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2009

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Recommended Citation
Baharun, N. and Porter, A., Learning designs to engage and support workers, Centre for Statistical and Survey Methodology, University of Wollongong, Working Paper 25-09, 2009, 10p.
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Centre for Statistical and Survey Methodology

The University of Wollongong

Working Paper

25-09

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LEARNING DESIGNS TO ENGAGE AND SUPPORT LEARNERS

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Abstract. *This paper reports on a case study aimed at developing a better understanding on how to design student learning experiences using of digital technologies and in particular using video resources within the subject to engage and support learners with a view to impacting on their learning. Drawing on student learning experiences, the study examines the circumstances under which students are more likely to engage with a variety of learning resources. It seeks to identify how best to place the resources and to determine which resources components could play important roles within the subject. Outcomes from the study presents the rationale for designing the learning experiences in technology-based teaching to effectively engage and support learners within their learning context.*

1 Introduction

The use of Information and Communication Technology (ICT) in higher education sector is growing rapidly and has become the important part of education agenda around the world. The introduction of new technologies to support the processes of teaching and learning over the last decade has driven major change and transformed the experience of both teachers and learners (Bennett, Agostinho, Lockyer, Harper, & Lukasiak, 2006; Collis, 1996; Littlejohn, 2002; Matheos, Daniel, & McCalla, 2005; Sharpe & Benfield, 2005). Research has shown that the integration of technology in teaching practices can enhance student learning experiences and increase their learning outcomes (Collis, 2002; Singh & Reed, 2001). There is, however, it remains the issue which highlighted in this study of how to improve the overall quality of students' experience using the new technologies (Alexander & McKenzie, 1998), although many claims often made that new technologies enhance the quality of learning.

As technology is becoming mainstream in higher education, teachers are faced with an ongoing challenge to review their teaching practices which not only involves the process of designing and presenting materials using new technology but also utilizing knowledge of how students' experience learning through the technologies (Boud & Prosser, 2002). This approach of teaching adopts a learner-focused perspective rather than teacher-focused perspective (Matheos et al., 2005), yet many teachers are implementing teacher-focused approaches that make ineffective use of technologies in teaching and learning activities (Herrington, Reeves, & Oliver, 2005). In learner-focused approach, the central focus is on understanding the students' experiences of learning using new technologies. As view by Boud and Prosser (2002, p. 237), "learning arises from what students experience, not what teachers do or technology does". Additionally, Bates and Poole (2003, p. 25) noted that "[the] choice and use of technology are absolutely dependent on beliefs and assumptions we have about the nature of knowledge, how our subject discipline should be taught, and how student learn". On the other hand, according to Bennett et al. (2007) teaching approaches from teacher-focused perspectives use conventional information delivery or content-focused approaches. Thus, it is essential for university educators to understand what constitutes "good university teaching" (Biggs, 2003; Ramsden, 1992) that will foster high quality learning in higher education.

This study addresses the current challenge of university teachers in designing effective technology-based learning experiences, or effective educational strategies (Agostinho, 2006) which referred to as learning designs. Boud and Prosser (2002, p. 238) defines the term learning designs as "a variety of structures using new technologies that support student learning experiences. Learning designs may be at the level of a whole subject, subject component or learning resources". Further, Bennett et al. (2007) refer to learning designs as a variety of ways of designing student learning experiences. This design includes the sequence of types of activities or tasks that learners are required to do, the content or resources that learners interact with, and support mechanisms provided to assist learners to engage and complete the tasks, resources and interactions (based on the work of Oliver (1999) and Oliver and Herrington (2001)). Activities in designing learning experiences include planning schedules, preparing course outlines and materials, determining assessment tasks, and anticipating learners' needs (Lockyer & Bennett, 2006). It may involve the activities of modifying a previous course such as updating materials or implementing new learning strategies (Bennett et al., 2007). Essentially, Alexander (1999) highlights the needs of appropriate learning designs in the implementation of technology as learning supports as

to improve or enhance student learning experiences. It is important for university educators to identify what elements of learning designs would need to be used and altered to enhance the possibility of the activity inducing a high quality learning experience on the part of the learners engaging with it (Boud & Prosser, 2002). Therefore, this study is investigating what impact of the technology-based resources in particular video resources implemented within the subject on student learning outcomes and the way in which these resources may be better design and deliver to the students.

