EVALUATION OF THE EFFECTIVENESS OF BLENDED LEARNING USING 'MOODLE' WITH FIRST YEAR UNDERGRADUATE STUDENTS

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ABSTRACT

This research uses a developmental evaluation to conduct an evaluation for knowledge on the effectiveness of blended learning using 'Moodle' within the learning context of whether a blended pedagogy could benefit a traditional classroom approach. The module used for the purposes of this research was a common module shared between two cohorts of undergraduate first years, with eighty-nine students by the end of the semester. Quizzes, group exercises and online lectures were rolled-out online every week after each class. Quiz questions contained content which examined the lecture that had just been taught, either in the classroom or asynchronously online. The first research question was to evaluate the depth of learning acquired through a social constructivist pedagogy applied with blended learning using 'Moodle'. The second was to evaluate the effectiveness of using 'Moodle' in this way for retention purposes. The third was to evaluate if the continued availability of the blended assessed aspects of the module left the assessment process vulnerable to misadventure. A developmental evaluation approach was used to assess quantitatively and qualitatively the effects of blended learning after weeks four and ten of the module. Findings indicate that all research questions have been proved, although the slow uptake of quizzes towards the end of the module may warrant further investigation.The findings suggest that a shift towards online delivery and blended learning at module, programme and Institutional level would be highly desirable and can be readily incorporated as a method to enhance the depth of learning achieved, to regulate and improve attrition and to give rigour and credence to the assessment processes used in Higher Education.

KEYWORDS: *Online Learning, Blended Learning, Moodle, E-tivities*

INTRODUCTION

This academic year, I was asked to facilitate the delivery of lectures and assessments for a common first year undergraduate module within a Higher Education Institute. This was a new module for me to teach. The module was to be taught over two hours, once a week, in a tiered lecture theatre for one semester.

Having never taught a class as large as this before, I reflected on how I could encourage a group of eighty-nine first year students, who did not know each other and were studying two different disciplines, to engage in the module.

On the advice of a colleague, I started to read Phil Race's publications and muse over his ideologies and philosophies of learning. I reflected on a pedagogical and assessment strategy for this module. 'It is our responsibility to cause learning to happen, because it doesn't always happen just by itself' (Race, 2011).

Of the seven factors of learning Phil Race suggests, I was particularly drawn to four:

1. Nothing happens until students do something. They've got to act, they've got to practice, they've got to learn from their mistakes… we've got to make sure they have plenty of relevant things to do
2. Feedback is critically important for learning
3. Get them talking. Get them talking to each other, talking to us, talking to anyone, communicating what they've learned, explaining it, putting it into words. The act of putting something into words and voicing it is one of the quickest ways to help students to get their heads around ideas and concepts
4. Get students to make judgements (using peer and self-assessment)… because the act of making judgements is where people really get their heads around something in a way that stays for life (Race, 2011).

The tiered lecture theatre we were timetabled in had no computers or facilities for groupwork. I decided to use 'Moodle' as an online Learning Management System (LMS) to facilitate a blended delivery of the module. I designed exercises to practice, apply and contextualise students' learning, give feedback and in some respects, get students talking more and adjudicating themselves and each other.

BLENDED LEARNING, PEDAGOGY, THEORY & EVALUATION

I created several quizzes, group exercises and lectures online (Using 'Skype for Business' and advanced 'PowerPoint') and these were rolled-out after class. Each quiz

contained content which examined the lecture that had just been taught, either in the classroom or asynchronously online.

Students were advised that they could access the exercises between classes when and wherever they preferred. They were encouraged to go somewhere they were comfortable studying. All quizzes and group exercises contributed towards the continuous assessment grade for the module. Most quiz questions were sourced from past examination papers.

I chose to adopt a blended learning pedagogy to challenge students outside of class. The exercises were designed to engage the student in keeping with a constructivist theory of learning, where 'learning is perceived as an active, not a passive, process, where knowledge is constructed, not acquired' (UCD, n.d.).

The application and reinforcement of the learning was facilitated by summative assignments which gave instantaneous feedback (e.g. identifying the correct answer, providing additional support information and so on) for some, but not all the questions.

Approximately 50% of the quiz questions required the lecturer to give direct, individualised feedback to each student (i.e. formative feedback), in the hope that this would aid their learning and personalise their learning journey, in an epistemological basis of interpretivism, ‘where knowledge is believed to be acquired through involvement with content instead of imitation or repetition’ (Kroll & LaBosky, 1996; cited in UCD, n.d.).

I chose to do this using an online platform to manage my time to best advantage using Technology Enhanced Learning (TEL) as I felt it was the only way I could facilitate an individual learning journey for each person within such a large class. ‘Knowledge is constructed based on personal experiences and hypotheses of the environment’ (“Learning Theories Constructivism - Learning Theories,” 2016).

I chose to allow quizzes to be open and freely accessible for the duration of the module. I deliberately did not time any online exercise. I believe that first year students should be encouraged to grow and learn, find friends and socialise, get a life-to-study balance and not be pressured into learning until they are ready to do this for themselves. A first-year student might often have large changes in their lives in the first few weeks of term. Some transfer to different programmes, some register late,

some have difficulty securing accommodation and so on. I aligned my pedagogical approach with a constructivist ontological lens, recognising that 'social phenomena and categories… are in a constant state of revision' for all students (Bryman, 2012, p33).

Students' motivation for learning must be self-driven. As the online exercises contributed towards a mark, it was my design intention that this would motivate students to engage in the process. 'Knowing is inseparable from action and environment, and is also inseparable from issues of access and empowerment', thus leading to 'the empowerment of learners' within a social constructivist pedagogical approach (Foucault 1975; cited by Carlile & Jordan 2005, p23).

My goal was to help students achieve a higher level of learning, not time them in their attempts to learn or dictate in a behaviourist fashion a list of cut-off dates for completion. I felt it in keeping with my ontological position to keep quizzes available for every student to attempt, for as long as possible. I am driven by the possibility that all students who engage in this process can pass the module in its totality. I am interested in the fact that learning is being achieved. When this is done should be up to each individual student. Panicking and pressuring a large group of first year students to complete an exercise online by a day or within a timed exercise is counter-intuitive to a relaxed, flexible and inclusive approach to assessment and learning, in keeping with a social constructivist theory of education. The effectiveness of this formed one of my evaluation research questions.

I was wary of the risk that students would not engage in the exercises until the last few days of term. It was also a risk that copying or cheating of some kind might occur the longer exercises were left open, as I gave feedback as soon as the exercises were uploaded, in keeping with my constructivist pedagogy. This formed another research question for evaluation.

I consciously wrote all online exercises to permit only one attempt. I wanted to focus students' minds and encourage them to make a concerted effort the first time around. It gave rigour, validity, prudence and consistency of challenge to each exercise. It also prevented duplication of corrections for me as an internal examiner.

I encouraged participation in quizzes by reminding students about them at the start of each class. I also sent a 'gentle reminder' email to all students at the start of each subsequent week, with a list of hyperlinks to each quiz. I hoped that this would encourage a few to click into the 'Moodle' page and start learning. I also kept the two first year tutors (one per cohort) informed of progress, so that they might encourage students if their commitment started to wane. This formed my final research question, to evaluate the effectiveness of blended learning and social constructivist pedagogy on student retention.

I actively encouraged students to query their results, expressly stating it in lectures, and to query the content of the lecture material and their assessments. I encouraged open and meaningful discussions during class time and subsequently after class with individuals or small emerging groups of friends, who may have been struggling with the technology or questioning some aspects of the class content, for example. I noticed an increase in the numbers of first year students coming up to me at the end of class the longer the semester progressed, so I perceived more self-confidence, awareness and courage growing within the student population, which was to be admired and nurtured.

I reminded students that this was not indecisiveness or a lack of knowledge on my part, but that it was a teaching style. Those coming straight into third level from secondary school were sometimes unsure or uneasy with this as they were only familiar with behaviourist or cognitivist teaching approaches. They were not necessarily used to thinking or acting autonomously or having to take responsibility for their own learning. Reassurances like these were comforting for first year students who had experienced radical change in every aspect of their lives during the first few weeks of term.

From observation of first year cohorts in general, they tend not to work in groups at the start of term, simply because they do not know each other. Cohort B's training involves intensive applied learning, so I suspected they would become socially connected within their group sooner. This will also occur because they are a smaller number of students than the other Cohort.

A critical point to note would be that this might leave students in the smaller cohort more likely to work together and should be monitored closely as part of the evaluation. I have also noted that group work should involve participants from both cohorts wherever possible, to encourage mixing and socialising in an educational context.

I designed two group work assignments. I wanted to encourage students to meet and get to know one another. The first group assignment was an ice-breaker, which most the class requested to complete online, once the exercise had commenced in class. This was done in the second week of term. The main group exercise was self-directed research on a topic (Which was incidentally the name of the group that they had joined) and to present their findings to the class by week twelve. These were peer, self and tutor assessed using a formative rubric. This exercise falls outside of the scope of this research and so has not been reported any further.

Purposeful student interaction was facilitated in group activities, to enhance learning achieved, as indicated by Vygotzky's 'Zone of Proximal Development (ZPD)' (Vygotsky 1934; cited in Carlile & Jordan 2005, p22; Carlile et al. 2004, p20), with clearly applied social constructivist signposting, such as to:

- encourage team working and collaboration
- Promote discussion
- Involve students in project work
- Set up study groups for peer learning
- Know your students as people, develop relationships and build trust
- Be emotionally aware and intelligent (Carlile & Jordan 2005, p23).

