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Teaching Discounted Cash Flows via an Interactive Computer-based Tutorial

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Abstract: At Massey University one of the challenges for academics is to deliver interactive education to students across multiple campuses and to those undertaking extramural studies. In this regard there is a growing emphasis at Massey on the development and integration of computer-based learning into courses.

Since 2001 academics within the Department of Finance, Banking and Property have been developing various computer-based learning resources, including multimedia CD-ROMs focusing on the teaching and comprehension of discounted cash flows. This paper describes one such multimedia application: the software system, the teaching content, and how the resource is being integrated into courses.

In short, the Department has developed a series of CD-ROMs that illustrate the creation of finance and property based discounted cash flows. The focus of this paper is a CD-ROM for property students. It has been constructed with the use of a Demoshield 7.0 application incorporating Camtasia Studio captured screen images with voiceovers. Students are able to view a spreadsheet template, a final spreadsheet and view certain steps required to complete the final spreadsheet. The CD is structured around tutorial exercises within an Excel Tutorial Workbook. While it is assumed the student has some basic knowledge of Excel, the Tutorial Workbook itself introduces some basic navigation and computational instructions.

The CD-ROM overcomes some of the problems associated with distributing large amounts of information to distance students, and also permits students to view material in a structured learning environment. Through an accompanying WebCT site students will be able to discuss aspects of the discounted cash flow with their fellow students and the lecturer. The WebCT site will also contain self-assessment quizzes allowing student and lecturer to gauge the student's understanding of core concepts and procedures.

1. Introduction and background

Massey University is one of New Zealand's largest providers of post-secondary or higher-level distance education. For many courses it has been and still remains the sole provider in the distance delivery mode. However, things are changing. With an abundance of new technologies, demand for cost effective education and a growing number of non-traditional students; institutions of higher learning, internationally, are turning to the development and provision of distance learning courses (Dowse, Fortes & Smee, 2002).

Massey University's distance education programmes are facing new challenges with more choices offered to students. Ultimately the strongest competition is unlikely to be from within New Zealand; rather it is likely to come from global education providers. A quick browse of the Internet reveals numerous overseas institutions offering on-line degree and diploma courses. Massey University was quick to recognise the challenge and has invested/continues to invest significant capital into new technologies and enhancements to both distance and on-campus courses (Dowse et al, 2002).

The Department of Finance, Banking and Property made the move to Web-enhance all its paper offerings in 1999. The Department hired a full-time computer consultant and during ensuing times it has WebCT'd all papers (60). The process started simply and added advanced features over time to the current stage where students may expect to receive the benefit of discussion forums, electronic administration guides, lecture notes, on-line quizzes, on-line mastery tests, assignment material, assignment results, use of multimedia etc.

Staff now have responsibility for their own WebCT sites, they update, change material etc. The Department has actively pushed WebCT training and encourages staff to apply for research funding to develop new technologies.

For property academics one of the hurdles has been how to WebCT the practical parts of their courses. Teaching duties include property management, development, investment, real estate, and valuation. In 2002 we obtained a College of Business Advanced Technology Teaching Research Unit (ATTRU) grant to develop a CD-ROM based spreadsheet learning resource. Our intention was to provide a practical demonstration to encourage familiarity with the use of computer applications that are used throughout the College and eliminate any learning resource inequities between extramural and internal students.

We have developed an illustrative CD-ROM for a core second year property management and valuation paper, which is run in both internal (on multiple campuses) and extramural modes in the University's first semester. The CD-ROM teaches a student how to complete a discounted cash flow.

This paper outlines the development and use of the CD-ROM. The structure of the paper is as follows; the next section provides a brief overview of previous research into the use of computer technologies in education. Section 3 explores the development of the CD-ROM for the second year property management and valuation paper at Massey. Section 4 contains an outline of its features, and Section 5 notes how it is being integrated with course material to enhance the property education experience.

2. Literature review

In an increasingly competitive educational environment, on-line educational facilities and the implementation of multimedia teaching tools used in a supportive, interactive environment can increase motivation, productivity and student results. There is no one teaching medium that should be applied in preference to another. Teachers well versed in the theories of learning that are familiar with their students and who have high levels of competence in using and implementing a range of education technology, will create appropriate learning environments (Semple, 2000).

Recent research into the effectiveness of computer-based learning resources has focused on the effectiveness of computer-based testing. Computer-based testing can be implemented as an academic tool in two ways:

- Practice and feedback.
- Assessment.

Gretes and Green (2000) find a significant one-half letter grade difference between students using computer-based practice tests and those who did not. They found there was a positive relationship between the number of practice tests taken by students and their course grades. Marks (1998) found that classes with access to computer software containing true/false and multiple-choice questions achieve higher test grades than those in other classes. A study completed by Devlin and James (2003) in Australia concluded that the impact of multimedia and educational technology can provide some indication of improved student learning. While, Thelwell (2000) on the impact of randomly generated open access tests finds evidence of improved student motivation and modified student study behaviour, through increased revision.

Gayton and Slate (2002/2003) explains the use of multimedia as a new student centred learning environment which will allow students to learn at their own pace while being sensitive to the various learning styles. Doucette (1994) showed evidence of the success of this approach when he found (a) high completion rates, (b) strong student preference for self-paced systems, (c) increased student demand for courses using the new methodology and (d) increased number of faculty members unwilling to return to classroom based instruction.

Riddle (1993) cited in Gayton and Slate (2002/2003) utilized multimedia in an elementary classroom, she found that the use of multimedia tools (a) enhanced students development of ideas, (b) increased the students' motivation level, (c) increased peer collaboration, and (d) increased satisfaction levels because students were proud of their work.

