MULTIMODAL DESIGN AND THE NEOMILLENNIAL LEARNER

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Abstract

Two courses delivered in 2004 by the Faculty of Business at USQ were part of an initial trial into a new CD based hybrid model of delivery. This represented a change in the way USQ had previously supplied course materials and so it was necessary to ascertain how students responded to this change. This paper reports on findings from this research and demonstrates that higher levels of student engagement are possible, particularly in the context of nationality, age and gender differences. It investigates possible implications for academia when catering for a range of neomillennial learning approaches initially facilitated by the integration of a range of multimodal learning and teaching strategies. It is true 'one size does not fit all', but that does not preclude us from designing learning experiences that cater for a wide range of learners and particularly for those who learn in non-traditional ways whilst utilizing existing technologies.

Keywords
hybrid delivery, neomillennial, learning modality, multimodal design, student engagement. VARK (Visual, Aural, Read/write and Kinaesthetic)

Introduction

This paper outlines the trial of two CD based hybrid courses delivered in semesters 1 and 2 of 2004 by the Faculty of Business at the University of Southern Queensland (USQ); ECO2000 'Macroeconomics for Business and Government' and MGT2004 'Human Development'. More particularly it seeks to demonstrate that higher levels of student engagement are possible, and that course materials can be designed to cater for learners with a range of different learning modalities and backgrounds. It also investigates the implications of catering for a wide range of students, proposing that one approach is to consider the notion of a neomillennial learning approach. 'Neo-' in this context meaning 'new', 'millennial' referring to the learning modality required for the new millennium. This should be done whilst considering the ever increased growth of non-traditional learners in our universities and the problems associated with these students accessing an ever increasing quantity of internet based materials. It is proposed that this approach may initially be facilitated by giving students the opportunity to discover their preferred learning modality and by the integration of a range of multimodal learning and teaching strategies. This hypothesis will be supported with a summary of key points from the research conducted into the two courses mentioned above, drawing on students' comments and their perceptions of these environments.

Differing Approaches to Learning

Taylor (2004) argues that traditional approaches to learning and teaching will not have the capacity to meet the escalating demands of higher education in the future. This is due to the significant societal and technological developments that have resulted in major changes taking

place in the field of higher education (Jochems, van Merrienboer, & Koper, 2004). Changes that have not been restricted to individual institutions, but have occurred on a more global level, with institutions increasingly competing in the international marketplace. On top of this it is also known that, increasingly people learn in very different ways. For example, Oblinger and Oblinger (2005) tell us that 'Net Geners' (those who have grown up with computers, usually under 25) spend so much time online, it seems reasonable to expect that they would have a strong preference for Web-based courses, however, 'the reverse is actually true' (p.2.11). Conversely, older students (Matures and Baby Boomers) are much more likely to be satisfied with fully Web-based courses than are traditional-age students. Oblinger and Oblinger also state that, "at the same time that colleges and universities are graduating their first Net Generation learners, most campuses are experiencing an influx of non-traditional students. Three-quarters of all undergraduates are 'non-traditional', according to the National Center for Educational Statistics" (p.2.8). Non-traditional learners being those who may: come to university later in life, only attend part-time, hold full- or part-time jobs, have dependants, may be single parents, or may not enter with an appropriate tertiary entrance qualifications. Either way, the need for universities to cater for a range of students with different experiences and backgrounds has never been greater, which is why USQ has opted for a move towards a hybrid mode of delivery for its course materials.

Hybrid Delivery

The term 'hybrid' in the educational context embraces a range of approaches to learning and teaching that integrates a number of delivery media facilitated by the proliferation of information and communication technologies (Parsons & Ross, 2002). McDonald et al. (2004) believe that, 'Hybrid learning, has emerged in response to a number of global and educational changes experienced by higher education institutions… including a greater emphasis on lifelong learning, globalization, the advent of the 'Information Age' and a move to a knowledge society' (p.287). This approach was deemed necessary by USQ as 75 percent of its students study off-campus over almost 70 countries requiring study materials to be supplied in many different contexts. More importantly, hybrid delivery is designed to complement the USQs new directions for teaching and learning and outlined in its 'leading transnational university' vision statement (Lovegrove, 2004). In practice, this requires courses with substantial content (mostly undergraduate) to be delivered to students on a CD, supported by a combination of related teaching activities and the University's e-systems.