I evaluated the impact of these changes at the end of week four and again at the end of week ten. This presents as an 'evaluation for knowledge' as defined by Eleanor Chelimskey and cited by Professor Murray Saunders, thus 'obtaining a deeper understanding in some specific area or policy field', in this case blended learning used to enhance a traditional classroom approach (Chelimskey, 1997; cited in Saunders, 2006, p205).

I would position this research within developmental evaluation, as it 'supports innovation and adaptive management' to evaluate the proposed 'system intervention' of blended online learning. The use of blended learning will continue to evolve as part

of this module and be evaluated beyond the scope of this paper, in a 'learn-by-doing process that has been, and continues to be, "developmental"' (Patton 2011, p1-3).

Developmental evaluation 'has the purpose of helping develop an innovation, intervention or programme' (Mathison 2005, p115; cited in Patton 2011, p20). It sits comfortably using complexity theory as a construct, where 'great changes can emerge from small actions'. This is in keeping with the non-linearity of this evaluation, where 'outcomes will emerge as we engage' (Patton 2011, p5). Indeed, complexity theory and developmental evaluation suit my ontological and epistemological position, within a social constructionist paradigm of learning-by-doing.

My research approach is not suited to 'an explicit change model, a logic model to show how you'll attain your goals', (Patton 2011, p5). Each cohort of students will position themselves and give direction to the teaching and assessments required each year, as they take ownership of their own unique personal learning journeys' as part of their first-year experience, in keeping with my chosen social constructivist theories' influence and guidance.

As mentioned by Patton (2011, p8), 'interacting and adaptive agents self-organise, ongoing connections emerge that become co-evolutionary as the agents evolve together (coevolve) within and as part of the whole system, over time'. The agents in this case are the different groups of students and myself as a reflective practitioner and active learner-educator, seeking to meet the needs of my students' learning requirements.

'Developmental evaluation is designed to be congruent with and to nurture developmental, emergent, innovative, and transformative processes'. Developmental evaluation sits within the overarching 'utilisation-focused evaluation', which 'is evaluation done for and with specific primary intended users for specific, intended uses'. I will adopt 'careful consideration for how everything is done, from beginning to (the) end' of the evaluation as it will affect its use (Patton 2011, p7, 13).

It should be noted that 'utilisation-focused evaluation does not advocate any particular evaluation content, model, method, theory, or even use' but instead provides a process to help choose the most appropriate of each. In this particular case,

developmental evaluation is appropriate to assess the enhancement of a traditional classroom approach using blended learning strategies (Patton 2011, p14).

EVALUATIVE RESEARCH QUESTIONS

The aim of this research was to evaluate the effectiveness of blended learning using 'Moodle' with first year undergraduate students within the learning context of online learning strategies used to enhance a traditional classroom approach. The research questions explored what parameters of effectiveness were to be evaluated, within an evaluation for knowledge in Higher Education.

In the first research question, I was keen to evaluate the depth of learning that had been acquired through social constructivist pedagogy applied with blended learning on 'Moodle'. If it was effective, was it the teaching or was it the tool, or was it both?

As my second research question, I was also keen to evaluate the effectiveness of using 'Moodle' in this way for retention on the module. I was interested to evaluate the numbers of students engaging in the material and passing, as opposed to what their grade point average was.

And finally, my third research question was to evaluate if the timing of engagement in the blended aspects of the module flagged opportunities to gain high grades or had it left the assessment process vulnerable to misadventure? Should online blended learning assignments have a completion date or cut-off point? How flexible should a social constructivist approach be?

METHODOLOGY

The primary research for evaluation was gathered four weeks into the semester. I extracted quantitative data from 'Moodle'. I noted which cohort a student belonged to (Either A or B), the length of time it took individuals to complete quizzes, what day and time of day it was, whether students accessed lecture notes and viewed recorded lectures online, and their subsequent grades for each exercise.

I gained qualitative data by way of circulating an electronic structured questionnaire using 'google forms' during the fifth week of term. Direct dialogue and feedback from

students in class, from meeting them outside class, in the canteen for example, and suggestions sent to me by email have been used to inform my pedagogical and assessment design evolution, allowing for the inclusion of my own account of 'the social world', within the context of facilitating exemplary Higher Education teaching and learning (Bryman, 2012, p33).

This allowed my adaption of developmental evaluation to be positioned such that I could conduct 'discussions with evaluative questions, thinking and data, and to facilitate systematic data-based reflection and decision-making in the developmental process' (Patton 2011, p1-2).

I gave an overview of the background to this research at the start of the online questionnaire for the students' benefit, as I felt it was important that 'intended users (were) more likely to use evaluations if they understood' the pedagogical approach at the outset (Patton 2011, p14).

The conflict between mixed mode analysis and the 'two different lenses' of positivism and interpretive paradigms (Cohen et al. 2011, p31) has been resolved by adopting a pragmatism paradigm, where pragmatists believe that 'multiple paradigms can be used to address research problems' (Creswell 2007, p10, 14-15), but must 'honour each and be explicit about when each is used' (Greene et al. 1989; Creswell 2007, p15).

I made changes based on findings from the week four evaluation and subsequently re-evaluated quantitatively such measures after week ten, based on 'Moodle' findings.

> Developmental evaluation, conducted from a utilization-focused perspective, facilitates ongoing innovation by helping those engaged in innovation examine the effects of their actions, shape and formulate hypothesis about what will result from their actions, and test their hypothesis about how to foment change in the face of uncertainty in situations characterized by complexity (Patton 2011, p14).

ETHICS

Students were made aware that the findings from the evaluation survey and information extrapolated from 'Moodle' were to be used for research purposes, but that all information would be kept strictly confidential and always anonymous.

RESEARCH ANALYSIS

'MOODLE' FINDINGS AFTER WEEK FOUR

Table1.0: Summary of Quiz findings after week four.

Summary of assessment data extrapolated from 'Moodle'										
Number of students participating in the module = 86 students	Quiz 1		Quiz 2		Quiz 3		Quiz 4		**Average**	
Roll-out of quizzes:	Week 1		Week 2		Week 3		Week 4			
Number of questions?	4		4		4		10		**5.5**	
Method of assessment?	Summative and formative		Summative and formative		Summative and formative		Summative and formative			
Written answers requiring additional individual feedback?	No		50% of questions		50% of questions		50% of questions			
At the end of week 4: Evaluation										
Number of students who completed online assessments	81		66		77		69*		**73 (Out of 86)**	
Numbers of students per cohort who completed online assessments	A	B	A	B	A	B	A	B		
	55 (68%)	26 (32%)	44 (67%)	22 (33%)	53 (69%)	24 (24%)	48 (70%)	21 (30%)		
On average, when was quiz started by students, once made available online?	+7 days (spanning 0 to 20 days)		+6 days (spanning 0 to 18 days)		+8 days		+5 days			
	Wednesday		Wednesday		Wednesday		Tuesday			
What time was the quiz started?	Afternoon 12 – 5pm		Afternoon 12 – 5pm		Afternoon 12 – 5pm		Afternoon 12 – 5pm			
On average, how long did it take to complete the quiz? *	8 minutes*		13 minutes*		12 minutes*		29 minutes*			
% passing, of those who attempted each quiz?	86% pass		97% pass		97% pass		94% pass*		**94% pass**	
	14% fail		3% fail		3% fail		6% fail*		**6% fail**	
% passing, from *whole number of students*?	81% pass		73% pass		87% pass		76% pass		**79% pass**	
	19% fail		27% fail		13% fail		24% fail		**21% fail**	
Average grade per quiz?	64%		82%		80%		74%		**75%**	
Average grade per Cohort?	A	B	A	B	A	B	A	B	**A**	**B**
	64%	65%	82%	82%	81%	76%	77%	67%	**76%**	**73%**

* Removing spoiled data i.e. quizzes that have been opened but not submitted for grading.

After four weeks of term, data was gathered from 'Moodle'. This has been summarised in Table 1.0 above. It is interesting to note that as the weeks progressed, the percentage passing averaged 94%, far exceeding expectations and retention requirements for first year, which at this Higher Education Institute are expected to be 68% or higher per subject, stage or Programme. I can surmise that for retention, it really comes down to attendance and participation on the blended aspects of the module.

From the results, the average grade was slightly different per cohort, ranging between 76% for Cohort A to 73% for Cohort B. The reason why both cohorts are different is not immediately obvious.

First year students do not have an expectation of what third level education involves and so are easier to persuade to take on new challenges such as this. The value of the average grade is very high. It does not reflect the fact that the quizzes were challenging and at times difficult. The depth of learning achieved appears to be very positive.

The weekly quiz output has been examined forensically below to evaluate technique and design and check the authenticity of grades awarded.

Quiz 1

A spread of grades for Quiz 1 is illustrated in Figure 1.0 bar chart, extracted from 'Moodle'.

