Multimodal Design and Hybrid Course Materials: Developing a New Paradigm for Course Delivery at USQ

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Abstract: The University of Southern Queensland is currently moving towards hybrid modes of course delivery across all discipline areas, reconceptualizing many current teaching and learning practices as a consequence. As USQ moves towards this CD based hybrid mode of delivery, the need to establish a range of pedagogically sound, cost effective guidelines for the delivery of these materials is regarded as paramount. This paper reports on two research projects that highlight the importance of cognitive style, visualisation and multiple representations on future course designs.

Background

Established in 1967 as a conventional tertiary education institution, the University of Southern Queensland (USQ) became a dual mode institution in 1977 when it began offering courses via distance education. Today, the USQ teaches and researches as a dual-mode university (with on-campus and off-campus student populations) and also with triple-option teaching styles (students can study on-campus or by ‘traditional’ distance education or online via the Internet). It offers well in excess of 100 full degree awards consisting of over 1,000 subjects/courses across five Faculties. The University provides access to educational opportunities to approximately 25,000 students annually, with about 19,000 studying via distance education and the remaining 6,000 on-campus in Toowoomba and Wide Bay. USQ’s student enrolment is truly multi-cultural, with students from more than 115 different countries.

The quality and standing of the University's teaching and learning activities have been widely recognised both nationally and internationally. In 1999, the Executive Committee of the International Council for Open and Distance Learning (ICDE), based in Oslo, Norway, awarded USQ its top prize of excellence. The Council awarded USQ the Inaugural Institutional Prize of Excellence for a dual mode institution in recognition of the University's very significant contribution to providing education at a distance to the world and in recognition of its leadership and innovation in the field of distance learning. In August, 2000 the Prime Minister of Australia announced that the University of Southern Queensland was joint Winner of the Good Universities Guides 'University of the Year' for 2000-2001. The Award recognised USQ's leadership in developing the 'e-university' where students learn and are supported through the innovative and strategic use of educational web-based technologies that encourage e-world expertise. The University has also won a Commonwealth of Learning Award of Excellence for Institutional Achievement at the third Pan-Commonwealth Forum on Open Learning held in Dunedin, New Zealand, in July 2004, specifically for its provision of flexible learning opportunities for people with diverse social and cultural backgrounds.
Since the late 1990s, USQ has embarked upon a range of initiatives designed to improve the infrastructure and systems used to support its wide-ranging activities in teaching and learning, research and its expansion into new international markets. This has involved the careful selection and implementation of various enterprise systems together with the use of horizontal process teams. The results of this approach are now being realised with demonstrable improvements to many University services together with significant cost efficiencies.

USQ has progressively developed its physical and technical infrastructure over its over 35 year history. Its development as a strong community-based regional higher educational institution with a strong focus on student-centred education has positioned it to become a leading innovator in the use of educational technologies. This in turn enabled it to expand its influence as a national and global provider. USQ is both a regional university with strong community links, a flexible education provider offering higher education opportunities for Australians nationally, and an international provider of quality higher education experiences to international students both on-campus in Australia and off-shore. USQ’s mission will continue to be a higher education leader in transnational education which is regionally based and globally focussed (Lovegrove, 2004).

Introduction

At the beginning of 2003, in a major shift in policy, USQ decided that all its courses both on and off campus, would be developed in hybrid delivery modes over the next 3 - 4 years. Central to this new hybrid delivery would be a resource-rich CD-ROM containing all essential study materials supported with multimedia enhancements. The CD would allow direct linking to a course website hosted on USQ’s learning management system (LMS) and in some cases be supported by print material. As USQ moves towards this CD based hybrid mode of delivery, the need to establish a range of pedagogically sound, cost effective guidelines for delivering these materials is regarded as paramount. Consideration of the most appropriate delivery combinations related to each course is currently taking place in many course development teams. This paper reports on the pedagogical issues considered when designing for CD-based delivery and comments on two individual research projects being undertaken with the view of establishing a set of sound process guidelines at USQ.