1.1 Purpose of Study

The aim of this study is to gain a better understanding of how we could designs the learning experiences with the use of digital technologies in particular video resources within the subject as to engage and support learners from the perspective of its impact on their learning. More specifically, the study research questions are (i) "How we can best place the resources to engage learners within their learning context?" and (ii) "Which resources play important roles in the subject?"

2 Methods

2.1 Design of subject

This subject was designed based on the learning design representation (refer http://www.learningdesigns.uow.edu.au) (Agostinho, Oliver, Harper, Hedberg, & Wills, 2002) which includes three major elements of learning activities such as tasks, resources, and supports (as mentioned above). As primary resources, this subject allocates three hours of face-to-face lectures weekly and two hours of laboratory a week with the laboratory class beginning in the second week of session. Students are expected to attend each lecture although they are not compulsory, while attendance is compulsory for each laboratory class within a 13-week of session. Other resources such as lecture notes, lab manual, lab solutions, and data sets required for the lab work were made available on the e-learning site (as shown in Figure 1). The support materials such as academic discussion forum, SPSS Help and video resources provided to students in assisting them to complete the tasks each week that included in their lab manual. On the e-learning site, students were encouraged to read any messages or notices posted by the lecturer of the subject on a regular basis. They were encouraged to post any questions about their academic work in the discussion forum on the website. They were also encouraged to respond and mutually benefit from the questions and the answers provided. In designing the assessment components for this subject, students were required to complete the assignment and online lab tests via the e-learning site, which conducted during the lab class.

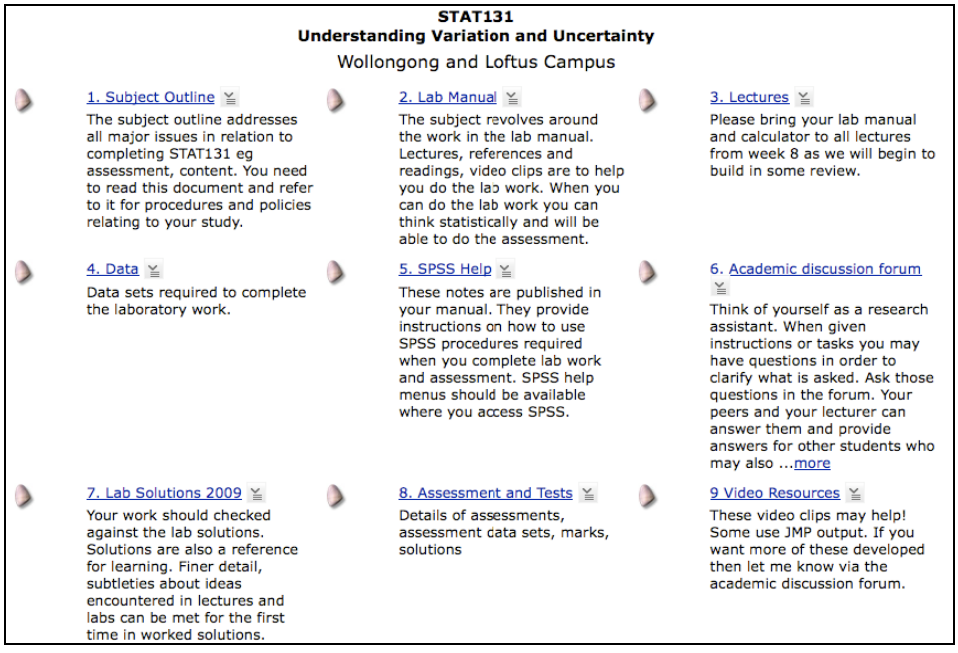

Figure 1. STAT131 e-learning site

2.2 Procedures

At the end of the weeks of final examination, the students asked to volunteer to fill out a set of questionnaire via online in the e-learning site. The approach of using an online survey has been shown to increase disclosure (Rodarte-Luna & Sherry, 2008; Turner et al., 1998) and could produce a higher response rate. In this instance, the response rate was 43 percent. The students approached initially and informed about the purpose of the study with an information sheet delivered during lab classes in week twelve of session. In addition to the information sheet supplied to the students, they asked to provide a permission slip giving their consent to participate in the study. The students told that their participation is voluntary and that they were free to refuse to participate and to withdraw from the study at any time. The students not be penalized for not participating in the study and they were informed that the outcome of the study should be beneficial for future students.