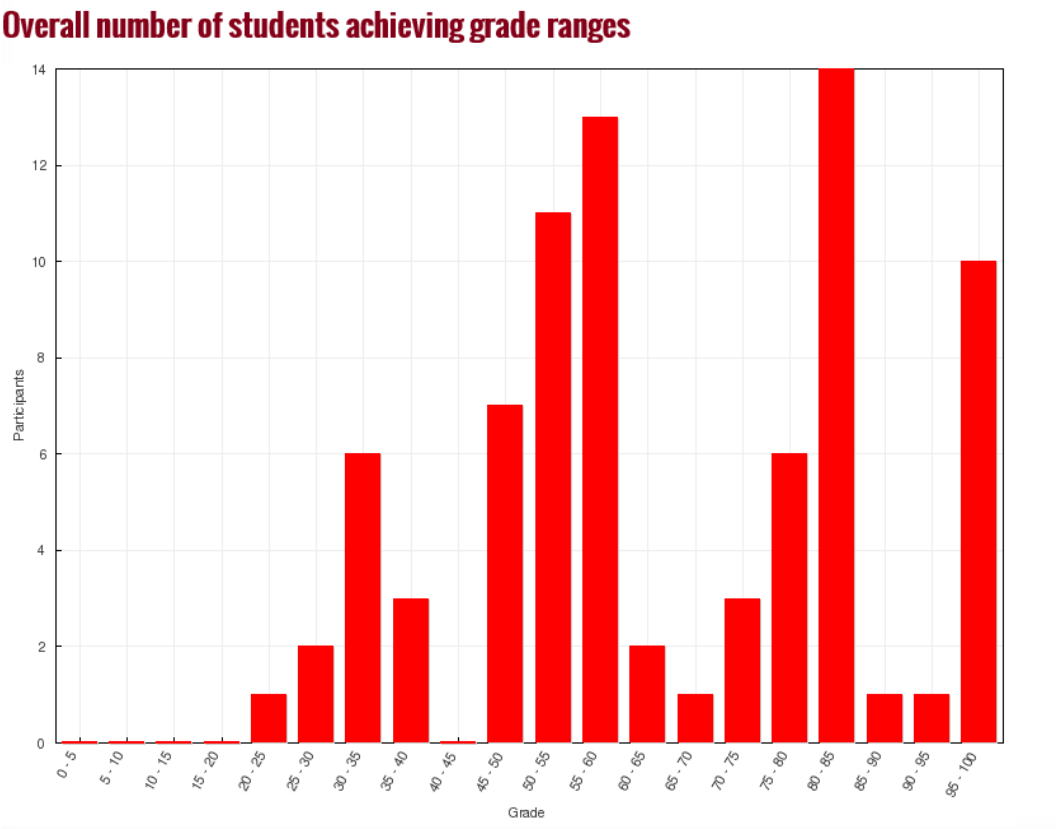

Figure 1.0 Quiz 1: Bar chart generated in 'Moodle'.

Table 2.0 Quiz 1: Time of day when attempting quiz.

Quiz 1		
Morning	9am to 12noon	15%
Afternoon	12noon to 5pm	49%
Evening	5pm to 10pm	31%
Night	10pm to 9am	5%

As can be seen in Table 2.0 and Table 3.0, most students favoured starting the quiz on a Wednesday, in the afternoon. It might be coincidental, but the class was held every Thursday afternoon, so perhaps the day before the next class afforded the opportunity to catch up. It could also be an indication of Cohort A and B's timetable and availability to complete online assignments.

Table 3.0 Quiz 1: Day when attempting quiz.

Quiz 1	
Monday	14%
Tuesday	19%
Wednesday	41%
Thursday	21%
Friday	2%
Weekend	4%

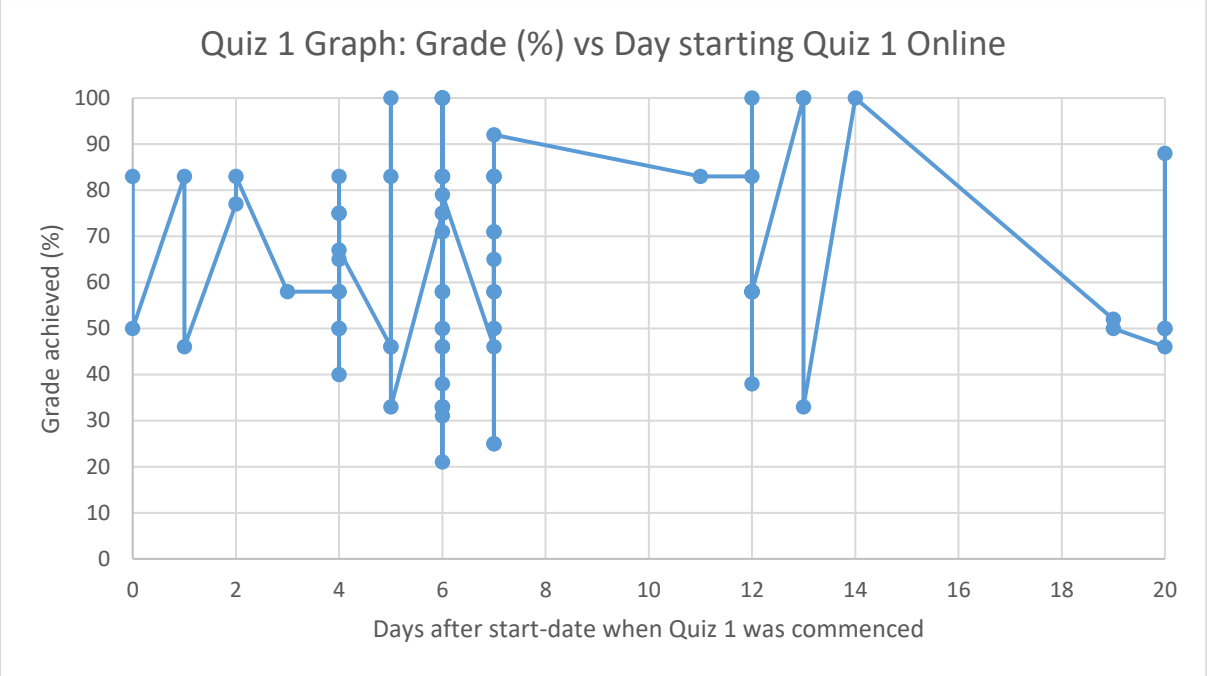

Figure 2.0 Quiz 1: Grade (%) vs days after start-date when quiz was available online.

Graphing grade against the date when Quiz 1 was attempted, illustrated in Figure 2.0 above, I suspected that it might indicate a profile of feeding-back information from those who have had their quiz graded in the first week to those who had yet to attempt the quiz. However, the graph clearly shows a random scatter, with no obvious pattern or system in place. There is a range of grades every day the quiz was attempted.

From the spreadsheet of data gathered, a large group of students in Cohort B appear to have completed their quiz within minutes of each other. I hasten to add that not one of those students managed to achieve a full grade, and both answers and grades were varied within the group.

What could be happening might actually be a form of peer support, ‘peer mentoring’ or the natural evolution of ‘mentoring circles’ (Darwin & Palmer, 2009). This is crucial to support one another, to have a sense of belonging, a group-connection and to reinforce and solidify their position within the cohort.

Quiz 2

Figure 3.0 below shows a significant change, with consistently higher grades achieved by more students from both cohorts.

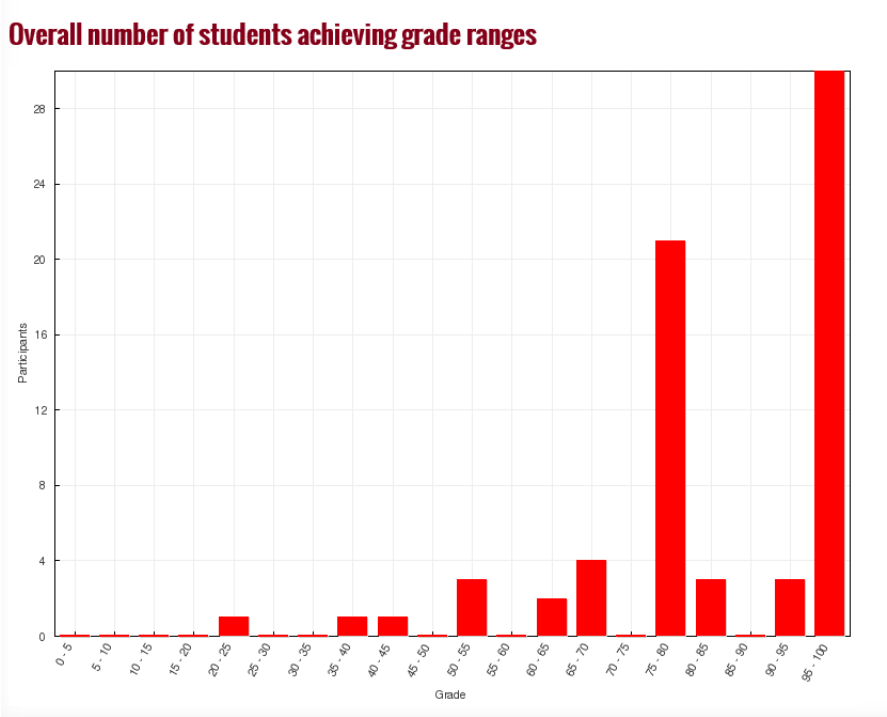

Figure 3.0 Quiz 2: Bar chart generated in 'Moodle'.

