DEVELOPING A WEB BASED METHODOLOGY TO TEACH A WEB-BASED TECHNOLOGY – THE E-JOURNAL APPROACH

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Abstract
This paper outlines the development of a web-based teaching methodology, the E-Journal, which aimed to assist students in the better integration of theory and technical skill development for the creation of virtual worlds within design and engineering disciplines. The paper outlines the development of the E-Journal, its implementation within a teaching unit and evaluates its benefits from both a student and teacher perspective and recommends future applications of the approach.

Keywords
journal, virtual worlds, design, engineering, activity theory, problem-based learning, constructivist learning environments, flexibility

Introduction

The teaching of computer-based technologies to Design and Engineering disciplines within a higher education environment is commonplace. Students are often required to undertake foundation computer classes that focus primarily on skill development and then are generally required to apply these skills later within their course to specific design and engineering projects. Personal experience of the authors has shown that such an approach is useful in the teaching of a particular technology but limited in the creative exploration of the technology within the discipline. However, new information technologies offer the potential to allow teachers to explore new ways of teaching their subject giving individual attention to the learning needs of students (Baillie, 2000). This learner-centred approach focuses on a "problem centred, activity-based approach where the computer applications are anchored in authentic and familiar contexts in which teaching and learning occurs" (Hill, 1999, p. 261). This paper presents one approach to the creation of a learner-centred teaching environment using new information technologies. The development of the E-Journal and its implementation within a teaching unit will be discussed to demonstrate how such a methodology can be used to assist students in the better integration of theory and technical skill development.

Background

The term Synthetic Environment refers to an interactive computer generated 3-Dimensional multi-discipline representation of an existing environment or conceptual design. This emerging field of study has significant potential to Design and Engineering disciplines as the technology allows for

enhanced communication to a multi-layered audience (Bucolo, 2001). Typically a virtual world (VRML 2.0 model) is developed with input from a number of Built Environment disciplines. The representation allows a range of professional groups the opportunity to contextually evaluate the design concept. This collaborative construction and evaluation paradigm shift in Design and Engineering has necessitated a corresponding change in Design and Engineering education.

In 1999 the Faculty of Built Environment and Engineering established an advanced computer visualisation facility – the Synthetic Environment Laboratory (online), which allows students and staff to explore the impacts and application of this technology from multiple perspectives. To use the facility students are recommended to enrol in the Faculty based elective – Fundamentals of Synthetic Environments.

The unit, Fundamentals of Synthetic Environments was offered initially in Semester 2, 1999. The unit provided an overview of Synthetic Environments focusing on its application to Design and Engineering disciplines as a tool for enhanced communication within a design process. The theory component provided an overview of historical and contemporary issues related to Synthetic Environments, whereas the tutorials provide the necessary skills for the creation of virtual worlds.

The teaching approach adopted followed the traditional paradigm of providing weekly theory lectures in a face-to-face mode followed by separate tutorials focused primarily on skill development related to the creation of virtual worlds.

Unit Development

A Small Teaching and Learning Development Grant was awarded in late 1999 with the aim of improving the delivery of this unit. The main aim of this grant was the development of a web-based environment for the enhancement of the unit. It would need to continue to cater for disparate levels of technology literacy through the use of self-paced tutorials whilst encouraging group learning through weekly presentations and reflections, and then integrating theory and skill in such a way that students and staff would perceive and relate to the desired synergy.

A further aim was to allow staff that may not necessarily have the skills and knowledge of this technology to view the lecture content and monitor student development to assist them in the integration of this technology into future units. By modelling the approach and actively engaging faculty members in it as 'expert contributors' to the E-journal, it was intended that staff may gather both experience in and ideas for utilising this instructional method. Collis and Moonen (2001) posit with regard to technology innovations, "the instructor is more likely to proceed if he or she is convinced of the effectiveness and pay-off of the change" (p. 61). After considerable analysis of the benefits of the existing mode of delivery, it was decided to proceed with the development of a web resource, which used the metaphor of a technology journal.