2.3 Questionnaire

A survey questionnaire used to collect the background information about the students, including gender, their origin whether international or domestic students, campuses they enrolled, and names for those who are willing to personally interviewed in future. There were questions asked about the usefulness of learning resources, which consists of classroom-based and technology-based resources, assessments, relevance of the subject, confidence with the subject including several topic areas, the use of video resources, changed in perspective after completing the subject, and improvement of the subject. Types of responses to the questions were either open-ended responses or Likert scales.

2.4 Participants

A cohort of 89 on-campus students was identified via the e-learning site who enrolled in a subject on introductory statistics, also known as “Exploring Variation and Uncertainty” which offered by the School of Mathematics and Applied Statistics at University of Wollongong. The participants were 38 students volunteered from this cohort. They were on-campus based students, which 17 students were female, 20 were male, and one student did not provide any gender information. Eleven students were international and 27 were domestic students. This subject offered at two campuses, which were in Wollongong and Loftus. Thirty-two students enrolled in Wollongong campus and six students enrolled in Loftus campus.

About 79 percent of participants reported spending not more than eight hours per week (most frequently cited time spent) for the first twelve weeks of session working on the subject. Twenty-one percent of participants reported spending between nine to eleven hours of work per week. The participants also asked to anticipate their grades to provide some indication as to the performance of students responding. Anticipated grades ranged from the lowest pass conceded through to high distinction grade, but majority of these students expected either a pass (26 percent) or credit grade (42 percent). This contrasts with the actual grades breakdown for the cohort (total of 89 students) which 24 percent of them failed (F), 2 percent obtained a pass conceded (PC), 21 percent obtained a pass (P), 27 percent obtained a credit (C), 23 percent obtained a distinction (D), and 3 percent obtained a high distinction (HD) grade (as shown in Figure 2). Clearly seen in Figure 2, none of the participants reported expecting a fail grade, and typically of the participants of such evaluations, those who did not respond are the most in need of providing comment (Porter, 2007). Thus, it was possibly either the students are excessively confident in anticipating their grades or better students are responding to the survey.

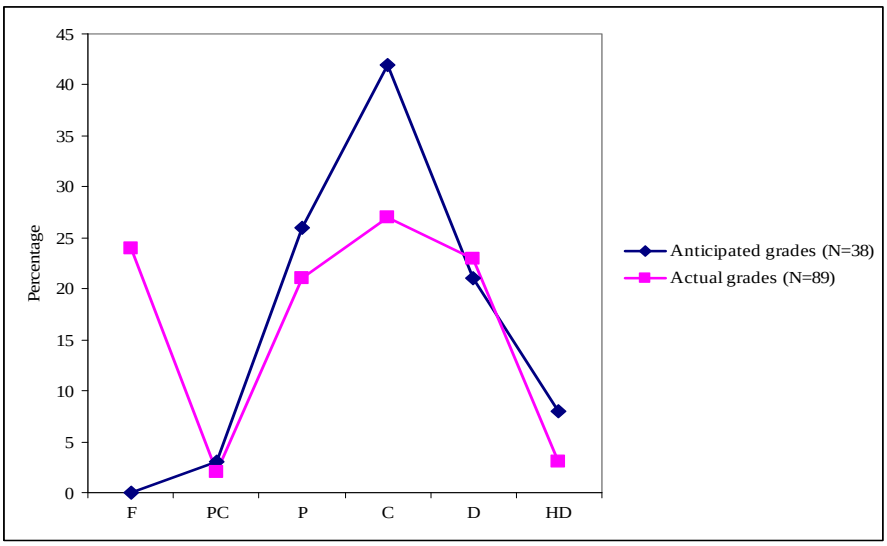

Figure 2. Student anticipated grades versus actual grades

3 Results

3.1 Usefulness of learning resources

In regards to the usefulness of learning resources which comprises classroom-based and technology-based resources, the students were asked to rate the usefulness of these resources according to 4-point scale which were 1=not applicable or rarely used, 2=little use, 3=moderately useful, and 4=extremely useful. As can be seen in Table 1, some of the technology-based resources such as video resources, Edu-stream and academic discussion forum found less useful for students in learning this subject compared to other learning resources. One of the classroom-based resources, the textbook also found less useful for students in this subject.

