Software Can Enhance Learning: A Case Study Evaluating the Implementation of an E-Learning Tool in a Multicultural, Tertiary Environment

Tony Richardson, Institute of Information and Mathematical Sciences, Massey University, New Zealand; E-mail: t.s.richardson@massey.ac.nz

ABSTRACT

The past 15 years have seen a major increase in the numbers of full fee paying international students entering the New Zealand tertiary education sector. Accompanying this have been significant government policy shifts which have moved New Zealand Universities from a traditional to a corporate and research oriented model of operation. Both these factors have manifested themselves at the classroom level as opposing forces, those of reduced emphasis on faculty teaching time and, paradoxically, expanded need for teaching time for the increasing numbers of students with poor English skills. This paper evaluates a software-based approach to providing a solution to this teaching-time paradox. The author considers the pros and cons of the proposed solution in principle and also in practice using a specific commercially available software application and proffers some conclusions on the desirability and feasibility of such a project.

Keywords: Multicultural e-learning system, Multimedia and hypermedia, Online learning companion, virtual mentor, Robodemo, Captivate

INTRODUCTION

In 1999 there were just 675 full fee paying students (FFPS) in New Zealand. By 2001 the number had risen to in excess of 52,000. In 2002 over 80,000 international students came to New Zealand from 116 different countries, representing 8.4 % of tertiary enrolments (Asia2000, 2003). This is a phenomenal rate of growth which seems set to continue, despite slowing in 2003 due to market demand, institutional capacity, policy effects, the impact of tightening quality requirements and consumer behaviour.

Before quotas were lifted in 1999 there were very few FFPS from China in New Zealand, for instance the secondary school sector had just 43. In the three years after the quota was lifted following China's endorsement of New Zealand as an acceptable educational destination, the number had risen to 6,476. This ferocious Chinese demand for New Zealand education is driven by the esteem with which a tertiary qualification is held in China (only a small proportion of those applying can get into Chinese universities, thereby creating pent up demand), the easing of travel restrictions and fundamental economic growth. Today, China dominates with 39.6 % of total international students in New Zealand (Asia2000, 2003).

Even these figures, startling though they are, mask the real "on the ground" picture since recent immigrants form a large percentage of those who are not classified as international students. In short, the reality is that in New Zealand today, when walking into a class of undergraduate students one is typically looking at a sea of fresh, eager, young, Asian faces. These students currently face two significant disadvantages:

a. Their pre-tertiary education has been predominantly passive rote-learning, making them inept at raising issues with staff and seeking face-to-face advice during lectures.
b. Their lack of English skills.

Although New Zealand tertiary institutions all require fluent English language competencies for most undergraduate degrees [IELTS] (the universities state specified minimum levels of competence, such as 6.0 in the International English Language Testing System (IELTS) or 550 in the Test of English as a Foreign Language (TOEFL)), this does not appear to translate into actual ability with the English language in the classroom. Most certainly in any typical Information Systems student cohort there would be only a sprinkling of students capable of expressing abstract ideas, outcomes of client interviews, conceptual system designs or user interface justifications. Staff room polling indicates that, while most staff are sympathetic to the plight of these students, there is a significant philosophical debate about the approach which should be taken. There is a great reluctance to change the traditional teaching methods and a not inconsiderable irritation that courses have to be "dumbed down" to compensate for students' lack of comprehension. Lecturers complain of having to translate their lectures on the fly from their "normal" vocabulary into simple English. Such informal indications appear to reinforce Colleen Ward's research (2001) in which she concluded that, in general, educators involved with international students were unlikely to make any changes to teaching methods or course content despite there being need and/or opportunity to do so. In technology courses, which may involve the use of multiple complex software environments, students who are unable to resolve issues using online "help" systems face further disadvantages: shortage of time and lack of assistance. The latter factor due to reducing government funding per student, the resultant increasing financial pressures on Universities and the consequential increase in the student: staff ratio.

This situation is a frustration for staff who expect undergraduates to be more self-sufficient and pro-active, yet must repeatedly answer the same questions and an irritation for students, who are unable to interrogate the advanced and expensive software supplied because of their inadequate English. The students feel they "lose face" in the admission to staff of their language inadequacies and for many, this is a price too high to pay.

It should be emphasised that these students are not below average; in fact many of them achieve higher IELTS scores than the minimum the universities require. Rather, they lack a wide general vocabulary and have only a smattering of technical English. It is worth noting here, that a significant number of students who have English as a first language often suffer from the same incapacitating problem.

There are only a few solutions to this problem and if those which reduce University income are eliminated (raising the English requirements of students, or reducing and limiting the number of students on a course) the question arises how best to increase teaching resources without increasing the time allocated to faculty teaching. The implementation of a software-based solution seems immediately attractive; this paper forms an examination of both the desirability and the feasibility of such an exercise.

