ONLINE DELIVERY OF A SUBJECT IN A PROBLEM BASED LEARNING ENVIRONMENT: A CASE STUDY ON THE INTRODUCTION OF A SUBJECT WEBSITE FOR AN UNDERGRADUATE CONSTRUCTION MANAGEMENT DEGREE PROGRAMME.

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ABSTRACT

The emerging paradigm for the delivery of courses and subjects in tertiary education is online. The Building programme in the School of Architecture and Built Environment at the University of Newcastle is committed to the innovative delivery of construction management education using integrated problem based learning and emerging technologies. The case study presented in this paper follows how a website was designed and integrated into a course. The survey of students showed that there was general acceptance of the concept. The case study ends by identifying key strengths and weaknesses of the website, how it has been modified to suit the new platform Blackboard and future directions.

Keywords: construction management; problem based learning; online delivery; virtual learning environment.

INTRODUCTION

For the last twelve years, the Discipline of Building at the University of Newcastle has delivered the Construction Management curriculum by the use of Integrated Problem Based Learning (IPBL). The rationale behind this position was that in delivering the curriculum conventionally we were failing to maximise the educational experience for our students. It was recognised that the greatest service we could perform would be to facilitate their growth as life long learners, problem solvers who would be capable of meaningful independent activity immediately upon graduation.

From this base of course curriculum innovation the building programme has always sought to explore technologies and techniques that would support the delivery of the course and strengthen its uniqueness. Since 1999 the use of an Internet platform developed by Flexicomm Australia has been trailed (Chen and Gameson 2000). This has been a purpose-designed platform called CMNet that allows students and teachers to interact online, communicate, participate in synchronous and asynchronous tutorials and discussions, access resources and course material and post submissions. However further development and broader institutional policy changes have lead to the implementation of Blackboard as the preferred platform from 2002.

This paper presents a case study of the introduction of a website to support the management and delivery of a learning programme in construction management. The website was developed as part of the Discipline's broader strategy of harnessing the Internet in the delivery of its programmes. A survey was conducted at the end of the course to gain the students views and reactions to the concept as a basis for future directions. The results are presented here in the context of further development of the website.

BACKGROUND

Problem Based Learning

This approach is not new. Informally, everyone uses it during the course of their lives to overcome a myriad of problematic situations with which they are initially unfamiliar. As a formal learning technique it has been around for about three decades since it was pioneered by a number of medical schools in North America. However, many of the institutions that came to embrace the approach did so because of a nagging dissatisfaction. "Underlying much of the adoption of student centred methods has been a concern that traditional teacher centred methods and syllabus centred methods have not always led to quality in learning but passive, bored students giving back to teachers what they have been given in a worthless grade-grubbing way irrelevant to their future lives." (Gibbs 1995).

Boud (1985) characterised PBL thus *"... a situation is presented (to the students) before any knowledge is given. Then once the knowledge is acquired, it is applied to the problem"*. Engel (1991) recognised that the process resulted in empowered exploration, deep learning, creativity and critical thinking. It was held that the quality of learning that resulted from the process was richer and more relevant than that gained from traditional courses. The benefits to the learner were that they grew in competence in the multiple areas of knowledge acquisition, knowledge application, problem-solving strategy development and independent learning within the context of relationships with others. (PROBLARC 1996). Within the School of Architecture and Built Environment at the University of Newcastle, Kingsland and Chen (1993) contended that, "a quality graduate should have the

necessary attributes, including the ability to apply knowledge and skills in practical settings. This, in turn, requires a change in emphasis away from the accumulation of current (even the latest) factual knowledge towards an understanding of the underlying principles that can be applied in the future to a wide range of situations." It was felt that the only way to achieve these high standards was by the application of a PBL approach, across the curriculum.

PBL within the Discipline of Building

In the Discipline of Building the delivery of a PBL programme is founded on a scenario at the centre of a Phase. The scenario, presented in a learning challenge, outlines a problem that focuses on a particular area; residential construction, high-rise, infrastructure, facilities management. The Phase period is from 4 to 9 weeks with the support of programmed lectures, workshops, site visits, guest lecturers and seminars. The product is an assessable piece of work that is evidence of the student's ability to solve problems, meet learning objectives and basic competencies.

WEBSITE DEVELOPMENT

The concept

In the context of the preceding discussion and the arrival of new staff impetus was given to the idea for the development of a website for a course. It was driven by the fact that the proposed course was to be revised and restructured combining two previous phases that were components of the one subject. These phases were in the second semester of the first year focusing on Ecological Sustainable Development (ESD) and the subdivision process. The resultant phase was called the "megaphase", looking at the building process from the initial idea for the development of land through to the construction of a house, under the theme of ESD.