Table 1. Student responses when asked about the usefulness of learning resources

	Moderately useful %	Extremely Useful %	Total %
Assignments	34.2	63.2	97.4
Laboratory manual	39.5	57.9	97.4
Laboratory tasks	42.1	55.3	97.4
Worked solutions	26.3	68.4	94.7
Lab tests	55.3	36.8	92.1
Laboratory classes	44.7	44.7	89.4
e-learning	42.1	44.7	86.8
Lecture for learning	60.5	23.7	84.2
Lecture notes for learning	44.7	34.2	78.9
Tutor	44.7	34.2	78.9
Marking guidelines	39.5	31.6	71.1
Online lectures for learning	42.1	21.1	63.2
Team learning	34.2	28.9	63.1
Learning techniques	50.0	7.9	57.9
Objectives in laboratory manual	42.1	5.3	47.4
Video resources for learning	28.9	10.5	39.4
Textbook	31.6	5.3	36.9
Edu-stream for learning	21.1	7.9	29.0
Academic discussion forum	23.7	2.6	26.3

Taken as an absolute the value of the resources could called into question as students lowly rate them. However Porter (2005) showed that this form of evaluation, *Change Evaluation*, was more useful in terms of

identifying the components of a subject that could be improved. While for this investigation, the assignments, lab manual and tasks were assigned a high value in terms of students perceived understanding; they were rated as such only after a major modification of the resources.

Drawing on ideas from students it is possible to identify why the resources were not highly regarded in this instance and to target future development of video resources so that would be more beneficial for future students in the subject. It is also worth noting that the videos used to target those students who are at risk. Aminifar (2007) had already found that the better performing students were more likely to use paper-based resources which could be accessed more quickly than videos.

The survey attempted to determine how technology in particular video resources, were used in this subject. When the students asked about the average time they spent using these resources each week, the data revealed majority or 92 percent of them responded either never used it or spent less than two hours a week, 3 percent spent between three to five hours a week and 5 percent spent between six to eight hours a week. Examples of the student's comments relating to the use of videos are as shown below.

> *"I did not use the video resources. More awareness to students not from the Wollongong campus should be made so that they know about these resources"*
>
> *"Tell the lecturers to remind students that they are available. I only discovered them a couple of days before the final lab exam"*
>
> *"It would be really useful if e-learning would indicate when a new video has been uploaded. I didn't know that the videos even existed until about 2 weeks ago"*
>
> *"I couldn't find them, maybe make them easier to access"*

Further, the students also asked about their views of using the videos in the subject. With up to 54 percent of them responded they did not use these resources at all, 11 percent found it was time consuming for them to use, 11 percent found it is difficult to use, and 24 percent found they can solved problems well when they used these resources. As to improve these resources in the future, students as stated below suggested several ideas.

> *"Had there been video resources briefly explaining the subject, it would be helpful for international students who arrives late (like me) due to visa problems, to understand the subject."*
>
> *"Concerns on more examples"*
>
> *"Involve more of them in the lectures and the lab classes"*
>
> *"One per week, reviewing the work done to assist with the lab"*

When the students asked about any specific subtopics to be included in these resources, they recommended topics such as interpreting data and statistical terms, writing meaningful paragraph, using the SPSS, distribution models and assumptions, and hypotheses testing. Some of their comments stated below.

> *"If there would be video resources on interpreting, I think would be helpful"*
>
> *"Writing. I'm not very confident with 'meaningful paragraph'"*
>
> *"How about just overall simple processes. For example, what distinguishes models? What are the differences and similarities?"*
>
> *"A general video of statistical theory for the first 7 weeks"*
>
> *"Give the students completed frames for things like assumptions, formulae of Poisson, t-test, etc"*
>
> *"Interpreting data and SPSS. Sometimes the back of the lab manual can be confusing to understand. Also, having the back of the manual tell you to 'refer to note ...' all the time can be very time consuming"*

"Conducting hypothesis tests and making decisions relating to these"

3.2 Assessments

In terms of the assessment system designed for this subject, the students are required to complete some of their online lab tests in class and some outside of lab class. The assignment submitted in paper form, but a presentation of one question made to the class. For any lab tests, those students who obtained mark less than seven out of ten, they awarded zero as they expected to demonstrate mastery or competency in the topic. The students who failed had the opportunity to sit a re-test in the following week with a different data set for which a maximum mark was seven out of ten.