E-Journal Approach

The unit was re-organised into six discrete 'online journal editions' which covered both the theory and skill development. Within each edition, which were uploaded throughout the semester on a fortnightly basis, the following was included:

*   Feature Article (Lecture content presented both as a web summary and an expanded PDF document)
*   Letter to the Editor (a re-worked discussion list in which students were required to comment on a particular issue of the feature article)
*   Online tutorial (traditional tutorial content provided online with additional face-to-face tutorials being provided every alternative week)
*   Online Case Study (which the students developed in groups and presented as part of the journal).

No face-to-face lectures were provided, however a face-to-face tutorial was provided every alternative week to allow students to ask specific questions not easily communicated through a text-based medium.

Teaching Innovations

The E-Journal allowed staff to present information to students in a stimulating manner, which accommodated for flexibility in time and place of delivery and allowed for self-paced understanding of concepts related to Synthetic Environments. The challenge was to develop a Constructivist Learning Environment (CLE) to support an activity centred approach as described by Jonassen and Rohrer-Murphy (1999), which led the team to include a number of elements in the design.

The Publishing Paradigm

Within each edition, a feature article was presented as a generic concept. Students had the option to view a summary of the article and if required could gain a greater understanding through downloading the complete article as a PDF file. Additional investigation by the student on a particular topic was made possible through the inclusion of embedded links within the PDF. In any case students were required to reflect upon the topic within the context of their own discipline. This was facilitated by providing students with a controversial statement at the end of each article which they were required to respond to using a discussion list in the form of a letter to the editor.

Discipline Application

Students were encouraged to apply the knowledge gained within this unit to concurrent design and engineering projects within other units or within their workplace. This immediate transfer of knowledge assisted in student motivation and creative investigation of the technology.

Group Learning

Students were required to present all development work as a case study continuously throughout the semester. As these projects consisted of both discipline specific and multi-disciplined projects, varying approaches to the application of the technology was available for the students to view and possibly apply to their own projects. In essence the students were developing a series of help files for other students to view. A separate discussion list was maintained for tutorial and case study discussion.

Staff/Student Reflections

Since the unit was initially offered in Semester 2, 1999 approximately 120 Design and Engineering undergraduate students have undertaken the redeveloped unit as part of their electives studies program. The strategy used to monitor and evaluate student-learning outcomes included the assessment of learning outcomes as compared with the original unit, together with formal student evaluations of the unit (an 18-item questionnaire administered by the Teaching and Learning Development Unit). An analysis of grade distribution found that there was no significant difference between student submissions related to the use of the web based resource to that of traditional lecture/tutorial delivery offered in Semester 2, 1999. Further, formal student evaluations of the E-Journal approach were extremely encouraging. Formal student feedback indicated that the use of a directed student discussion (in the form of letters to the editor) was well received by the student cohort. However what came as a surprise was the student dislike for online tutorials preferring the face-to-face approach. It was difficult to determine student interest in the unit. Work was continually being submitted, however this did not indicate student motivation, which can be quickly determined through traditional lectures.

Teaching staff evaluation of the approach was also encouraging. It was found that the unit was useful for the integration of theory and application. The mechanism of knowledge construction through social negotiation in a constructivist learning environment (Jonassen, 1994) was evidenced through an increase in student discussion and cross-linking of discipline specific topics. This

encouraged group learning within a multidisciplinary context. The letters to the editors approach required students to make a connection between the theory and skill being presented within the fortnightly editions.

The development of each E-Journal however was time consuming. Re-working lecture content into a print/graphical format to ensure that it is both stimulating and challenging to the students requires considerable effort (however if done correctly is worth the effort).

Future Development

A QUT, Faculty Teaching Innovation Grant has been awarded to continue the development of this project. Specific improvements include improving the 'look and feel' of the site, allowing further integration of the case studies and discussion lists. It is envisaged that each E-journal edition will be identifiable as a separate entity. The use of block mode teaching rather than online tutorials will also be considered. Finally once developed this methodology will be evaluated across a range of subject areas with the Faculty.

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