The work of Bonk (1999, 2001) and Alexander (1999) in the delivery and development of online subjects supported the work setting-up an appropriate website for the Megaphase. Alexander's work in particular highlighted the need not just to replicate a traditional course online but also to explore the benefits that online technologies can offer to improve and enhance course delivery (Alexander 1999). This implied moving beyond the placement of course notes and talking heads online to exploring and harnessing the inherent uniqueness of Internet technologies to enrich and direct the students learning. With a background in Education Bonk's work in online delivery systems provided the foundation for exploring tools for student engagement and maintaining constant interest throughout the period of the course.

Within the framework of a PBL course the underlying principle influencing the development of the website was the potential to reinforce student centredness and enhancement of independent learning approaches at the centre of PBL in construction management at Newcastle. In exploring online technologies the ability to be able to search the web was one aspect that was important in the context of the students taking ownership of their learning. The key to this was the potential "interactiveness" that online technologies offered. The secondary aspect was the potential to develop threaded discussions from remote centres and the concept of asynchronous participation, simply referring to the ability of students and staff to be able to participate at any time in the same discussion.

The megaphase: online model

The format of the website for the Megaphase was simple. Initially access to the site was through our platform CMNet[1]. This was considered important to strengthen support and use of the platform amongst the students, rather than creating separate systems with neither being used effectively.

The structure of the site was based on separate pages for individual pieces of information, or learning activities. The central page on the site was the learning challenge. In the model of PBL practiced at Newcastle the learning challenge is central to the Phase and the development of the problem.

In this model the learning challenge became interactive, while defining the problem area and presenting the scenario the text was also interactive with hyperlinks to relevant external sites (in this case sites related to the environment, local government, and other institutions with connections to the environment) and embedded PDF files that added layers of complexity to the scenario (examples include background information, newspaper articles etc.). These hyperlinks enabled the student to explore a range of issues directly related to the problem scenario they were reading. Examples include links to the Lake Macquarie City Council website, and another to

[1] Since this Megaphase was run the Discipline of Building has now moved to Blackboard as the preferred platform. This has impacted on the nature of the website in that there is no website as such, and all aspects are supported through blackboard.

a file containing a newspaper (written by the author) giving a background news story of the environmental problems related to the sites used in the Phase.

The other component of the website was the introduction of a series of tutorials that explored a range of conceptual, theoretical and ethical issues around the scenario which were essentially looking for a practical solution. These tutorials took advantage of a time release mechanism within CMNet that allowed the author to plan the type and nature of the tutorial in advance utilising an asynchronous form of discussion whereby the students could logon at anytime and pick-up the thread of discussion adding to the comments of others over a period of time until the release of the next tutorial. Bonk (2000) explains that one advantage of this method of online discussion allows those students who normally feel inhibited to participate in face-to-face discussions to make meaningful contributions. To facilitate these tutorials the ability to make anonymous postings was switched off within the system.

The advantage of operating with a platform such as CMNet (and subsequently Blackboard) meant that security could be provided as students needed to logon to CMNet with a password and that all pages could be opened within CMNet as well as links to external sites opening within CMNet.

In this experiment and in the context of the ESD theme no information or material was handed to the students on paper. At the beginning of the Phase they were told that any information they required to complete the Phase was contained on the website in CMNet. This included PowerPoint presentations of guest lectures, lecture notes, reading lists and other curriculum material. This proved to be one of the biggest challenges, however as the survey results show this was not such a big issue with the students.

While there maybe many models for delivering courses on line for traditional and PBL programmes the model presented here offered a range of opportunities for the delivery of the construction management course at Newcastle. These include the opportunity to strengthen independent learning through exploration and student "centeredness" because of the remote role of the instructor and the concept of asynchronous tutorials.

SURVEYING THE OUTCOMES

As part of the development of this concept it was decided by the authors to survey the students to determine the acceptance of a website as the basis for delivering an internal programme. This was believed to be important as part of the University's broader institutional policy of continual course evaluation and offering the staff of the Building Discipline potential to expand the concept to other Phases while maintaining continual development. The survey instrument was a questionnaire divided into three sections that explore the important aspects of the website; Structure of the Web site, Usability of the Website and Educational Aspects. The questions were designed to ellicit responses that could be provided for using a Likert scale with 1 representing strongly disagree to 5 representing strongly agree. This facilitated very elementary quantitative analysis of the results providing meaningful figures with which to determine success or otherwise of the experiment of a website for online delivery of an internal PBL programme (Lockyer et al. 1999).

Results of the survey

Table 1 provides the results of the responses to the questions with an analysis of the results. Means and standard deviations were calculated on each question from the results. There were 26 respondents with only two questions incorrectly completed.