In attempting to determine how effective the assessment system implemented in this subject was, the students asked to indicate how useful was the opportunity to do the lab re-tests for helping them understand and learn the subject. The findings showed that 50 percent of them found it were extremely useful, 37 percent found it was moderately useful, 8 percent found it was of little use, and 5 percent responded they did not really prepare for the lab tests.

When the students asked about the structure of the lab tests and when it is best to have these tests, 58 percent of them responded to have it as a mix in class and done over two or three days, 29 percent responded to do it over two or three days, and 13 percent responded to do it in class. This survey also asked the students about the fairness of assessment system in this subject. Most of them or 79 percent indicated the system was fair; 8 percent found it was unfair, 8 percent thought cheating would occur, 2 percent found marking was inconsistent, and 3 percent did not respond. Some of their comments stated below.

"Assessment system is fair, students earn marks for their own and others' works but overall it gives them the chance to go through the material, which is very helpful"

"The assessment system was good for me because on the assignment I kept to just myself and my partner. With the lab tests and re-sit the system is fair as well as students should be able to improve"

"Probably a lot of cheating"

"I think it is unfair. If you do not pass the 70%... you will get 0 marks. I do not like it. Many times I just less 0.5"

"Some lab tests needed to be out of more marks. And there may have been inconsistency in marking with different markers which makes a difference if one was to fail by 0.5 of a mark"

"I think that the marking system is very fair it proves to people who have done well or need to do some revision... but in the lab test a pass mark should be enough as getting a mark 7 or higher is harder and that could come down to whether passing or failing the subject"

"I think it is fair. At first, I did not see why there was a min mark of 7. But now I understand and in the long run this actually encouraged me to improve my marks"

"Yes I believe it is a fair system. By having to do the lab tests keeps you accountable for being up to date with your lab manual. Gaining feedback after failing a lab test is most helpful as you can see how you went wrong not just that you were wrong, end of story (figure out the mistake for yourself)"

3.3 The impact on student learning

The survey also sought information about the impact of technology usage within the subject on student learning. At the end of session, 10 percent of the students believed they have learned a great deal and 58 percent of them believed they have moderate amount of success after they tried to make sense of difficult material in this subject. However, 16 percent of them felt they have been unsuccessful although they tried to make sense of difficult material in the subject, 13 percent believed they have limited success, and 3 percent believed the subject was too difficult. When the students asked about the relevance of statistics to student anticipated profession and/or their life, 61 percent of them viewed the same relevance as when they commenced the subject,

16 percent viewed as less relevant, and 23 percent viewed as more relevant compared to when they started this subject.

After completing the subject, the students asked about their ability and learning progress in the subject. With more than 60 percent of them believed that they have made a positive progress in most aspects of the subject (as shown in Table 2).

Table 2. Student ability and learning progress in the subject

	I have made moderate progress %	I have made a great deal of progress %	Total %
Meaningful paragraphs Increased my confidence in writing meaningful paragraphs containing statistical concepts and reasoning	71.1	13.2	84.3
Improved solutions Helped me to develop my ability to explore data in order to present improved solutions	65.8	15.8	81.6
Examine problems Enabled me to examine problems in context and the assumptions underlying statistical analysis	78.9	2.6	81.5
Solve problems Helped me to solve problems	65.8	13.2	79.0
Logic Helped me to develop my ability to make choices in the analysis of data and logically justify these choices	68.4	10.5	78.9
Presentation Helped me to develop my ability to use technology to analyze, organize and present data as information	47.4	28.9	76.3
Teamwork Helped me to increase my capacity for, and understanding of, teamwork to support my own and the learning of others	39.5	21.1	60.6

In relation to student perceived comfort with topics in the subject, the majority of students revealed they were confident in most topic areas at the end of session (refer to Table 3). When the students asked about whether they need more video resources in all of these topics, one topic, “Formulae Identification” showed the highest demand of video resources by 53 percent of the students.