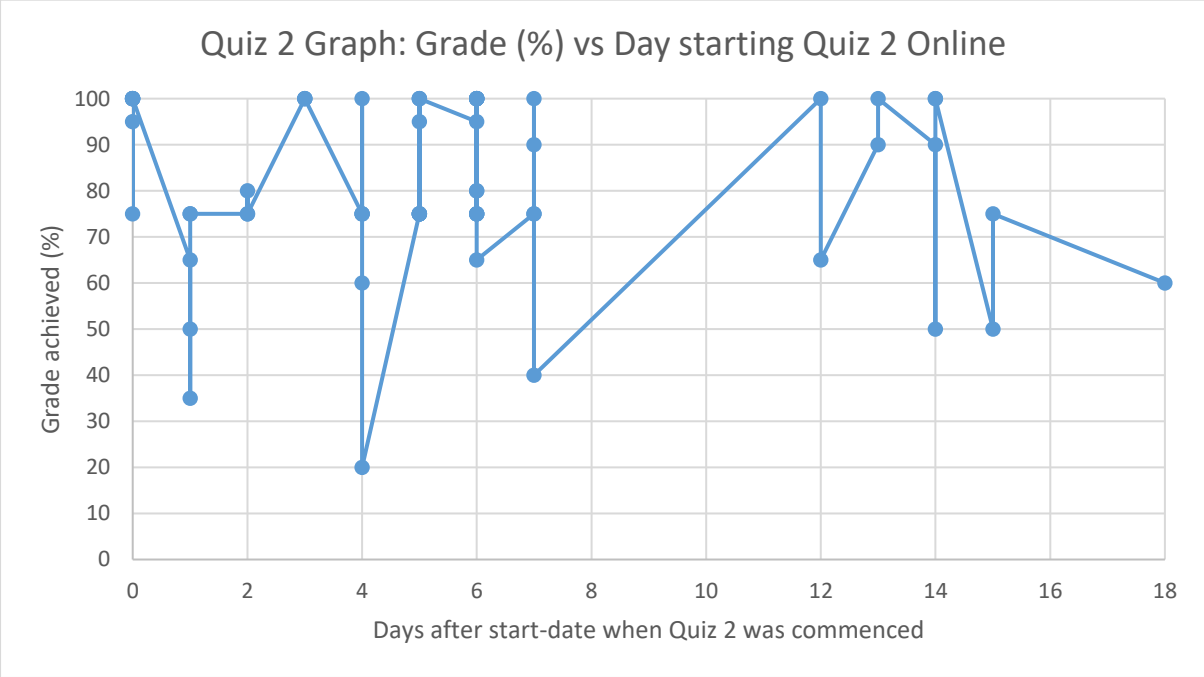

Figure 4.0 Quiz 2: Grade (%) vs days after start-date when quiz was available online.

Figure 4.0 shows a range of grades every day the quiz was attempted. From Table 4.0 and 6.0, most students completed the quiz on a Wednesday, either in the morning or afternoon.

Table 4.0 Quiz 2: Comparing the percentage of students attempting Quiz 2 on days of the week.

Quiz 2	
Monday	12%
Tuesday	18%
Wednesday	29%
Thursday	23%
Friday	8%
Weekend	11%

Table 5.0 Quiz 2: Indicating days of the week when best grade was achieved.

Quiz 2	
Monday	71%
Tuesday	**86%**
Wednesday	**87%**
Thursday	**85%**
Friday / Saturday / Sunday	74%

It is subjective and based only on the findings of Quiz 2, however, Table 5.0 illustrates that, on average, the highest grades achieved was when the quiz was conducted on a Tuesday, Wednesday or a Thursday, perhaps because students were more prepared for study mid-week. Examining Table 6.0 closer, morning and afternoon attempts at Quiz 2 proved to yield a higher grade.

Table 6.0 Quiz 2: Indicating time of day when best grade was achieved.

Quiz 2	
Morning	**84%**
Afternoon	**84%**
Evening	80%
Night	76%

Quiz 3

Figure 5.0 illustrates findings from Quiz 3, which are like Quiz 2 findings.

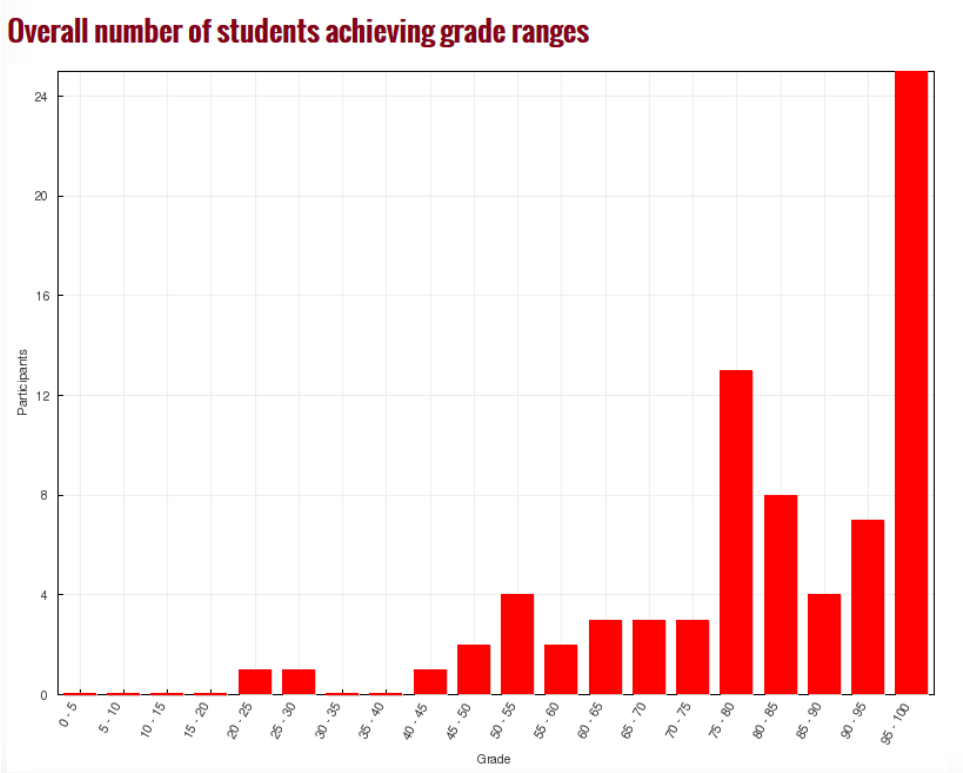

Figure 5.0 Quiz 3: Bar chart generated in 'Moodle'.

Only one response identified after four weeks appeared to have a copied answer. It occurred in this quiz. It was student P71, who was from Cohort A. The answer given was an exact copy of the response I had given other students who had completed the quiz before P71. This information would not have been found any other way other than by getting it from another student.

However, P71s grades for all other questions in Quiz 3 were varied and some were not correct at all. Was it a case that the student innocently asked a question of their colleague, enquiring as to what the answer might be? To find the answer, rather than copy or cheat? Is this perhaps sharing of knowledge and information and in this context, is this necessarily a bad thing? Surely this is what Phil Race alluded to, to get the dialogue going. This is the only instance where this occurred, in all four quizzes which were forensically examined. The continuous assessment value per quiz was so nominal that it was a low-risk issue, and new learning would have been achieved, either way.

Figure 6.0 shows a range of grades every day the quiz was attempted.

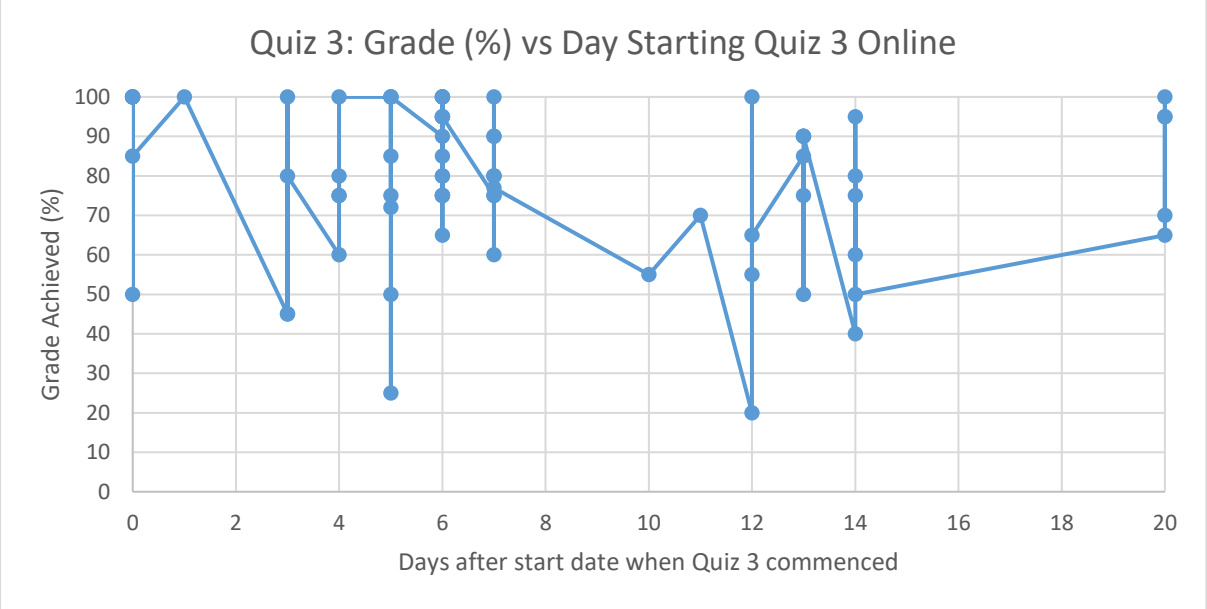

Figure 6.0 Quiz 3: Grade (%) vs days after start-date when quiz was available online.

Table 7.0 Quiz 3: Time of day when attempting quiz.

Quiz 3		
Morning	9am to 12noon	6%
Afternoon	12noon to 5pm	44%
Evening	5pm to 10pm	31%
Night	10pm to 9am	18%

From Table 7.0 and 8.0, afternoon or evening, Wednesday or Thursday were the preferred times. The pattern of engagement in the module had found a comfortable study-rhythm. I would hypothesis that perhaps the use of online blended student-led learning had found its niche time.

Table 8.0 Quiz 3: Day when attempting quiz.

Quiz 3	
Monday	8%
Tuesday	16%
Wednesday	36%
Thursday	32%
Friday	8%
Weekend	6%

I wanted to investigate the depth of learning achieved, and findings can be seen in Table 9.0 and 10.0 below.