It might be argued that there is little point in developing an approach to learning and teaching that is so flexible when all the learning resources could very easily, and more cost effectively, be made available online. The main reason for choosing CD based delivery is largely due to the inconsistency and variability of Internet connections both within Australia and in the countries in which the University enrols its students. In China, for example, many students report they can only access the Internet for the purpose of downloading PowerPoint presentations or completing online assessment during the early hours of the morning. Students from countries such as Germany (where USQ has a campus), typically study while commuting on trains and consequently have difficulty accessing the Internet (Sankey & St Hill, 2005). Also in Malaysia, where USQ has over 2500 students, high speed broadband facilities are still very expensive and difficult to find, even in most educational institutions, in fact most schools still rely on dial up technology limited to a bandwidth of 56K (Wan Mohd, 2004). Here in Australia it is expected that rural and remote areas will still not have the same level of access as metropolitan areas for a considerable time (NOIE, 2004). Therefore, as equitable access for students is a major consideration online delivery cannot be realistically considered *en masse*.

The Internet r still plays an important role in USQ's approach to the provision of course content and all students are required to have some form of access. Each course has an online presence (if not completely online) that enables course leaders to supplement the CD with discussion groups (synchronous or asynchronous), announcements and e-mail. However for content rich courses hybrid delivery is designed to limit the amount of time students require this access.

Fundamental to the design of the ECO2000 and MGT2004 courses are the principles of multimodal design. Multimodal information being, 'information presented in multiple modes such as visual and auditory modes' (Chen & Fu, 2003, p.350). This premise is strongly based in research that demonstrates that learners, for many reasons, use a variety of learning/cognitive styles to process information and that students prefer to learn in environments that reflects the cognitive style in which they are most comfortable (Hazari, 2004). The hybrid model makes it possible to provide such a learning environment as it can present information in ways that utilise multiple sensory channels to enhance both students' enjoyment of the learning and ultimately their assessment outcomes (demonstrated below). Chen and Fu (2003) state that, 'multimodal information presentation makes people feel that it is easy to learn and they can maintain attention, which will benefit the learning process and increase the learning performance' (p.359).

In this context, the use of images is highly important, particularly for those entering higher education straight from school, the 'Net Geners'. This is also true in computer based environments where 'visual, displays are frequently useful for representing relationships amongst elements that are difficult to explain verbally' (Shah & Freedman, 2003, p.317). Even though visual images are proven to be an integral part of human cognition, they have tended to be marginalised and undervalued in contemporary higher education (McLoughlin & Krakowski, 2001).

There is also significant support for the potential benefits of utilising multimedia in learning and teaching environments to match students' different learning modalities (Ellis, 2004). For example, if material such as verbal texts (audio), diagrams, drawings, photographs, and videos are regarded as texts to be read, they can be applied to the development of new inclusive curricula (Roth, 2002). It is therefore necessary to develop strategies for the multiple representation of a whole range of instructional concepts to cater for the diversity of learners we have today.

Use of multiple representations, particularly in computer-based learning environments is recognised as a powerful way to facilitate understanding. For example, when the written word fails to fully communicate a concept, a visual representation can often remedy the communication problem (Ainsworth & Van Labeke, 2002). The type of blended learning approach established for hybrid delivery provides a unique opportunity to bridge both generational and cultural factors, providing the face-to-face contact requested by Baby Boomers, the independence preferred by Gen-Xers, and the interaction and sense of community for the Net Geners. (Hartman, Moskal, & Dziuban, 2005).