Table 3. Student confidence with the subject

	Moderately confident %	Could do this %	Total %
Exploratory Do basic exploration identifying and describing the centre, shape, spread and outliers of data	55.3	42.1	97.4
SPSS Set up a data in SPSS and produce output	42.1	39.5	81.6
Hypotheses Set up, test and interpret hypotheses tests	47.4	31.6	79.0
Correlation and regression Do basic plotting, identifying relationships and conducting a regression analysis on two variables	50.0	26.3	76.3
Confidence intervals Set up and interpret confidence intervals	39.5	34.2	73.7
Model fitting Determine whether a set of data fit a particular model	47.4	21.1	68.5
Binomial and Poisson Solving problems using the binomial and poisson distributions	50.0	18.4	68.4
Normal and exponential Solving problems using the exponential and normal distributions	50.0	13.2	63.2
Formulae Identify appropriate formulae for different situations	50.0	5.3	55.3

4 Discussion

The concept of learning designs guides university teachers to design appropriate learning experiences for the students and for what is to be learn. It describes the strategies used by the teacher to engage the students thus it can optimize the students learning opportunities. Fundamentally effective learning designs are based on four principles of high quality learning in higher education developed by Boud and Prosser (2001). These are (i) engaging learners' prior knowledge, their desires and expectations, (ii) acknowledge the learning context via i.e. connecting with problems in context, identifying needs and learners' contexts (iii) challenge learners through active participation encouraging reflection, monitoring and self-regulation, and (iv) provide practice, which encourages learners to articulate and demonstrate what has learned to themselves and peers. These principles are based on the learners' perspective, that is teachers need to examine their learning design from the perspective of impact of the design on student learning as "learning arises from what students experience from an implementation of a learning design" (Agostinho et al., 2002, p. 31-32). More simply stated, "put ourselves [teacher] in learners' shoes and try to see our designs from their perspective" (Boud & Prosser, 2002, p. 239).

Within the context of this study, the researchers approached learning design in terms of understanding how learners experience and understand those designs. In particular, this study examined how well the technology-based resources integrated into a subject as whole and finally how students experience and understand the particulars of that integration. The findings revealed some of the technology-based resources provided to students such as video resources, Edu-stream and academic discussion forum found less useful for them to learn and understand this subject. More than 50 percent of the students reported they did not use the video resources and if they did, the average time they spent was less than two hours a week. While it may appear that the resources were not successful in helping students learn in this subject, there were topics such as interpreting data and statistical terms, writing meaningful paragraph, using the SPSS, distribution models and assumptions, and hypotheses testing which were recommended by students to be included in the video resources. In keeping with earlier studies, the evaluation is a comment on the relative worth of the videos. In this study, there was evidence to suggest that the resources not well integrated within the subject with many students not aware of their existence. Further, from the previous work it revealed that good students prefer access to the resources that are less time consuming. Initially, these video resources were to target the needs of weaker students. In the previous session, the video resources been used by a group of postgraduate students in another statistics subject of similar difficulty. At the end of session, most students found the resources were useful in helping them to learn and understand the subject and reduced their anxieties (Baharun & Porter, 2009). However the manner or the designs in which the videos integrated into the subject differed, with the videos being associated with each weeks work seemingly more effective (as shown in Figure 3) than in the subject where they provided as a list of resources as seen in Figure 1.