Looking at the results of the first section related to the structure of the website the results indicated general consensus amongst the students that the structure of the website was good within the limitation of the questions posed. This is supported by the standard deviations. For section B which dealt with usability there was general support amongst the students for the idea of online delivery of the Phase indicated by the means and standard deviations of the last questions B5, B6 and B7. One concern for the authors was the fact that maybe the students computers may not support the website, this fear was removed by the results of questions B4.

Section C of the questionnaire dealt with the educational issues of the website. The results from this were not as convincing as the previous. While there was general support for online tutorials there was hesitancy to support complete reliance on this format for the delivery with a number of students supporting a balance of online and face-to-face tutorials. Many students felt uncomfortable with online tutorials. This tends to be contrary to Bonk's (2001) findings, his students embraced online delivery. Finally there wasn't particular agreement with the integration of the tutorials into the assessment process.

Table 1: Summary of results of the survey conducted to determine the success of the online delivery of the megaphase.

Question	Mean	S.D.
A1: The structure of the web site was clear and easily navigable	3.8	0.88
A2: The left-hand column index was a good way of moving through the site	4.0	0.999
A3: There was sufficient information online for me to complete the Phase	3.7	0.997
A4: It is worthwhile to pursue this type of delivery in future Phases	3.8	1.21
A5: The structure and layout were inappropriate for the Phase	2.3	0.777
A6: PDF versions of self assessment sheets and objectives were useful	3.3	1.164
A7: A PDF version should be made available for the learning challenge	3.8	0.992
B1: In the learning challenge the links were well conceived	3.6	0.902
B2: The relationship between CMNet and the subject website was good	3.5	1.028
B3: It would be more convenient to have the website on CD	3.2	1.155
B4: The graphics/formats of the website were supported by my computer	3.5	1.174
B5: The online delivery of the Phase was well developed	3.8	0.951
B6: The use of online delivery is appropriate for the Phase	3.8	0.992
B7: Access to the website through CMNet is appropriate	3.8	0.967
C1: The links in the learning challenge were useful and valuable	3.7	0.838
C2: I would prefer a traditional delivery of materials rather than online	3.3	1.011
C3: The online tutorials were well integrated into the learning experience	2.7	1.08
C4: The online tutorials were relevant	3.3	0.936
C5: I would prefer all tutorials to be online	2.0	0.774
C6: I would prefer a balanced mix of online and face-to-face tutorials	3.2	1.096
C7: The timed release of the tutorial topics related well to the phase	3.0	0.898
C8: I understood the reasoning behind the tutorial topics	3.5	0.905
C9: I always contribute in face-to-face tutorials	3.6	1.051
C10: I feel more comfortable with on-line tutorials	2.3	0.928
C11: I would like to see the online tutorials integrated into the assessment	2.3	1.05
C12: I don't bother with online tutorials as they are a waste of time	2.8	1.132

The results have indicated that there is general acceptance of the concept for online delivery of a Phase through a website. The authors feel comfortable with the results and encouraged to continue further development of the website for other phases. However it is the belief of the authors that there is still a need for a person to stand in front of the class to motivate and excite the student, and this is reinforced by the results of the survey.

CONCLUSIONS: MOVING FORWARD

Since its inception and the adoption of PBL as the delivery method the Discipline of Building at Newcastle has always sought to push the boundaries of pedagogical thought and practice in construction management. This paper highlights the success of one such experiment with online delivery. Using the inherent technologies of the web; hyperlinks, time-release mechanisms and the ability to have asynchronous threaded discussions the authors have been able to construct an online delivery experience reinforcing the discipline's philosophy of student centeredness and independent learning. The results of the survey point to a reasonable level of success of the intentions of the website as a delivery method.

From these results future development will look at:

- Maintaining a balance of face-to-face and online delivery.
- Explore ways of encouraging student participation in online tutorials.

In general further work will explore:

- Moving from the interactive hyperlinked text to virtual text and talking text. In this context the information will be presented by virtual actors role-playing real-life scenarios as the basis for presenting real life problems.
- Integrating an assessment process with the online platform to create a fully integrated system for ease of teaching and assessment.
- Making available material on CD ROM for external and off-shore students.

This concept has very real applications for the Disciplines distance and off-shore programmes. Implications for the Building Discipline are that the methodologies adopted here have been generally accepted and lay the foundation for further exploration. Developments are now under way as part of the current course restructuring to assimilate these ideas into external programmes to achieve greater concurrence between the internal and external programmes. The justification for continuing these ideas are based in part on the results of the survey and the strong synergies between the technologies of online learning and the Discipline of Building's particular model of integrated problem based learning.

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