To help illustrate the design concepts being proposed for CD based delivery, two courses currently being researched have been chosen; ECO2000 ‘Macroeconomics for Business and Government’, run in first semester 2004 and MGT2102 ‘Optimisations Applications II’, run in second semester 2003. Specifically, this paper examines issues involved in redeveloping these courses such as; the role learning styles play in preparing instructional material and the importance of visualisation in the representation of concepts; catering for a multiliterate clientele; and how the use of multiple representations may enhance the learning opportunities for USQ students is explored. Finally this paper will report on the initial research findings from the MGT2102 and ECO2000 courses and reflect on what impacts this may have on the design of future CD based hybrid courses.
Establishing a Need for Multimodal Design

In developing CD based multimedia materials educators are keenly aware that learners, for many reasons, use a variety of learning/cognitive styles to process information. Although most researchers agree that different learning styles exist, and freely acknowledge their significance on the learning process, they are unable to reach consensus regarding the establishment of a single set of accepted principles (Vincent & Ross, 2001). Even with this understanding, current research indicates that many instructional events, particularly at university, only target genetic cognitive styles, or certain types of learners, usually read/write learners (Sarasin, 1999). Unfortunately, this approach inadvertently leads to some students feeling disenfranchised, particularly student’s whose learning modalities do not match the style of the information presentation, which may in turn result in a student’s performance being reduced (St Hill, 2000). As De Porter (1992) states ‘many people don’t even realise they are favouring one way or the other, because nothing external tells them they’re any different from anyone else’ (p. 114). Consequently, some students struggle with the text-based learning materials provided in a variety of traditional learning environments. If however, multiple sensory channels can be allowed for in a presentation, the design of learning materials may become more effective.

An important aspect in catering for a variety of learning styles, particularly relevant in today’s highly visual culture, is the use of images. Stokes (2002) asserts that using visual strategies in teaching results in a greater degrees of learning. Felder and Soloman (2001) agree, further suggesting that if sufficient visual content were included in learning materials students would retain more information. Although visual images are an integral part of human cognition, they have tended to be marginalised and undervalued in today’s higher education systems (McLoughlin & Krakowski, 2001). Unfortunately, in traditional DE courses this problem seems to be exacerbated with students interacting with study books or computer screens containing very few visual references (Sankey, 2001).

However consideration should not be limited to just visual literacy, as literacy generally is on the verge of reinventing itself, and by implication require learners to decode information from all types of media (Grisham, 2001). Once material such as verbal texts (audio), graphs, drawings, photos, videos and other communicative devices are seen as texts to be read, they may then be applied to the development of new, inclusive curriculum (Roth, 2002). Being multiliterate in a society that recognises a full range of learning styles requires the development of theories and strategies for the multiple representation of a whole range of instructional concepts.

The use of multiple representations, particularly in computer-based learning environments, has been recognised for many years as being a powerful way of facilitating understanding (Ainsworth & Van Labeke, 2002). For example, when the written message fails to fully communicate a concept, a visual element may be relied upon. This is further supported by research into multiple representations conducted by Ainsworth (1999) that found, ‘where the learner employed more than one strategy, their performance was significantly more effective than that of problem solvers who used only a single strategy’ (p. 137).

For CD based multimedia, the notion of ‘visual and multiple literacy’ takes on an increased importance. Computer screens are clearly more visual and interactive than traditional media and the use of animated pictures, it would appear, have an enabling function that allows the user to perform a higher degree of cognitive processing than with static pictures (Schnotz, 2002). Therefore, when verbal explanations are presented with animated graphics a greater understanding is achieved than when a single representation is used (Mayer, 2001).

This important feature of multimedia however, if not handled correctly, may prove detrimental to the learning process, as multiple representations on the screen may place additional, and quite often unnecessary, cognitive demands on a learner. For example, learners may have to direct attention simultaneously to different representations, especially if these representations are combined with other dynamic components, such as complicated sound, animated movement and interactive text. Often these demands overburden student cognitive capabilities, resulting in them learning very little.
Two specific cognitive processing theories should be taken into account when considering the design of instructional multimedia. These are Dual Coding Theory and Cognitive Load Theory. Both theories focus on the use of short-term or working memory, where text (auditory or written) and images are processed simultaneously.