As previously mentioned, no one teaching tool should be applied in preference to another. Marks (1998) concludes that the success of computerised learning aids ultimately depends upon the learning style preferences of the students. Whatever the education delivery mode, it should provide a teaching and learning environment that support: interactivity (teacher-learner, learner-learner, and learner-content); student centred control of pertinent information; mechanisms for the learner to discuss the ongoing shaping of their knowledge (Wells, 2001). The literature on theories of learning, educational instructional design, and software selection that purportedly enhances learning is extensive (see Semple, 2000 for a review). Semple suggests that the terms computer-assisted and computer-based learning indicate a positive

change in emphasis to teaching and learning, with more flexible approaches to facilities creating student centred learning environments.

3. Developing the multimedia CD-ROM

Currently, students in the Department of Finance, Banking and Property core second year property management and valuation paper are required to complete a discounted cash flow as part of their internal assessment. Face to face computer tutorials are provided (though not compulsory) for internal students. Extramural students were traditionally provided with a printed workbook to follow and complete their discounted cash flow exercise. The main weakness of this practice for extramural students is the lack of face to face teacher assistance.

The goal of the discounted cash flow CD-ROM project was to remedy the aforementioned weakness and to demonstrate the use of Excel spreadsheets adequately for students to complete the exercise and to enhance their comprehension of discounted cash flows.

Our design team:

Raewyn Fortes – Compiled CD-ROM including capturing excel movies, text and completed voiceovers, editing excel workbook.

Garry Dowse – Contribution towards paper and literature, proofed final product.

Allan Smee – Developer, programmer and assisted in compilation of CD-ROM.

Carolyn Black – Compiled a similar CD-ROM for finance students which was used as a guide for this final product.

Key points for design:

Encouragement of active student centred learning.

Extent of existing and allied course materials.

Advancement of post-teaching reinforcement.

The discounted cash flow had to be realistic.

Selection of material that meet Web “usability” standards (see Section 4).

Efficient use of staff resources.

Capabilities of the electronic medium (flexibility).

What we did:

Identified the most suitable software to complete the project.

Applied for an ATTRU grant.

Developed hardcopy then computer versions of a case study.

Captured still images, excel movies and audio voiceovers.

We have had the product progressively evaluated by selected undergraduate and postgraduate students, and property industry experts.

The software:

The authoring software is Demoshield 7.0 which enables a range of different learning techniques by incorporating a range of text, audio and electronic demonstrations.

Camtasia Studio software has also been utilised to capture movements within an Excel spreadsheet to demonstrate steps in building a discounted cash flow. Camtasia can record any type of screen movement and stores this within an .AVI file.

While we have chosen to provide the product directly from the CD-ROM, Demoshield 7.0 can also be run directly from a website.

The limitation of this software is that it performs solely on Windows based products.

How long did it take?

CD-ROM development took in excess of 12-months. While the capturing of excel motion videos, screen captures and audio voiceovers did take a reasonable amount of time, the most time consuming part of the project has been consumed in editing text, and ensuring the information is correct. Normal day to day work commitments have interrupted earlier production of this CD-ROM.

The CD-ROM was released to certain extramural students who struggled with the internal assessment requirement in 2003. The feedback received to date has been outstanding.

4. Features of the CD-ROM

We have spent significant time to produce a resource that is accurate and represents a logical learning process. The CD-ROM demonstrates how to set out and how to complete a discounted cash flow. Further content includes examples of scenarios and sensitivity analyses. Students are able to view a range of options from a simple addition calculation, to the production of a more complex function such as the 'IF' statement within an Excel spreadsheet. The application provides a demonstration and explanation of the steps being completed.

The CD-ROM breaks down the discounted cash flow process into small "learning objects". Attention is variously given to:

- Developing an input table.
- Developing the cash flow underneath the input table.
- Completing the cash flow.
- Completing the NPV and IRR.
- Carrying out a scenario.
- Carrying out a sensitivity analysis.
- Completing a PV assessment.
- Completing more complex equations in a further tutorial exercise.

The many positives of the multimedia resource:

- It is student centred.
- It operates without the presence of a lecturer.
- Advances post-teaching reinforcement.
- It uses discovery.

It is suitable for on-line learning.

It introduces equivalence for internal and extramural students.

It is suitable for practitioners working in the property industry as a learning tool or for use as revision.

Emphasis is on content, speed, interactivity and appearance because we are asking a lot of students to sit and listen, and read and view information.

5. Implementing the resource

From the First Semester of 2004 our CD-ROM will be used in a core second year property management and valuation paper, run in both internal (on multiple campuses) and extramural modes.

The CD-ROM will overcome some of the problems associated with distributing large amounts of data via the Internet, and it will also permit students without Internet access to view the material in a structured learning environment. Through an accompanying WebCT site students will be able to discuss aspects of the discounted cash flow with their fellow students and the lecturer. The WebCT site will also contain self-assessment quizzes allowing student and lecturer to gauge the student's understanding of core concepts and procedures.

Ultimately it would be our goal to create additional on-line tutorials and mastery tests. It would be good to further anticipate where students can go wrong and provide extended hints and feedback.

6. Conclusions

This paper has outlined the development of a CD-ROM resource for use in a property education setting. The CD-ROM will be distributed to students on their enrolment as a learning aid in addition to the standard study guide, textbook and WebCT support. Would we develop the resource again? You Bet! CD-ROMs allow teachers to create interactive presentations through integration of text, images, audio etc. and it can facilitate critical thinking, problem solving, group and networked learning communities' etc. We are currently in the process of adding self-assessment quizzes to an accompanying WebCT site allowing student and teacher to gauge the student's understanding of core concepts and procedures.

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