A further advantage of using a CD is that it allows hyperlinks to different media elements designed to suit a combination of learning modalities. For example, where a learner is presented with a choice of representations the one or combination that best suits that learner can be selected. Research by Ainsworth and van Labeke (2002) demonstrates that this design strategy can significantly enhance learning opportunities for students. Jona (2000) asserted that this kind of learner choice represents the paradigm shift that needs to occur in higher education.

The ECO2000 and MGT2004 courses included a considerable number of learning resources and multiple representations: HTML and PDF texts of the content, multimedia enhancements and links to online resources including the course home page containing discussion groups, announcements and additional presentations. Examples of multiple representations used include, using point-form text with video and audio (mini lectures introducing each topic in the course), animated diagrams with voiceovers, interactive graphs and forms, audio explanations of concepts, and still images.

It can be seen that there is a real need to design learning environments for a range of different learning modalities, However, it is equally necessary to facilitate a student's own understanding of his/her preferred learning modality. To assist in using the hybrid environments of ECO2000 and MGT2004, students were encouraged, early in the semester, to complete a VARK learning styles inventory (Fleming, 2001b). VARK stands for Visual, Aural, Read/write and Kinaesthetic. Fleming (2001a) considers that everyone has a preferred learning modality and in many cases a combination of learning modalities (are multimodal). However, it is also seen that within this multimodality most people have some measure of preference for one modality over another. This preference influences the 'characteristics and preferred ways of gathering, organising and thinking

about information' (Fleming, 2001a, p.1). The VARK inventory was made available on the course CDs along with a series of study tips based on the four modal preferences.

Student Perceptions of Hybrid Delivery

Research into students' perceptions of the ECO2000 and MGT2004 environments commenced in March 2004, primarily focussing on the use of the CD and related multiple representations. In week 3 two surveys were administered: a self-reporting learning styles inventory (VARK); and a ten-item questionnaire. Focus groups were also conducted for on and off-campus students. In week 14 a longer survey of 31 items was administered and a further set of focus groups convened. From the total student population (from both courses) of 288 the resultant usable data set contains responses from 170 students (not all students responded to all questions in week 3), 62 from ECO2000 and 108 from MGT2004. (107 females and 63 males). These figures fall within the recommended sample size required for this type of survey research (Gomm, 2004). As this paper can only accommodate a summary of the data, further research results (both quantitative and qualitative) may be accessed at http://www.usq.edu.au/users/sankey/hybrid.htm.

For the purpose of this study mature age students were classified as those aged 30 years and above (30+), making up approximately one third of the data set. 118 students were Australian (69%) with the remainder coming from 14 other nations. There was no significant differences found between Australian and international students in relation to age, gender or modal preference, however differences were found in relation to students' modal preferences and their use of the learning environment and the perceived value of the multiple representations.

Learning Modality
In week 3 of semester the majority of students (68%) identified that they felt confident that they could make the most of their learning material having identified their learning modality. When asked, 'now that I have identified my learning preference I feel more confident that I can make the most of my learning materials', 7% of students disagreed, while 25% were unsure (see Figure 1). There was a slight difference found between the two courses (72% ECO students agreed, 66% MGT students agreed), but a noticeable difference between male and female respondents, 74% of females reported they felt more confident against 59% of males.
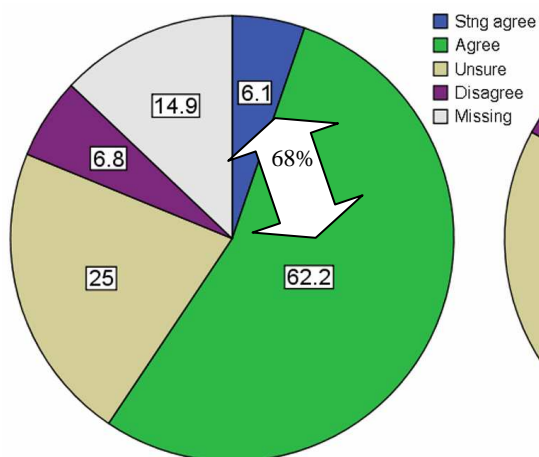