Table 9.0 Quiz 3: Indicating days of the week when best grade was achieved.

Quiz 3	
Monday	77%
Tuesday	71%
Wednesday	**85%**
Thursday	80%
Friday / Saturday / Sunday	71%

Table 10.0 Quiz 3: Indicating time of day when best grade was achieved.

Quiz 3	
Morning	**88%**
Afternoon	79%
Evening	78%
Night	79%

It can be seen from Table 9.0 and 10.0 that the morning appears to lend most people to performing their best and mid-week appears to be the best performance time for students in Cohort A and B.

Quiz 4

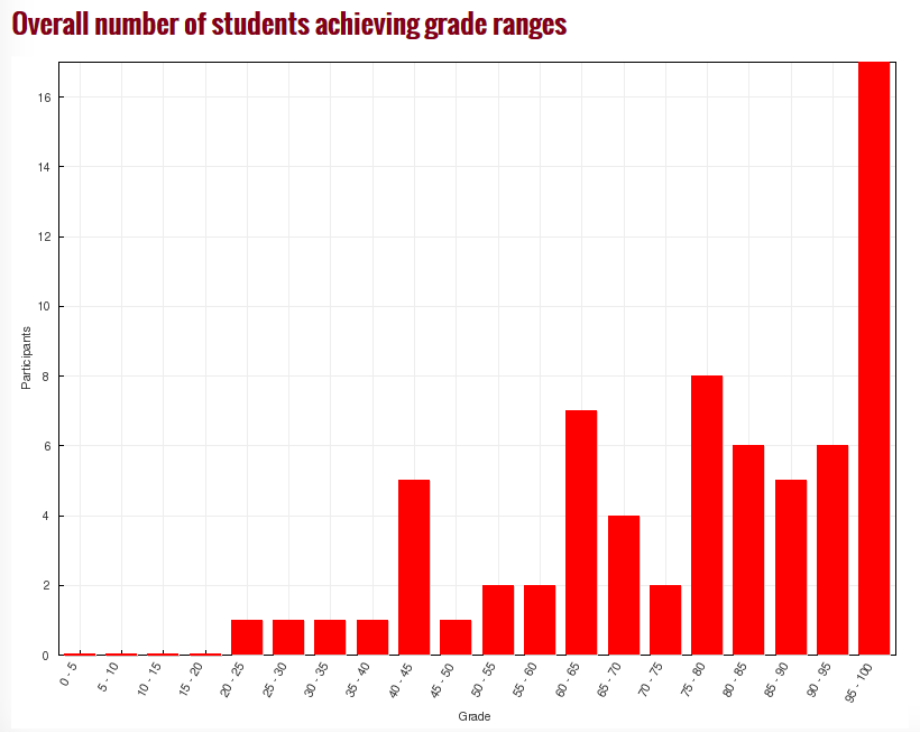

Figure 7.0 Quiz 4: Bar chart generated in 'Moodle'.

Quiz 4 was conducted using an online lecture and a quiz on 'Moodle', with grades illustrated in Figure 7.0 above. On this occasion, using technology required more

pastoral care and mentoring of students as they disliked the quiz. The average time to complete this quiz was almost four times longer as ten questions were posed, instead of four.

There were no obvious signs of copying in the answers received as half of the ten questions required a unique response both from the student and the lecturer when marking, indicated in Figure 8.0 below.

From speaking to students in class, they were not put-out by the imposition of extra time required to be spent on this subject. Some were looking forward to it. They really understood the reasons for doing it and were agreeable to it.

From a pedagogical perspective, I could judge on a micro-level, right down to specific questions, whether the delivery of lecture material online and exercises posed for completion outside of class were successful or not.

If the breadcrumbs of information I pointed out and discussed in the online lecture were not expressly stated or clearly signposted in the lecture notes, it caused ambiguity for some students. For example, in Quiz 4, Question 7 was a multiple-choice question. Most students (From both cohorts) answered it incorrectly. However, if they had understood the lecture material better and had really listened to the online video, then this would not have been the case.

It really differentiated assessment of understanding language from rote learning and stood out in my opinion as a significant justification for using ‘Moodle’ as an effective assessment tool if used correctly when incorporating blended learning pedagogy.

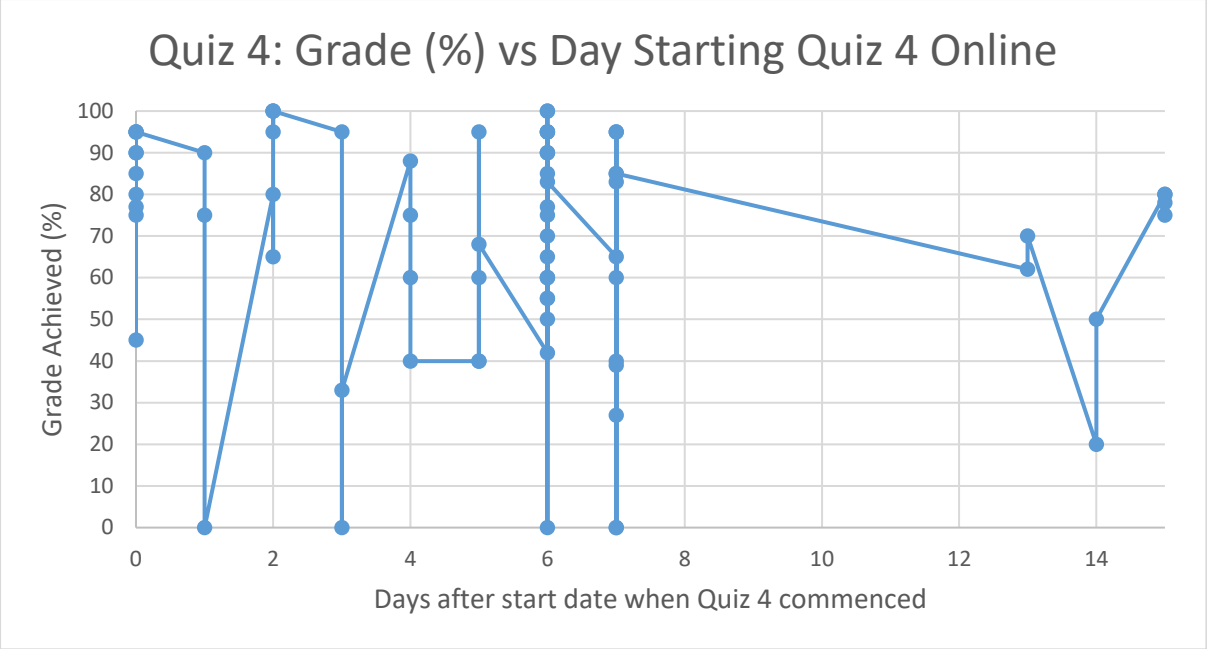

Figure 8.0 Quiz 4: Grade (%) vs days after start-date when quiz was available online.

I noted a divergence between cohorts. Cohort B appeared to be performing weaker than Cohort A. I discussed this with their year tutor, as I had an average of 50% attendance during class contact hours. This appeared to be the same for all subjects. Perhaps this is where blended delivery can be effective, in that these issues can be picked up early and perhaps notifications sent through 'Moodle', for example.

Students' choice of day to do this exercise was Tuesday and the majority conducted this quiz in the afternoon or evening, illustrated in Table 11.0 and 12.0 below.

Table 11.0 Quiz 4: Time of day when attempting quiz.

Quiz 4		
Morning	9am to 12noon	15%
Afternoon	12noon to 5pm	42%
Evening	5pm to 10pm	30%
Night	10pm to 9am	14%

Table 12.0 Quiz 4: Day when attempting quiz.

Quiz 4	
Monday	7%
Tuesday	34%
Wednesday	19%
Thursday	19%
Friday	4%
Weekend	18%

Speculating again as to whether there might be an optimised time and day to attain higher grades, bearing in mind that it was based on an online lecture, the findings indicated in Table 13.0 and 14.0 conclude that a Thursday night attempt gained the most marks. Comparing these findings with quizzes 1 to 3, I can conclude that the day and time of day that quizzes were accessed have no bearing on the grade achieved. However, it is interesting to note that as the lecture was delivered online, the quiz attempts which gained the most marks were conducted outside of normal class hours. Could it be that a length of free time without interruption might be a deciding factor between grade classifications? It is subjective and would warrant further investigation.

Table 13.0 Quiz 4: Indicating days of the week when best grade was achieved.

Quiz 4	
Monday	61%
Tuesday	76%
Wednesday	62%
Thursday	**82%**
Friday / Saturday / Sunday	78%

Table 14.0 Quiz 4: Indicating time of day when best grade was achieved.

Quiz 4	
Morning	61%
Afternoon	78%
Evening	75%
Night	**89%**

QUESTIONNAIRE FINDINGS AFTER WEEK FOUR

The ‘google survey’ questionnaire was opened during week five and was responded to by 28 out of 86 students, or 33% of students, which would make its findings valid. 79% were from Cohort A, 21% from Cohort B. 86% of students were between 18 and 29 years of age. 89% were male, 11% were female.

As would be expected, given the diverse range of days and times of day online material has been accessed, most students used a variety of hardware in different locations to access blended delivery of module material on 'Moodle', as indicated in Figure 9.0 below.

