

Maintaining a balance whilst building momentum: Designing for millennial learners and everyone else

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Abstract

This paper reports on the findings of a research project investigating two CD-based transmodal learning environments delivered by the Faculty of Business at the University of Southern Queensland. It demonstrates that higher levels of student engagement are possible when utilising multiple representations to cater for a range of millennial and transnational learning styles, whilst also maintaining a balanced environment for more traditional learners. This is initially facilitated by the integration of a range of multimodal learning and teaching strategies, supported by online engagement and further informed by an awareness of an individual's modal preference. It is true that 'one size does not fit all', but that does not preclude us from designing learning environments and experiences that cater for a wide range of learners and particularly for those who learn in non-traditional ways.

Keywords

multimodal design, learning styles, transmodal, multiple representations

Introduction

The University of Southern Queensland (USQ) is a dual-mode institution with 'triple-option' teaching modes (on-campus, distance education, and online). It is currently the second largest distance education provider in Australia (see Table 1), with a total student population of some 26,000 students and with almost 70 nationalities being represented across the student body. For more than a quarter of a century USQ has been providing opportunities for distance education and in doing so has adopted a range of instructional design and delivery approaches, namely:

- Correspondence — printed materials delivery (traditional distance education).
- Multimedia — print-based, but supplemented by audiotape, videotape, computer-based learning and interactive video.
- Telelearning — videoconferencing, audiographic communication, broadcast TV/radio, and audioconferencing.
- Flexible learning — interactive multimedia, Internet-based access to WWW resources, and computer-mediated communication.

Table 1: The top 10 providers of distance education in Australia for the year 2004

BIG TEN			
Distance Ed Providers 2004		Distance Ed students	% of total
1	Charles Sturt University	21,213	18.5%
2	University of Southern Queensland	15,433	13.4%
3	The University of New England	11,863	10.3%
4	Deakin University	9,788	8.5%
5	Monash University	7,963	6.9%
6	Central Queensland University	5,682	4.9%
7	Southern Cross University	4,274	3.7%
8	University of South Australia	3,700	3.2%
9	Queensland University of Technology	3,245	2.8%
10	The University of New South Wales	3,126	2.7%
	Other Universities	28,650	24.9%
Total		114,937	100.0%

Source: DEST; Ian Dobson (cited in Vergnani, 2005)

Elements of all of these four generations of distance delivery are still present in various forms along with traditional on-campus lectures/tutorials. However, it has become increasingly clear that maintaining so many different approaches is economically unsustainable. Aligned with this concern is the increasing demand from off-campus students to be provided with more than simply a correspondence model.

As a consequence, the University announced a change in policy in early 2003. Under the new policy all courses, whether offered on-campus or off-campus, would be moved progressively towards a so-called hybrid or 'transmodal' delivery model. In this context, 'transmodal' is to be interpreted as a resource-rich learning environment supported by well-integrated institutional e-systems and a combination of teaching support (Smith & Sankey, 2005). The centrepiece of this delivery (in most cases) being a resource-rich CD containing essential learning resources, support materials and significant multimedia enhancements. The CD allows direct linking to course web sites hosted on the University's learning management system (USQConnect) and to additional web-based resources such as publisher's web sites and library resources. As of 2005, transmodal courses have been developed and are being trialled across a range of different discipline areas.

In moving to a transmodal model the University recognised that it would be necessary to identify a range of pedagogically robust approaches to the instructional design for this delivery mode. Two courses, ECO2000 'Macroeconomics for Business and Government' and MGT2004 'Human Development' (delivered in Semesters 1 and 2 of 2004 respectively), were chosen to be part of an initial trial of this delivery mode. This paper provides background to the trial, discusses the rationale and pedagogy involved in the design of the two courses and reports on some of the findings of an associated research project, discussing outcomes from surveys, focus groups and student assessment outcomes.