Figure 1. Question 6 from survey 1 conducted in week 3 of semester
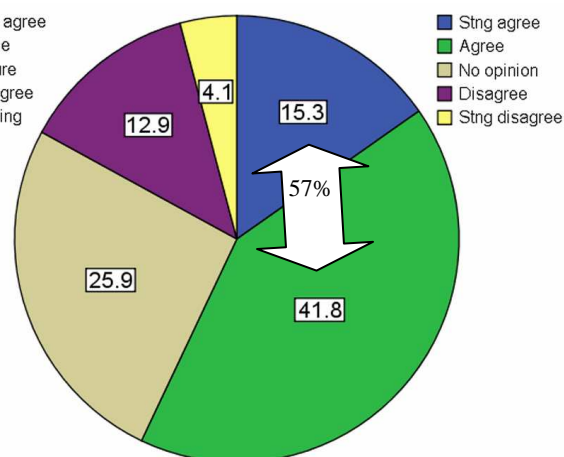
Figure 2. Question 13 from survey 2 conducted in week 14 of semester

There was also a greater awareness of the CD suiting their learning modality, from off-campus and international students due to these students receiving an enhanced level of support facilitated by the addition of the multimedia enhancements. The Australian on-campus students on the other

hand continued to rely more on lectures and tutorials. These sentiments are typified by the following three comments made by; an on-campus Australian student; an international student; and an Australian off-campus student.

> *I think the materials cater to a wider range of learning styles, but I've found because of my learning style I prefer to have something concrete to read and that sort of thing, that it takes more time to work through the activities that are on the CD. (M022)*
> *The CD is more interactive it helps me a great deal as it addresses all my ways that I prefer. I am personally a slow learner and especially when it comes to reading I take all my time struggling to grasp the contents but with the interactive and aural its easier for me when reading as I read what has been said or explained to me. It has really decreased the time I spend on reading and I feel I am doing my studying effectively and a lot is sticking in my mind more than before. (M004)*
> *I found this suited my obvious aural preference to study. I think noting these few modules, the interactive CD and Intro videos will prove to supplement this learning style. (E110)*

In week 14, when asked if the VARK survey had helped them understand their approach to learning, the level of overall agreement was 57% with 17% in disagreement and 26% expressing no opinion (see figure 2). In a similar way to week 3 ECO students responded in agreement (63%) more often than did the MGT students (54%), as did off-campus students (69%) against on-campus students (51%) and females (60%) against males (52%). Interestingly, those with a kinaesthetic modal preference responded above the norm (57%) with 65% in agreement, while those with a read/write preference responded below with 52%. 'M151', an off-campus 30+ male student and 'M053', an off-campus female Malaysian student under 30 made these comments:

> *The CD gave catered for a range of learning styles so that all students would derive some benefit. The actual content of the material was good in terms of the variety and depth coupled with examples. (M151)*
> *One advantage that I found is that it enhances one's study experience as it offers a different style in delivering the study materials. (M053)*

What became apparent however from the qualitative data was that many students had never previously identified their learning modality before this. For example one student said:

> *I hadn't even thought about [this] before doing the VARK test, I hadn't even considered the different types of learning. I just did whatever or did nothing kind of thing. So even just looking at what time of day I study best or location and everything like that, it really helped me to become aware of it, and therefore I could start to use that when looking at when I am going to study and how I do go about it. So yeah, it did help me a lot. (E120)*

This finding came as a bit of a surprise, as many of the students were in their second year at university studies and had not, up to this point, established a preferred way of learning. However, two clear advantages were seen in proving an opportunity for students to establish their preferred learning modality. These are, firstly to aid those who previously had no understanding of how they learned and subsequently gained some benefit and secondly, that this process served to confirm their learning modality giving those students more confidence in their approach to learning. Clearly it is difficult to effectively cater for every different learning modality of modal preference in what is presented in course materials, however, what can be done is to help facilitate student awareness that there are things they can do to help themselves.