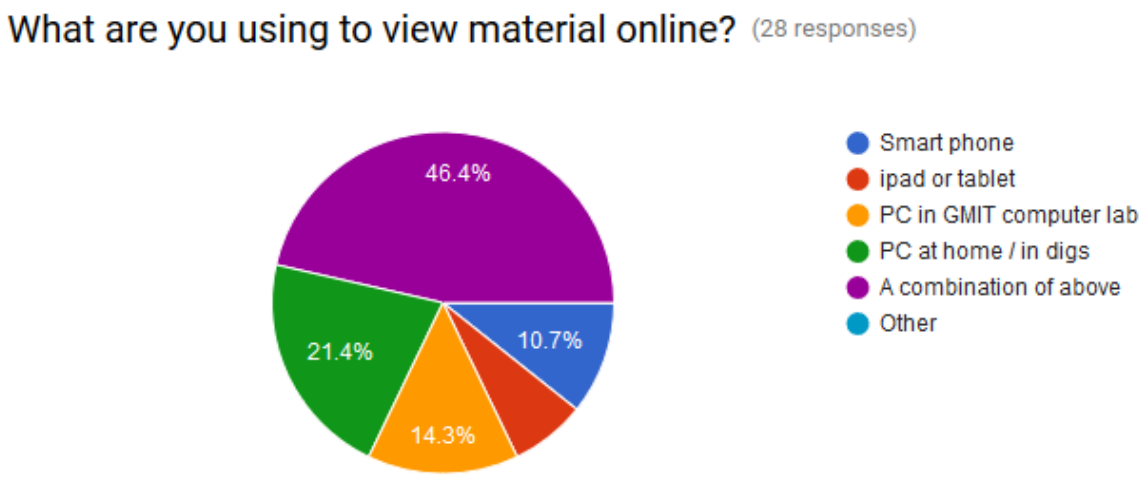

Figure 9.0 Percentage of students' access to blended material online through 'Moodle' using the hardware indicated.

When asked if students had difficulty using online material, the four feedback responses received were as follows:

- P1: 'Yes, it's impossible to log in sometimes on the computer and I can never login on my phone'
- P2: 'Quizzes computer glitch (if written answers are long?)'
- P3: 'couldn't open a recorded lecture. It looked like the sound was recorded twice making it impossible to watch'
- P4: 'It depends, sometimes the internet may be slow'.

When asked where students were when they logged into 'Moodle' for these exercises, the responses were varied. A significant number reported that they were at home or in their digs, some were working in computer labs, the library and the IT student centre. None reported viewing material when getting public transport.

86% were happy with the summative and formative feedback they received on quizzes. 53% answered that they would be keen to try another online lecture, with

39% undecided. Their feedback in relation to the online lecture was varied, but predominately positive, outlined in Table 15.0 below.

Table 15.0 Summary of qualitative findings in relation to first online lecture.

Positive	Constructive
P1 to P8 all reported: 'good'	P9: 'no good'
P10: 'ok'	P11: 'I don't really like it'
P12: 'it was different as it was my first online class it was bit easier to listen as I did it in my house with comfy chairs and no distractions'	P13: 'mixed views'
P14: 'easy'	P15: 'unsure'
P16: 'perfect'	P17: 'forgot to do it'
P18: 'It was beneficial because I could re-watch it'	
P19: 'excellent'	
P20: 'online classes very good'	
P21: 'I like it'	
P22: 'good as I am able to look over notes from lectures'	
P23: 'helpful'	
P24: 'informative'	
Mixed response	
P25: 'grand, hard in places as could not ask for further info etc.'	
P26: 'It was alright, it got a bit boring'	
P27: 'good, it was well delivered but wasn't as effective as a traditional lecture'	
P28: 'It was nice. Perhaps not as easy to focus though'	

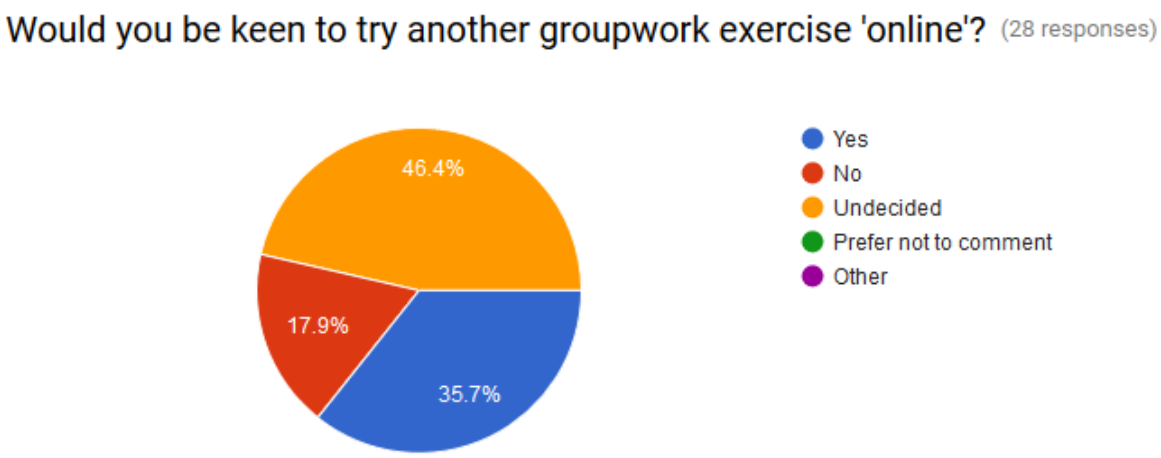

Figure 10.0 Percentage of students' willingness to do another a group work exercise 'online'.

The group work exercise was an ice breaker in week two, with nominal grades associated with it. When polled, most students were undecided or not keen to try another group exercise online again, illustrated in Figure 10.0 above, with feedback tabulated in Table 16.0 below.

Table 16.0 Summary of qualitative findings in relation to group work exercise.

Positive	Constructive
P1: 'good'	P2: 'bad'
P3: 'great'	P4: 'mixed'
P5: 'excellent'	P6: 'no interaction'
P7: 'good as I met new people I haven't talked to before'	P8: 'hard to communicate online to fellow members compared to face to face'
	P9: 'I think it's early days to do group online work as we're still only getting to know each other and no one yet is keen to make the first step'

It is interesting to note that, while outside of the scope of this research, in the second group exercise, students have set up online groups (using email, 'skype for business', 'yammer', 'what's app' and 'Facebook') and have taken full control of their learning, group management and mentoring in this manner.

'MOODLE' FINDINGS AFTER WEEK TEN

'There is no such thing as a failed experiment, only experiments with unexpected outcomes', Buckminster Fuller (Cited by Patton 2011, p10). Having recognised that there was no benefit in assessing the time of day students were online nor the length of time they took to complete exercises as the module progressed, I decided to be less forensic in my approach within this ongoing developmental evaluation.

By week ten of the module, I had gained three transfer students and had designed four additional quizzes. All quizzes were left open. The results in Table 17.0 indicate a significant increase in the average grade attained and in the percentage of participants passing each quiz.

Table 17.0 Summary of findings from Quiz 1 to 4 by Week 10.

Summary of assessment data extrapolated from 'Moodle'					
Number of students participating in the module = 89 students	Quiz 1	Quiz 2	Quiz 3	Quiz 4	**Average**
At the end of week 10: Evaluation					
Number of students who completed online assessments	89 (100%)	84 (94%)	87 (98%)	79* (89%)	**85 (Out of 89)**
% passing, of those who attempted each quiz?	87% pass	96% pass	93% pass	91% pass*	**92% pass**
	13% fail	4% fail	7% fail	9% fail*	**8% fail**
% passing, from *whole number of students*?	87% pass	90% pass	91% pass	81% pass	**87% pass**
	13% fail	10% fail	9% fail	19% fail	**13% fail**
Average grade per quiz?	68%	81%	76%	71%	**74%**

* Removing spoiled data

Table 18.0 Summary of findings from Quiz 5 to 8 by Week 10.

Summary of assessment data extrapolated from 'Moodle'					
Number of students participating in the module = 89 students	Quiz 5	Quiz 6	Quiz 7	Quiz 8	**Average**
At the end of week 10: Evaluation					
Number of students who completed online assessments	70 (79%)	68 (76%)	62 (70%)	61 (69%)	**65 (Out of 89)**
% passing, of those who attempted each quiz?	93% pass	99% pass	98% pass	100% pass	**98% pass**
	7% fail	1% fail	2% fail	-	**2% fail**
% passing, from *whole number of students*?	62% pass	75% pass	68% pass	69% pass	**69% pass**
	27% fail	25% fail	32% fail	31% fail	**31% fail**
Average grade per quiz?	72%	89%	87%	91%	**85%**

Table 18.0 indicates a steady decrease in the numbers of students attempting quizzes as each week rolls out. Semester completion is at week thirteen. It was anticipated that the numbers of students engaging in the process within this module would steadily increase within the last few weeks of term. In general, the percentage passing and the grades per quiz have increased.

Without an attendance policy, I have very little control over declining numbers attempting quizzes. To date, there is no attendance policy in this third level institution. An attendance policy can be difficult to police but very easy to manage and prove in

an online environment. I believe that initiatives using blended learning on 'Moodle' could facilitate robust tracking for enforcement if an attendance policy were to be trialled.

It can be seen from this research using developmental evaluation that the 'complexity concepts… identify and frame… (the) intervention circumstances' and evaluation response, in my role as an 'agile evaluator… responding to emergent stakeholder needs' (Morell 2010; cited in Patton 2011, p10).

I was able to 'engage in open inquiry, talk to participants… and observe… what is going on as innovations unfold to detect unanticipated consequences'. Measures suggested in Table 19.0 below were enacted during the roll-out of the module between weeks four and ten, to strengthen and enhance the online programme delivery (Patton 2011, p10-11).

Table 19.0 Blended delivery innovations trialled between weeks four and ten.

