500
Burnaby, BC V5H 4M2 Canada
Phone + 1 604 775 8200 / Fax + 1 604 775 8210
info@col.org
www.col.org
@col4d
facebook.com/COL4D/
instagram.com/commonwealthoflearning/

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