Multiple Representations
In week 3 students were asked to respond to the following statement: 'I find the interactive elements on the CD, like the introductory videos for each module and the multimedia explanations of the equations, very helpful in learning the course material' students overwhelmingly agreed (73%) with this statement (see Figure 3). On-campus students did not agree as often as off-campus students, but this is understandable given these students had the advantage of attending lectures and tutorials. Nevertheless, still well over half (64%) of the on-campus students agreed. 79% of

off-campus students agreed (23% strongly agreed), a weight of sentiment was further highlighted in the focus groups with students reflecting:

…when I just read it [the materials] I don't always understand it but when you have it [see it] spoken and explained it is better. (E124)
…when you look at it in different ways it reinforces it in your mind (E121)
…It gives you a different way of learning so you can do your hard copy reading and all that type of thing, but to have it actually to listen to it reinforces what you have actually been reading as well. (M104)

These comments give a clear indication that each student used a combination of strategies to comprehend the concepts. Each mentioned reading and noted that the further representation either explained the concept better or served to reinforce it. This reinforcement may have come from using either a combination of representations or by repeatedly using just one. Interestingly, a higher percentage of 30+ students agreed more often than younger students. International students also agreed more often than Australian students. Typical of their comments:
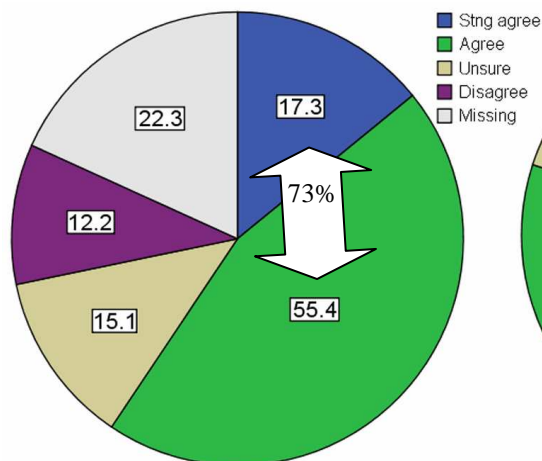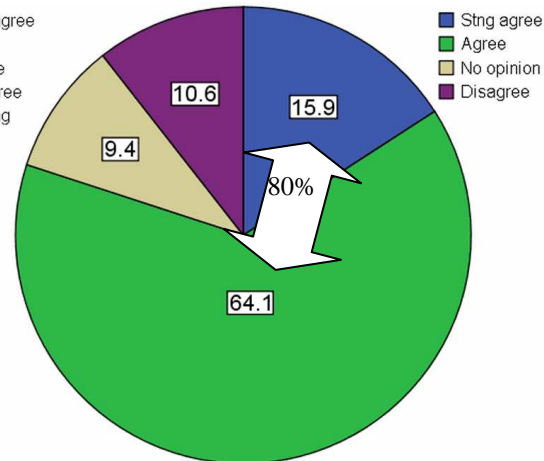

| *Figure 3. Question 9 from survey 1* | *Figure 4. Question 1 from survey 2* |
| *conducted in week 3 of semester* | *conducted in week 14 of semester* |

I think it is because some of the Indonesian students' English is not that good and they can actually repeat the audio with PowerPoint slides and they can understand better. (M006)
…You can get bored sometimes by looking at the same page but with the audio and video intro you can listen to the voice of the lecturer which helps you understand faster rather than reading the book. Sometimes the writing in the book you may not be so familiar with, you don't understand it instantly compared to that [the introductions]. (E009)

Clearly the additional support offered by the aural material and the ability to replay the content was considered extremely helpful in relation to understanding the concepts and aided their understanding of the English language and so was used to complement (reinforce) their reading.