Consideration	How it was addressed
Quiz with ten questions or long-answer questions kept crashing on 'Moodle'. Students spent large amounts of time on them.	All quizzes were reduced to 4-5 questions per quiz; removed long-answer requirement from questions.
Some students did not give the first quiz a proper attempt, thus their grades were low; they were just trying it for the first time and complained that they were not happy with their grades.	The first quiz was re-opened so that all students could have a second attempt.
Video files for online delivery were hard to view (skype for business); there was sound interference with two sound tracks playing; production of video file from PowerPoint was poor.	All subsequent online lectures were delivered in a more traditional format using pdfs until technical support or 'Panopto' is made available.
Hard to see where the quizzes are on 'Moodle'.	Added visual 'progress bar' with hyperlinks to all online assessments.
Found group submissions online a challenge.	Added an option to make individual submissions in lieu of group activity for individuals who had difficulty with this.
Risk that students might not open the lecture and either blindly attempt the quizzes or else try 'google' the answers.	Added 'enable activity completion' on 'Moodle' which blocks students accessing the quiz until they have first accessed the lecture material on 'Moodle'.
Pressure from other modules on the programme (deadlines).	Negotiated with the class to agree a final date and time to close online submissions, giving students from both cohorts an extra week after classes finish to complete graded exercises.
The online process and 'Moodle' interface can be quite boring; all quizzes can appear similar and become monotonous.	Added cognitive content to some quiz questions, to make it more appealing and interesting; used pictures, images, graphs, videos, and links to websites embedded in individual quiz questions; contextualise learning with examples that the students can relate to within quiz questions.

The technique of single loop learning within this developmental evaluation served this process well, by embedding 'a problem-detection-and-correction process' within the blended delivery, like action research in this respect. It has facilitated a process of 'getting beyond surface learnings to deeper understandings of what's happening in a system', in keeping with my position as an active reflective practitioner within a social constructivist pedagogical approach and overarching social constructionist theory of education and co-measurable complexity theory (Patton 2011, p11).

The findings in Table 19.0 and 20.0 reflect a 'vision-and-values driven social innovator', constantly assessing the process, people and outcomes, internalising this inquisition with questions 'asked ferociously, continuously, because (I) want to know'. My responsibility and accountability is on a macro-scale when performing developmental evaluation on a micro-scale, to answer 'the question of institutional and societal accountability' (Patton 2011, p13).

ONGOING DEVELOPMENTAL EVALUATION

The process of developmental evaluation will continue to contribute to this module beyond the scope of this research. I have listed suggestions below in Table 20.0 for current consideration.

Table 20.0 Suggested blended delivery innovations to be trialled.

Consideration	How it was addressed
Some students did not give the first quiz a proper attempt, thus their grades were low; they were just trying it for the first time.	Set a 'dummy' quiz before a graded assessment.
Video files for online delivery were hard to view (skype for business); there was sound interference with two sound tracks playing; production of video file from PowerPoint was poor.	Resolve technical issues.
It was hard to concentrate for a 2-hour class. Material lends itself to two 1-hour classes. Cohort A are used to having 1-hour classes, whereas Cohort B have 2-hour classes, generally.	Suggest a proposal to trial a 50% blended delivery next semester; 1-hour in class and 1-hour online.
The group sizes were too large?	Reduce group sizes from 11 to 5 next semester, making sure to mix student cohorts.
As the semester progressed, there could be more of a risk of students copying as they got to know each other better and were under pressure with deadlines from competing modules.	Suggest creating quiz content for a variety of groups; then shuffle groups.
Dwindling engagement with the blended delivery of the module (and incidentally attendance in the classroom) as the semester progressed. Multi-faceted reasons.	It would be beneficial to look at this in conjunction with a robust attendance policy learning.

Group exercise and mentoring circles facilitated online as part of blended approach.	Discussion forums for individual groups, to separate social media complications away from learning achieved and aim to facilitate peer mentoring online using 'Moodle'; An ice-breaker discussion forum online might pre-empt this greater aspiration and get first year students acclimatised to using 'Moodle' this way.
Is there a risk of copying between students from one year to the next?	This could be the case, if the exact same quiz questions are used each year. It would be worthwhile designing quizzes to shuffle questions (via 'Moodle' quiz bank) and track which ones are delivered, on a year-by-year basis.
International students tend to work very closely together.	Make consideration for this when assigning into groups.

CONCLUSIONS & RECOMMENDATIONS

The findings from the research questions posed were expected to be complicated, multifaceted and co-dependent. The issue of whether recommendations can be made on the basis of findings from this evaluation is that, simply put, it was not the intention of the evaluation from the outset to do so (Murray Saunders, 2006).

The findings have suggested that a substantial depth of learning has been achieved through social constructivist pedagogy applied with blended learning using 'Moodle'. High grades and high numbers of students achieving these grades are more than what I was expecting to achieve at the outset.

It appears to be a combination of how 'Moodle' was used, what it was used for, and a very careful, conscientious consideration of each online question, quiz, lecture and group activity, which encouraged students to exceed. The challenge was set and the majority excelled. Students were in fact coming to ask why they failed one question when they did not get 100% in every test. I suspect that because the standards were raised so high from the beginning, that nearly all students raced towards this standard, with peer pressure and a desire to excel being the primary motivator.

The support from year tutors was equally instrumental in encouraging students to keep coming back to the module, and keep motivation high for the semester, reflecting a team delivery and 'community of practice' from within the Department (Saunders 2000, p12).

Demonstrations of this manner are essential in terms of leadership and positioning students within a caring environment, where they have a sense of belonging, a purpose, a feeling of direction, moving forward, encouragement and support from all staff members. This 'community of practice' should be encouraged and nurtured as it is the first public face of the programme which first year students are exposed to in Higher Education. In time, it will then be replicated by a similar 'community of practice' within the student cohorts.

As an evaluation for knowledge, the research proved successful in terms of higher grades achieved. Blended delivery of online material did indeed enhance the traditional classroom approach.

In relation to findings for my second research question, 'Moodle' used in the context of blended delivery is incredibly effective at monitoring virtual attendance, participation in course material and percentage of students passing when graded using 'Moodle'. If it is utilised as a resource in this capacity, it is a powerful tool.

Drawing as a conclusion from this research, it comes down to this: If the student is in class, whether it is in the classroom or virtually online as part of a blended delivery, if they are present, they can be taught. If they are not, they cannot.

The research findings indicate a direct correlation in this respect and my own personal experience of teaching in Higher Education would also indicate this. As an evaluator, I have my 'own values, … ways of thinking, … language, … hierarchy, and … reward system', which form part of this evaluation journey as well. 'It is a cross-cultural interaction' (Patton 1998, p226).

It is difficult without a robust attendance policy to keep students' motivation going through a semester or year-long module. It is a multi-faceted, complicated issue. However, I will reiterate, by using blended delivery within a module, it gives precedent to unequivocally monitor engagement and perhaps attrition. 'Simplicity does not precede complexity, but follows it' (Cabaj 2009; cited by Patton 2011, p9).

To instigate a shift towards online delivery and blended learning at a module, programme or Institutional level will take time, notwithstanding the avoidance of 'goal displacement', such as attrition targets or financial drivers (Patton 1998, p231).

It is interesting to note that the developmental evaluation 'process use' has enlightened me as an educator and researcher as much as the findings from this research have (Patton 1998, p225). Indeed, 'to develop a culture of evaluation that will build capacity for better performance' is a key component to the solution at Institutional level (Chelimskey 1997, p101).

In answer to the third research question, findings indicate that there did not appear to be copying within the cohorts of students, no matter how long quizzes remained open. I have evaluated this on a question by question, quiz by quiz basis. I do not believe that this approach has left the assessment process vulnerable to misadventure. I believe that the pedagogical choices, theories, single-loop evaluation process and careful use of 'Moodle' for blended delivery has leant itself towards grades which are unique, individual, verifiable and accountable.

By the end of the semester, the students who remained on their programme attempted most if not all the quizzes on 'Moodle'. There was a divergence between cohorts noted, with 89% passing from Cohort A and 70% from Cohort B. If momentum in a blended module delivery can be maintained, it will reflect favourably on attrition, as it has done in this instance.

Relating back to the learning context, blended delivery using 'Moodle' has enhanced a traditional classroom approach for first year undergraduate students. As an evaluation for knowledge, this research has been successful, guided by developmental evaluation practices in Higher Education research.

LIST OF REFERENCES

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford; NY: Oxford University Press.

Cabaj, M. (2009). Understanding poverty as a complex issue and why that matters.

Ottowa: Caledon Institute for Social Policy.

Carlile, O., & Jordan, A. (2005). It works in practice, but will it work in theory. The theoretical underpinnings of pedagogy. *Emerging Issues in the Practice of University Learning and Teaching*, 11–26. http://doi.org/10.1002/sres.783

Carlile, O., Jordan, A., & Stack, A. (2004). *Learning by Design: Learning Theory for the Designer of Multimedia Educational Materials.* Waterford: WIT / BBC Online.

Chelimskey, E. (1997). Thoughts for a new evaluation society. *Evaluation*, *3*(1), 97–109.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). Oxon; NY: Routledge.

Creswell, J. W. (2007). Understanding mixed methods research. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, *11*(2), 1–19. http://doi.org/10.1016/j.aenj.2008.02.005

Darwin, A., & Palmer, E. (2009). Mentoring circles in higher education. *Higher Education Research & Development*, *28*(2), 125–136. http://doi.org/10.1080/07294360902725017

Foucault, M. (1975). *Discipline and Punish: The Birth of the Prison*. London: Tavistock.

Greene, J., Caracelli, V., & Graham, W. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, *11*(3), 255–274.