MOTIVATION

The motivation for this implementation stems not from a hoped for "silver bullet", nor from a submission to marketing hype, but from positive past experiences automating aspects of University undergraduate instruction and assessment. In 2000 a pilot study was carried out (Richardson, 2000) among students who used a purpose-designed computer-based tutorial and assessment package called SOAP

(Student Online Assessment Program, pre-Microsoft use of the term) developed with the following requirements in mind:

Quality of Testing
- Elimination of plagiarism
- Audit trail verifying student identification and completion of the test
- Automated marking
- Centralised result logging

Quality of Test Management
- Reduction in overall staff time
- More immediate results feedback
- More immediate performance feedback
- Improved student satisfaction
- Elimination of post test disputes

The student reactions to the introduction of the system were interesting and were summarised at the time as follows:

Running the pilot system gave some very valuable insights into the practicalities of system based tutorials and assessment. Overall, the computer literate students embraced the system and gave very positive feedback. They liked the ability to proceed at their own pace which the computer-based tutorial gave them. They were happy with the email help desk and computer-based practice test. The less computer literate students attended University-based tutorials and progressed more slowly, requiring more hand-holding to understand the interface and the principles of the exercise. (Richardson, 2000)

Among the conclusions reached in 2000 were:

Experience with the SOAP system highlighted the inability of students with poor English skills to understand a written query and translate that English sentence into SQL code. It was not use of computer-based learning or the lack of technical SQL skills that limited a significant number of students' performance; rather, it was their poor grasp of English that was their undoing. (Richardson, 2000)

While SOAP was a specific solution to a specific set of course issues, the general goals of a reduction in faculty time allocated to each student, increased student satisfaction and ubiquitous availability were inherited by the 2005 system requirements. In addition, the system evaluated here had a prime goal of circumventing the cultural and English language issues that proved to be the major stumbling block for students in the 2000 pilot study.

An additional motivation for the introduction of e-learning technology and one that is less quantifiable though nevertheless real is the student perception of what "up to date teaching methods and materials" actually means. Students now expect online, 24/7 access to teaching materials such as lecture notes, chat forums, streamed video, reading lists, web links and so on. In the current market-driven tertiary environment, such items are considered desirable features of a course and act as points of differentiation with other tertiary providers. These features are seen by students as pedagogical assets, necessary for the successful completion of a course and not, as is the view of many faculty members, merely technology which is convenient for and panders to lazy students.

TECHNOLOGY PLATFORM

With the 2000 SOAP experience in mind and the 2005 requirements set, several software packages were considered for evaluation. It should be emphasised here that the requirements called for a content generation and manipulation package rather than a delivery system. In fact the University had standardised on WebCT as its e-learning delivery platform and, for delivery of the 2005 e-learning content, would be an option, together with stand-alone web sites linked to individual faculty members. Although there were many generic screen-capture packages, available both for proprietary operating systems and as open source, none offered a feature set commensurate with the proposed system requirements (Table 1), proven stability and adequate support.

Table 1. 2005 system requirements

Features
Text entry boxes
Quizzes and scoring
Storyboard-based editing
URL and email branching
Audio creation and editing
Text and caption manipulation
High resolution video output
Streaming
Small output file size
Smooth mouse movements

After a comparison was made between the myriad of packages available and the proposed system requirements, the actual software options were reduced to two: Macromedia Robodemo and TechSmith Camtasia. Both TechSmith and Macromedia were viewed as well-established companies with proven track records and lists of well-respected corporations in their client base. The two rival products, Robodemo and Camtasia both had similar feature sets, were comparably priced, relatively easy to use considering their complexity and were well supported. A decision was made in favour of Robodemo due to its superior level of integration with Dreamweaver and Flash, both of which formed the chosen platform for web-development. A further consideration was the historic and continued satisfaction with Macromedia as a commercial software development company.

It should be noted here that shortly after this decision was made, Robodemo was re-launched as "Captivate" which included some enhancements to the Robodemo development interface and an improved feature set. For the purpose of this report both "Robodemo" and "Captivate" are synonymous.

Captivate offers a broad scope for experienced developers to generate e-learning systems with interfaces and content in synchronisation with the individual lecturer's style of presentation. It opens the door to the development of e-learning systems that reflect the personality and experience of the lecturer, including anecdotal examples and asides, rather than a clinical set of functional, point and click exercises that marginalise the student. This ability to personalise and link the multimedia tutorial with both the lecture content and the lecturer provides continuity for the student and a point of one-on-one contact. The 2005 system takes a learning-objects approach to its organisation in that, over time, a significant library of video/audio clips should be amassed, each dealing with a specific topic and able to be played and re-played under the students' control. These are significant benefits, being conducive to learning and providing a cross-cultural bridge for students who habitually use repetition as a lever to understanding. Similarly, using the lecturer's voice for audio tracks rather than third-party voice-over further cements an individual relationship with students and encourages them to relax in the presence of a familiar course "leader".