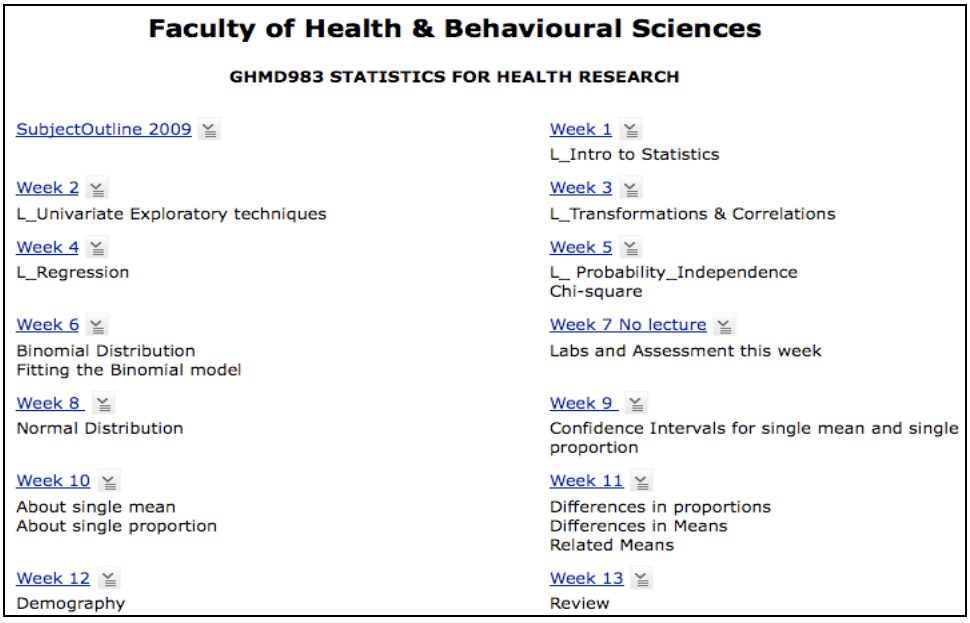

Figure 3. A sample of GHMD983 e-learning site

It is also likely that the postgraduate students were more active in seeking support for their learning than the undergraduate students. This difference between classes and the differences within subjects highlight the issue of how learners engage in the process of learning. In terms of learning setting, the Australian Flexible Learning Framework (2008, p. 3) states, "Different learners in the same learning setting can learn very different things. When a learner engages in a learning experience, what they learn depends very much on what they bring to the setting". Moreover, according to Boud and Prosser (2002, p. 238), "learning is always situated in a particular learning context. That is, students perceive the same learning context in different ways and this variation in ways of perceiving the context is fundamentally related to how they approach their learning and to the quality of their learning outcomes". Therefore, it is important when designing the learning using the technology based on students learning experiences as to support and encourage deep engagement with the subject matter.

In regards to the design of assessment system which was implemented in this subject, most students found both the lab re-tests and the structure of the lab tests were useful for helping them understand and learn the subject. The majority of them preferred to complete these tests as having a mix of individual work in class and completed over two or three days out of class. In responding to the fairness of the assessment system, the participants consistently favored the system which most of them indicated it was fair throughout the session. Fundamentally assessment is about the process of evaluating and judging the students' learning for a particular subject, more specifically it is about teachers getting know their students' abilities and the standard of their learning (Ramsden, 1992). Further, according to Ramsden (1992, p. 182), "Assessment is about several things at once…It is about reporting on students' achievements and about teaching them better…It is about measuring student learning and it is about diagnosing specific misunderstandings…It concern the quality of teaching as well as the quality of learning… It is not about what a student can do; it is also about what it means he or she can do". Thus in designing the assessment system for a particular subject, teachers need to consider the issues of how best to teach their students and how best to help students to learn more effectively. For instance, when looking at the impact of technology-based resources used within the subject most students indicated they have made a positive progress in most aspects of the subject. These are, writing a meaningful paragraphs containing statistical concepts and reasoning, developing their ability to explore data in order to present improved solutions, and examining problems in context and assumptions underlying statistical analysis. Moreover, the findings also revealed the majority of students were confident in most topic areas at the end of session. These topic areas are, basic exploration identifying and describing the centre, shape, spread and outliers of data; set up a data in SPSS and produce output; set up, test and interpret hypotheses tests; and basic plotting, identifying relationships and conducting a regression analysis on two variables.

It would be of benefit to conduct a study involving several groups of students within different learning contexts to identify the learning activities, which benefited different student learning approaches. In instance, we were able to reflect on the experience of video resources from this cohort of students with the findings of an earlier study. While the resources in the subject were similar, the video resources the same, the designs in which the resources integrated differed and student responses to them also differed. There are several outcomes to examine, what sort of learning designs are best or more suitable for a particular group of students, learning context or subject; how do learning settings differs among group of students and/or subjects; and how the students' characteristics such as gender, origin, age, academic backgrounds, make a difference. How else can the learning settings designed in statistics. To summarize, this study focused on students' experiences of learning using technology. The main issue in designing the learning activities for a particular subject involves understanding how teachers engage the students by challenging the students' experiences of the world, their present understandings, and helping them to develop their self-critical skills (Boud & Prosser, 2002). Thus based on the student learning perspective, this study suggests that understanding the impact of learning designs is fundamental to comprehend how students experience the teaching and learning situation within their learning context.

Acknowledgements

The authors gratefully acknowledge the important contributions and support provided for the production of this paper from the University of Wollongong and the Australian Learning and Teaching Council Ltd, an initiative of the Australian Government Department of Education, Employment and Workplace Relations. The views expressed in this paper do not necessarily reflect the views of the Australian Learning and Teaching Council Ltd.

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