Kroll, L. R., & LaBosky, V. K. (1996). Practicing what we preach: Constructivism in a teacher education program. *Action in Teacher Education*, *18*(2), 63–72.

Learning Theories Constructivism - Learning Theories. (2016). Retrieved February 15, 2016, from http://www.learning-theories.com/constructivism.html

Mathison, S. (2005). *Encyclopedia of Evaluation*. British Columbia: University of British Columbia.

Morell, J. A. (2010). *Evaluation in the Face of Uncertainty, Anticipating Surprise and Responding to the Inevitable*. London: Guilford Press.

Patton, M. Q. (1998). Discovering Process Use. *Evaluation*, *4*(2), 225–233.

Patton, M. Q. (2011). Developmental Evaluation Defined and Positioned. In *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use* (pp. 1–27). New York: The Guilford Press.

Race, P. (2011). Emeritus Prof Phil Race discusses his seven factors of learning. UK: CQUniversityOLTv. Retrieved from https://youtu.be/RuQaRcPcmJs

Saunders, M. (2000). Beginning an Evaluation with RUFDATA: Theorizing a Practical Approach to Evaluation Planning. *Evaluation*, *6*(1), 7–21. http://doi.org/10.1177/13563890022209082

Saunders, M. (2006). The “presence” of evaluation theory and practice in educational and social development: toward an inclusive approach. *London Review of Education*, *4*(2), 197–215.

UCD. (n.d.). Education Theory: Constructivism and Social Constructivism. Retrieved October 15, 2016, from http://www.ucdoer.ie/index.php/Education_Theory/Constructivism_and_Social_Constructivism

Vygotsky, L. (1934). *Thought and Language*. Cambridge Mass: MIT Press.

BIBLIOGRAPHY

Ally, M. (2009). *Mobile Learning Transforming the Delivery of Education and Training*. (M. Ally, Ed.). Edmonton: AU Press. http://doi.org/10.1111/j.1467-8535.2007.00809.x

Articulate. (2015). *E-learning for Beginners*.

Brunton, J., Brown, M., Costello, E., & Farrell, O. (2016). “A good start is half the work”: Developing a MOOC to aid flexible learner transition into Higher Education. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 570–577). Rome: AEDTU Conference 2016.

Chakraborty, M., & Nafukho, F. M. (2014). Strengthening student engagement : what do students want in online courses ? *European Journal of Training and Development*, *38*(9), 782–802. http://doi.org/10.1108/EJTD-11-2013-0123

Christensen, I. F., Kjær, C., & Porner Nielsen, S. P. (2016). Empowering lecturers to facilitate high quality education through the use of learning technologies. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 122–138). Rome: AEDTU Conference 2016.

Clinch, G. (2016). Online Proctoring of Exams: authenticity , integrity , security. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 531–539). Rome: AEDTU Conference 2016.

Conti, L. (2016). Beyond remote and virtual labs : mobile laboratories for physics and engineering in e-learning and traditional teaching. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 857–868). Rome: AEDTU Conference 2016.

Department of Education and Skills. (2014). *Education for Sustainability: The National Strategy for Education for Sustainable Development in Ireland, 2014-2020*. Retrieved from https://www.education.ie/en/Publications/Policy-Reports/National-Strategy-on-Education-for-Sustainable-Development-in-Ireland-2014-2020.pdf

Devine, J. (2015). *Strategic And Leadership Perspectives On Digital Capacity In Irish Higher Education National Forum In Irish Higher Education*. Dublin.

Doing more with Digital, National Digital Strategy for Ireland, Phase 1 - Digital Engagement. (2013). Dublin.

EADTU conference 2016 “ European higher education in the digital age : opportunities and impact of new modes of teaching .” (2016). In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 1–5).

EU. (2014). *High Level Group on the Modernisation of Higher Education, Report to the European Commission on “New modes of learning and teaching in higher education.”* Luxembourg.

European Policy response on MOOC opportunities. (2016). Brussels.

Farrell, O., & Brunton, J. (2016). Using online primary sources to foster historical thinking. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 442–447). Rome: EADTU Conference 2016.

Future Ready Learning Reimagining the Role of Technology in Education 2016 National Education Technology Plan. (2016).

Gaebel, M., Kupriyanova, V., Morais, R., & Colucci, E. (2014). *E-Learning in European Higher Education Institutions Results of a Mapping Survey Conducted in October-December 2013*. Brussels.

Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: review, issues and future directions. *Internet and Higher Education*, *10*, 157–172.

Garrison, D. R., & Cleveland-Innes, M. (2005). in Online Learning : Interaction Is Not Enough. *American Journal of Distance Education*, *19*(3), 133–148. http://doi.org/10.1207/s15389286ajde1903

Glynn, M. (2016a). How blended are your programmes? | Mark Glynn at MoodleMoot Ireland & UK 2016. Retrieved May 11, 2017, from https://youtu.be/Hc8iO2AwX68

Glynn, M. (2016b). Learning Analytics - snapshot 2016. Retrieved May 11, 2017, from https://youtu.be/bQf39jSrlts

Gregori, E., Torras, E., & Guasch, T. (2012). Cognitive attainment in online learning environments: matching cognitive and technological presence. *Interactive Learning Environments*, *20*(5), 467–483. http://doi.org/10.1080/10494820.2010.531026

Kiely, P., & Keegan, D. (2016). Online Education Resources as supports for blended degree learning and flexible continued education in University College Cork. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 2012–2015). Rome: AEDTU Conference 2016.

Knight, C., Dondorf, T., Eckers, V., & Nacken, H. (2016). Exploratory Teaching Space: Stimulating Innovation in Teaching. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 152–162). Rome: AEDTU Conference 2016.

Kuusela, H. (2016). Bring Your Own Device - Utilising students' own laptops in Higher

Education. In *The Online, Open and Flexible Higher Education Conference 2016*. Rome: AEDTU Conference 2016. http://doi.org/10.4018/978-1-61350-150-4.ch013

Mac Keogh, K., Fox, S., Lorenzi, F., & Walsh, E. (2010). Designing Online Pedagogical Techniques for Student Learning Outcomes. In *Critical Design and Effective Tools for E-Learning in Higher Education* (pp. 22–38).

Marks, P. Z., Jennings, B., Farrell, B., Kennie-kaulbach, N., Jorgenson, D., Sharpe, J. P., … Waite, N. (2014). "I gained a skill and a change in attitude": A Case Study Describing How an Online Continuing Professional Education Course for Pharmacists Supported Achievemetn of Its Transfer-to-Practice Outcomes. *Canadian Journal of University Continuing Education*, *40*(2), 1–18.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of Evidence-Based Practices in Online Learning A meta analysis and review of online learning studies*. *US Department of Education, Center for Technology in Learning*. Retrieved from http://www.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

NMC. (2015). *2015 NMC Technology Outlook, Higher Education in Ireland, A Horizon Project Regional Report*. Austin.

QQI. (2016a). "Quality in an Era of Diminishing Resources" Irish Higher Education 2008-15, (March).

QQI. (2016b). *White Paper Statutory Quality Assurance Guidelines for Flexible and Distributed Learning*. Retrieved from https://qqi365-public.sharepoint.com/Publications/QA Guidelines for Flexible and Distributed Learning.pdf

Rovai, A. P., & Jordan, H. M. (2004). Blended Learning and Sense of Community: A comparative analysis with traditional and fully online graduate courses. *International Review of Research in Open and Distance Learning*, *5*(2), 1–13.

Salmon, G. (2013). Gilly Salmon's Five Stage Model of E -learning. Retrieved from https://www.acu.edu.au/__data/assets/pdf_file/0014/411035/Salmon_Five_Stage_Model_of_ELearning.pdf

Sangra, A., Vlachopoulos, D., Cabrera, N., & Bravo, S. (2011). Towards an inclusive definition of e-learning. Barcelona: E Learn Centre, UOC Open University Catalonia.

Suhonen, S. (2016). Students' experiences of different types of (distance) learning. In *The Online, Open and Flexible Higher Education Conference 2016* (pp. 380–389). Rome: AEDTU Conference 2016.

Swan, A. (2012). *Policy guidelines for the development and promotion of open access*. Paris: United Nations Education, Scientific and Cultural Organization. Retrieved from http://unesdoc.unesco.org/images/0021/002158/215863e.pdf%5Cnhttp://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/publications/_412_12_ci_e_int_epub_3-1.epub

Ubachs, G., & Konings, L. (Eds.). (2016). Conference Proceedings The Online, Open and Flexible Higher Education Conference Hosted by Università Telematica Internazionale UNINETTUNO, 19-21 October 2016. In *Enhancing European Higher Education; "Opportunities and impact of new modes of teaching"* (pp. 1–958). Rome: European Association of Distance Teaching Universities. Retrieved from conference.eadtu.eu

Ubachs, G., Williams, K., Belt, P., van Hezewijk, R., Boon, J., Wagemans, L., … Riegler, K. (2016). *Quality assessment for e-Learning: a benchmarking approach*. (K. Kear & J. Rosewell, Eds.) (3rd ed.). Parkweg 27: EADTU.

Vaughan, N. D., Cleveland-Innes, M., & Garrison, D. R. (2013). *Teaching in Blended Learning Environments, Creating and Sustaining Communities of Inquiry*. (T. Anderson & D. Wiley, Eds.). Edmonton: AU Press. Retrieved from http://www.colfinder.org/handle/123456789/4850

Zafeiropoulos, V., & Kalles, D. (2016). Performance Evaluation in Virtual Lab Training. In *The Online, Open and Flexible Higher Education Conference 2016*. Rome: AEDTU Conference 2016.