Cognitive Load Theory suggests that when large amounts of information are presented at one time the learner can experience overload in their working memory, due to limited capacity. In effect, the learner becomes overwhelmed with what is presented, resulting in a loss of direction and focus (Sweller, 1999). Consequently it is essential that presentations are clear and concise, rather than contain the ‘bells and whistles’ that will potentially impede student learning (Doolittle, 2002). In the context of multimedia, the main factors influencing cognitive load is the overuse of designs incorporating text, graphics and animation. This may steer a learner to the exciting or entertaining aspects of a presentation, but usually at the expense of encouraging the thoughtful analysis of the underlying meaning, interfering with the intent of the lesson (Stokes, 2002). Some cognitive psychologists now acknowledge that a more effective processing capacity is available if instruction can be presented in multiple modes (McLoughlin, 1997), given reasonable constraints are provided.

Dual Coding Theory suggests that the working memory consists of two distinct processing systems, verbal and nonverbal. The verbal system processes narrative (spoken) information, while visual information (both image and text) is processed by the non-verbal system. Thus, one way to enhance the capacity of working memory is to utilise both processing areas simultaneously, allowing both narrative and picture to be processed at the same time (Mayer, 2001), thereby maximising the amount of working memory available. By utilising the human visual system to process information in parallel with verbal information, one can bypass or reduce the ‘bottleneck effect’ that can occur within working memory (Zhang, Johnson, Malin, & Smith, 2002). Utilising illustrations or simple (rather than complex) images can also minimise the load on working memory. Text, by contrast, is read in temporal sequence and requires extra memory to keep all the parts in one place, therefore requiring more cognitive processing (Kirsh, 2002). If text can be presented as audio the learner can listen to a narration while viewing an illustration, thereby utilising both areas of the working memory. In essence, students will learn better from animation with narrative rather than from animation, narration, and on screen text (Doolittle, 2002).

A further advantage that CD based multimedia offers is that a number of different media elements can be included to suit a combination of learning styles. If, for example, the learner is presented with a choice of representations the one that best suits their needs can be selected. Evidence in research conducted by Ainsworth & Van Labeke (2002) suggests that this strategy can significantly improve learning opportunities for students. Jona (2000) believes that this notion of learner choice is a paradigm shift that needs to occur in the delivery of education. If students perceive they have a level of control over their learning experience they are more likely to both enjoy the experience and utilise appropriate information processing approaches (Shu-Ling, 2001). However, one must be careful, as allowing too much freedom may generate a level of insecurity, particularly within the inexperienced learner, leading to increases in cognitive load.
Schnotz (2002) believes, when a presentation is broken down into learner-controlled, stepwise segments, rather than being one continuous presentation, learners can understand a larger number of different concepts. In Fig. 1 we see a screen capture from the MGT2102 course. In this example students are taken through four animated sequences demonstrating how to construct a network flow diagram. Initially led through the presentation in a pre-determined sequence, they are then allowed to experiment with the environment, to see the effects of changing certain perimeters, replaying or jumping to the next sequence if they feel they are familiar with the concept being presented. Student can view the text being narrated by clicking an icon at the top right of the screen. This feature is added for those who prefer to read, rather than listen to, the presentation.

Many universities are involved in the translation of courses to CD and Web delivery. However, instead of utilising the unique attributes of these technologies, most e-courses simply replicate a transmission of information model common in classrooms and traditional DE. Jona (2000) believes that most online courses are simply fancy ‘page turners’, purely being digital presentations of lecture notes, facts and concepts that the learner progresses through sequentially. Sometimes with the aid of a learning management system (LMS) that provides the added advantage of some neat communication tools to help teachers and student interact with each other.