In week 14 students were asked a series of questions to indicate whether they felt that multiple representations, had actually catered for their approach to learning. This was based on the demonstrated assumption that each student had identified his/her preferred learning modality earlier in the course and that this had been actively reinforced by the lecturing staff. Question 1 of this survey asked students to respond to the following statement: 'The animations/MR's catered for my approach to learning'. This was a similar question to that asked in survey 1 the responses to which are seen in figure 4.

It became clear that the strong support for the use of multiple representations evident seen in week 3 continued into week 14, and in some cases became even stronger, indicating that students not only found them helpful to their learning, but in some cases invaluable. In the qualitative data pool, 62 students mention the fact that the multiple representations were helpful to their understanding of the concepts. For example:

> *The advantages are obviously having all those different options available for the different modes of presentation. The explanation of diagrams and stuff like that are invaluable. I study a lot late at night so I'm not able to contact people. So that side of it is really good for me. (M010)*

One feature of the multiple representations that continued to generate the most positive comments, both from on and off-campus students was the use of audio. This benefit was mentioned by a substantial 35 students within the qualitative data pool and typified in the following comment:

> *…you can interpret things differently when you read it. When you get somebody explaining it to you through the audio it's like, 'oh that's what they mean by it'. You can definitely read things and they can be interpreted in a different way. (M009)*

This further highlights the point of using multiple representations for reinforcement. It was seen in the above comments that the audio was used to complete the picture by contextualising what had been read. A substantial 45 students made mention of this fact of 'reinforcement' either in the focus groups or in response to the open ended survey questions. This is also supported in the following two comments, one by an off-campus student and the other by an on-campus student:

> *I found the biggest advantage of the CD was that it presents material in a different way. Like if you are struggling to get a concept from the written material it was presented in a different way and that sometimes makes it clearer. (M045)*
> *It is almost like looking at the same content from a few different angles. And the more you do that and look at it using the different media it makes for a much more dynamic and powerful learning experience. (E011)*

In these two comments lies the essence of what is seen as the advantage of supplying core information in more than one way. That is, the use of multiple representations can aid in making concepts clearer and in so doing enhances the opportunity for learning from the material, or in the words of M009: *"the more options the better off you are at learning what you are trying to learn".*

Overall it can be seen that there was a strong acceptance of the use of multiple representations and the multimedia introductions in the hybrid learning environments. This was demonstrated both in the survey responses and in the qualitative comments. As a possible consequence of the value of this strategy, both courses experienced a marked improvement in the overall grades. This result was true when compared to both with the previous and the previous four offers. For example, the fail rate for the previous offer of ECO2000 was 15.1% with an average over the previous four offers of 13.5%. This fail rate fell to 7.6%. Likewise, the last offer of the MGT2004 course had a fail rate of 21.7% with an average over the previous four offers of 25%. The fail rate for this offer fell to 15.6%. Fewer students also deferred their assessment, down from 9% to 7%. Consequently 10% more students attained passing grades over all. Clearly this improvement will need to be demonstrated over future offers of these courses and further statistical analysis will be necessary before a solid claim of significance can be made. However, these initial results are extremely pleasing and are worthy of continued investigation.

Conclusion

The design of the two courses described in this paper aimed to provide resources to students in a form that may suit their preferred learning modality. Surveys and focus groups, and assessment results indicated that the aim was achieved. Of particular interest was the way students used the multiple representations to reinforce and their by enhanced their mastery of the concepts being

represented. It may be concluded from this analysis that the use of multiple representations can make learning environments more comprehensive, more interesting and more effective. This may be achieved by providing a more complete representation of the information being presented thereby increasing the opportunity of students to engage with the materials, and in so doing cater for a broader range of learning modalities. This is further aided by giving students the opportunity of understanding their own approach to learning. This is demonstrated by the weight of both quantitative and qualitative agreement by students. These results will be used to further develop the resources available on the hybrid CD and in an effort to further improve the learning experience and assessment outcomes of students.

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