To summarise, the author expected Captivate to provide a flexible and comprehensive video screen capture, editing and manipulation tool, with the ability to record and synchronise audio tracks and produce small output files playable in a ubiquitous browser user interface. From a systems environment point of view, the author observe that this development and evaluation took place in a somewhat "Lone Ranger" atmosphere, where, though e-learning was seen by the University as generally a good thing, there was a dearth of specific goals or coherent strategies in place and no central, standards-based development model. As a result the project was staffed by academics throughout its entire life-cycle, the resultant conclusions therefore were based on real-world usage rather than remote laboratory evaluation by Information Technology technicians.

EVALUATION

Students and Delivery

The 2005 system was implemented initially on a computer graphics course. The students enrolled on this course had a very wide spectrum of English abilities; indeed a significant percentage could be classified as having very poor or negligible English communication skills. However, all students on the course had

similar issues understanding the somewhat arcane software specific terminology. Introducing the Captivate content as the main tutorial method attempted to address this specific issue.

An important difference between the students of 2000 and the students of 2005 is the non-academic work patterns. The pilot system developed in 2000 was laboratory based since students tended to attend University in semester time and be employed during breaks. The 2005 system had to be designed with a changed employment pattern in mind since some students worked part time all year round and required access to teaching materials accordingly. Robodemo addresses this service issue by providing output deliverable via web-browser 24-7. Students are able to benefit from the portability of a Robodemo movie and play the multimedia presentation at home or in a computer laboratory at a time to suit their work schedule. As Robodemo content may be output as Flash movies, the software required to view them is equally ubiquitous and also free to download.

More importantly, Robodemo content may be created for a variety of media. As noted by Tom Green (2005)

We are rapidly moving into a media development market where our work is no longer tethered to the desktop computer. The rise of cell phones, handheld devices and even tablets has expanded the reach of our development efforts.

Robodemo facilitates output to different devices, each device having its own screen size and playback requirement and, since Flash players are available for most handheld devices, content may be output to a plethora of different devices; with the proviso that it is correctly sized for the specific device during capture.

Students who lack English skills may be confronted by tutorial material they don't understand; nor do they have sufficient English conversation skills to appropriately question the tutor or lecturer. Often, afraid of losing face, they will send indecipherable emails to the lecturer rather than raise their hands in class.

Self-conscious about how they [Asians] are perceived by others, their questions and opinions may be geared to building relationships rather than expressing unique ideas. They tend to be reserved with people they do not know well, and they assume a power relationship with the teacher as an authority, so they may avoid the possible offence of even asking questions that they do have (McCarty, 2005)

Robodemo-based tutorials allowed the student to control tuition at their own pace, replaying content that was not understood. Many students schooled in Asian education, have experienced an environment that did not encourage an interactive learning style using Robodemo content. These students were able to watch and listen in their own time to explanations dealing with the use of graphics applications which reduced pressure on them in lectures. Robodemo can incorporate branching to applications and other interactive hypertexting, which leads students through application based upon their responses to questions and quizzes in the tutorial content. In this way the application is somewhat adaptable to the individual's e-learning style.

In Human Computer Interaction (HCI) there are many widely accepted guidelines that must be considered when developing user interfaces (Connolly 1996, Schneiderman 1987, Nielsen & Norman). One of the main guidelines is the need to make users feel in command rather than at the mercy of the system (Connolly, 1996). This can be achieved by keeping the user informed, clarifying each step and providing context sensitive help facilities. Robodemo facilitates this goal by using rollover buttons, dialogue boxes and other interface objects, as well as a fully integrated help generator called RoboHelp. To assist user navigation, Robodemo provides indicators of the points reached. Also, Robodemo-based content may exclude extraneous material, assisting student learning by 'only including what is necessary to the user' (Schneiderman, 1987). The creator of the content may remove or add parts of the screen capture – from mouse movements and keyboard sounds to quizzes and rollover buttons, leaving only the most relevant and useful actions and noises.

Management and Administration

The Computer Graphics course uses various software packages to teach the basics of 3d animation and multimedia production. Packages such as Bryce 3d and Poser are used extensively for landscape and human modelling. Each of these has a steep learning curve that students must surmount in order to gain understanding and confidence using the software package. Until the introduction of the 2005 system, the course had been organised as a series of five, three-hour "lectorials" (a mixture of lectures and tutorials) per week, delivered in a purpose built computer graphics lab. This labour intensive delivery method provided extra impetus for the introduction of an e-learning solution.

Creating Robodemo-based content for each tutorial normally delivered over the semester amassed a significant library of objects, which in turn has facilitated rapid and easy variation of the course structure. Indeed, the course delivery method was to some extent reshaped, as the content previously provided by lecturers as part of a presentation would be delivered instead by Robodemo. The tutorials needed no longer to be presented in a computer lab at set times; instead students could choose to view the tutorials at leisure in any lab or from home.