**CD Based Hybrid Delivery**

The CD based hybrid delivery used by USQ has begun the process of reconceptualising how to provide distance education to students. Fig. 2 below illustrates the structure underpinning the Hybrid CD for ECO2000. All the core learning material is created in an XML editor, allowing materials to be rendered to both a navigateable html structure and a series of pdf files, for those students wanting a print friendly version (Fig. 3). The materials that are then further enhanced by the inclusion of supporting multimedia elements contained on the CD and links to relevant material on the internet (Fig. 4).
USQ has chosen to deliver this material on CD as opposed to simply online for a number of reasons. The primary reason being, what has been termed, the ‘tyranny of broadband’ (Bruch, 2003) or the inconsistency of internet connection within Australia. Due to low population densities in most of rural and remote Australia commercial provision of affordable broadband access is problematic with little change expected in the short term (NOIE, 2004, p.4). Given that over 75% of USQ’s students study by distance education, in countries all over the world this is a major consideration, both domestically and internationally. Due to this restriction, it is considered that CD will allow large quantities of electronic information to be provided directly to students, limiting the need for them to access large amounts of core data from the internet. It also allows the University to directly supply a range of multimedia enhancements to study materials.
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The web still plays a significant role in the delivery of USQ’s courses, but more so from the perspective of support, communication and discussion. It is expected that all students have access to the internet to fully participate in their courses. The CD allows USQ to deliver its material at a fraction of the cost of traditional print-based distance education materials. To compensate for the absence of printed materials students are encouraged to use the navigable version of the materials that have been richly enhanced with the additional multimedia elements. If students prefer to print their materials they may do so from the printer-friendly files (Fig. 4) supplied on the CD.

Investigating Student Perceptions of e-Delivery

MGT2102

In 2003 research was conducted on 101 students associated with the MGT2102 course. Students were presented with both a print-based and a multimedia based version of their study materials. They were then asked to respond in a three part questionnaire containing 26 questions. Part A contained 10 questions based on a five choice instrument, with parts B and C, containing an 8 question, 10 point Likart scale instrument.

The data revealed that 80 percent of students found the multimedia version of the materials quicker and easier to use than the printed based version (Fig. 5). 77 percent found the project management concepts contained in the course easier to understand when using the multimedia version (Fig. 6). There was also an extremely high acceptance rating of these materials, with 90 percent of respondents reporting that they found them either ‘good’ or ‘very good’ (Fig. 7). Interestingly when asked if they would prefer to receive most of their learning materials electronically only 17 percent responded positively, with 56 percent preferring to receive a combination of both electronic and print based materials (Fig. 8). Only 5 respondents preferred to receive solely print based material.
It was evident from these results that while many students wanted to retain some level of access to printed materials, it was not necessarily seen as the primary source of instruction. It was also seen, that when concepts were presented in a multimedia format, students generally found them both quicker to use and easier to understand. A complete list of results from this study can be found at: http://www.usq.edu.au/users/sankey/mgt2102/results/results.htm

**ECO2000**

Research into the ECO2000 course began in March 2004. This study has focused on the use of the hybrid CD and, more particularly, the multiple representations of key concepts within the course. At the time of writing an initial short questionnaire of 10 questions, based on a five point Likart scale instrument, had been administered to 130 students. Two focus group sessions had also been conducted with 5 off-campus students and 6 on-campus students. Initial results indicate a very strong acceptance of the multiple representations contained on the CD, but again moderated with a desire to still receive some printed material. Interestingly however, students although indicating this initial
preference for printed materials, would rather receive the CD based version over that of the print version if that were the option.

Further and more extensive research is currently underway. This involves a larger 30 question survey and two further rounds of focus groups. The results of this research will be reported at the conference and may be accessed from: http://www.usq.edu.au/users/sankey/MDML/pages/ECO2000results.htm

Conclusion

USQ has taken a bold step in implementing a policy that will see the production of the majority of its study materials being committed to a CD based hybrid mode of delivery over the next few years. This challenge, if handled correctly, will provide resources to students in a highly user-friendly, pedagogically-sound way and will keep USQ in the forefront of providing distance education and e-learning opportunities for many years to come. It is hoped that through this research a greater understanding of the way students access CD based hybrid course material will be gained. Of particular interest are the ways in which multiple representations are used by students to enhance their understanding of the core concepts contained within these courses and that this research will lead to a greater understanding of the most appropriate way in which to develop future course material. This paper has demonstrated that considering such a change in delivery direction must be thoroughly investigated from both a theoretical and practical perspective. More research in this area is needed but the results to date have been most encouraging.

Reference List


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