It was found, in general, that when creating movies, Robodemo helped concentrate the mind of the lecturer/creator such that oversights and sequence errors were mostly eliminated. As a consequence, rework was reduced or similarly eliminated.

From a course management perspective, Robodemo helped overcome the proverbial bus syndrome by providing a library of quality-controlled objects that lecturers could use to educate themselves and provide continuity for students.

Cultural Usability

Del Galdo (1996) comments that there are increasing numbers of products currently available concerning internationalisation, localisation and translation; that these usability issues have been placed at the forefront for many companies who want to move into the foreign market. Macromedia's Robodemo is no exception.

There is a great deal more to culture than just language. We cannot make exceptions about culture based on what is the norm in our own culture (Del Galdo, 1996).

Robodemo helps achieve internationalisation of tutorials with numerous toolbars to help customize the content, storyboarding and overall structure of the movie. This can be as simple as changes to the text in dialogue boxes or adding multicultural audio tracks to frames. Graphical metaphors in the movie can be similarly adjusted so that the use of a culturally unsuitable metaphor is not included. Unfortunately many of the software applications studied in the Graphics course do not also follow the same rigorous usability testing but by using Robodemo students can be educated to recognise the English meaning for a symbol or metaphor that has been used within the software package.

Observations

During the initial development of movies some observations were made regarding Robodemo's usability. There were irritations with certain aspects of the functionality and usability of the Robodemo package. However these were minor and became transparent with increased familiarity.

Adding audio to the movie was found to be one of the more time consuming components of the movie making routine. Whilst using a good microphone was essential, the frame by frame approach of adding a vocal soundtrack was slow going. The use of an additional software package to remedied this. Captivate has since improved this step.

Whilst initially the movies took longer to prepare, now the practiced hand can develop content in a quarter of the time taken to develop a normal lecture & tutorial (Table 2). The number of repetitive emails received regarding course content has significantly dropped as students spend more time using this elearning tool, and less time trying to replicate what they mistakenly saw or heard in class.

IS THERE A DOWNSIDE?

Many students do not have the motivation or skills to sit down and teach themselves by reading a manual or self-study guide. Manuals are usually more effective for reference than for learning. On the other hand, Robodemo attracts the student's interest and can even be enjoyable to use. It also has added benefits of being able to be developed for a diverse body of learners

Table 2. Break down of course work

	Before Robodemo	After Robodemo
Hours of Lectures/Tutorials per semester	5 x 3 hours =15 x 12 weeks = 180	12 x 2 hours = 24
Staff hours developing course	100	50 (first year)
Hours developing one tutorial	18	12 hours (initially), 8 hours now

It is argued that if e-learning is to be driven by the needs of the users, then diversity should be a driving force behind the use of e-learning technology (Minton, Boyle, Dimitrova, 2004).

E-learning has brought proven benefits to the course. It has encouraged students to take responsibility for their own learning and introduced flexible learning so that the tutorials can be taken to suit their circumstances. With e-learning there are options for learning at a place, time, pace and style to meet the student's needs.

E-learning assures standardization of training and content presented. Each student receives a consistent lesson – rather than a repeated version by a lecturer who may accidentally miss vital steps along the way. Students become productive more quickly and require less handholding to achieve results. It has saved time over traditional face-to-face courses as students only study what they need and at their own pace. Robodemo empowers learners with responsibility for their own learning experience.

The e-learning content must be designed and written in a quality manner for the students to keep interest and learn. A poorly designed movie can result in boredom or even confuse the person supposed to learn the material.

CONCLUSION

For the most part in tertiary education, students require lecturers and tutors to drive the instruction process. They are given content, are able to ask questions and are asked to memorize facts and synthesize material. However if their ability to do so is hampered by a lack of English skill or by a reluctance to show their lack of knowledge, students can fail to progress in their understanding.

E-learning refers to a broad range of activities that involve the use of information and communication technologies (ICT) to support and enhance learning. By introducing Robodemo as an e-learning tool, many of the difficulties that lecturers have coordinating and presenting a time intensive course can be dealt with and students benefit from the ever expanding library of interactive resources. Students are able to reinforce their knowledge as needed and at their own pace.

Whilst initially the time spent on developing the course may be significant as one learns the Robodemo system, the time and effort saved in the long term makes the shift to elearning worthwhile. Robodemo has helped support an increasingly large and diverse student population while at the same time reducing teaching time.

The key to improving the effectiveness and quality of student learning and making it worthwhile is to replace existing traditional modes of teaching with more active and engaging learning opportunities, delivered where appropriate by e-learning (Ashford, 2003)

Future work on this project will include quantitative analysis of student use of the Robodemo based system.

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