It will be demonstrated that higher levels of student engagement are possible when utilising a hybrid or transmodal style of delivery, particularly when multimodal learning principles can be applied to these environments. Principles that integrate a range of learning and teaching strategies, supported by online engagement and further informed by an awareness of student's individual modal preferences. In practice it will be seen that when multiple representations are included to cater for a range of millennial and transnational learning styles, whilst also maintaining a balanced environment for more traditional learners, students from a range of backgrounds respond very positively. It is true that 'one size does not fit all', but that does not preclude educators from designing learning environments and experiences that cater for a wide range of learners and particularly for those who learn in non-traditional ways.

Rationale for transmodal delivery

Transmodal delivery at USQ has its genesis in the principles of hybridised learning environments. The term 'hybrid' in the educational context embraces a range of approaches to learning and teaching that integrate a number of delivery media, mainly facilitated by the proliferation of information and communication technologies (Parsons & Ross, 2002). This approach has allowed considerable expansion of support mechanisms for both on-campus and off-campus students and has made them available *en masse* (Cookson, 2002).

This approach was deemed necessary as USQ study materials are delivered in many different contexts; on campus in Toowoomba and Wide Bay; for students studying at preparation level through to postgraduate; to international agents and partners; to independent and corporate groups of students. More importantly, transmodal delivery is designed to complement the University's new directions for teaching and learning and its 'leading transnational university' vision (Smith & Sankey, 2005). In practice, this has required delivery primarily based on a CD, supported by a combination of relevant 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 the learning resources could very easily, and more cost effectively, be made available online. The main reason for choosing to deliver by CD is primary due to what has been termed the 'tyranny of broadband' (Bruch, 2003), or the inconsistency and variability of Internet connections both within Australia and in many of the countries in which the University enrolls students.

In China, for example, many students report that 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 other countries, such as Germany (where USQ has a campus), typically study while commuting on trains and consequently have difficulty in accessing the Internet (Sankey & St Hill, 2005). Also in Malaysia, where USQ has well over 2000 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). 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 period of time (NOIE, 2004).

Given the unreliability and/or difficulty of access, linked with the fact that over 75 per cent of USQ's students study off-campus, spread over almost 70 countries, the delivery of high quality web-based learning resources is problematic. Therefore, as equitable access for students is a major consideration online delivery cannot be realistically considered *en masse* until a consistent level of broadband technology is available. The CD thus offers the most reliable and equitable platform for the delivery of resource rich learning materials for the foreseeable future.

A further advantage of the CD-ROM also allows considerable standardisation among courses, i.e. the look and 'feel' of core generic information such as the University Handbook, Student Guide, 'getting started' information, help files, software updates and plug-ins can all provided on the CD and are consistent across all courses. The CD-ROM also contains specific course elements such as introductory materials (course specification, assessment schedule, sample examination paper, etc.), a study guide, study modules, selected readings, multimedia elements, PowerPoint presentations (sometimes with voice-over), interactive quizzes, case studies, reference lists, and web links.

The Internet still plays an important role in USQ's approach to course delivery and all students are required to have some form of access. However, transmodal delivery is designed to limit the amount of time students need this access. Each course the University offers has an online presence found on the students own electronic 'Study Desk' on 'USQConnect'. This enables course leaders to supplement the CD with discussion groups (synchronous or asynchronous), announcements, and e-mail. In addition, USQConnect provides students with access to library services, the USQ Bookshop, USQAssist (for information about University systems and courses), and USQAdmin (for enrolment, access to results and personal details). The Study Desk varies among courses depending on each course leader's approach.

Pedagogy and the transmodal CD-ROM

Fundamental to the instructional design incorporated in the transmodal CD-ROMs for ECO2000 and MGT2004 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). Although most researchers agree that different learning styles exist and readily acknowledge their significance, current research indicates that many instructional events, particularly at the higher education level, only target generic cognitive styles, or certain types of learners, particularly read/write learners (Sarasin, 1999). This has led to some students feeling disenfranchised, especially students whose learning preferences are not matched by the style of presentation, which, in turn, may impede their performance (St Hill, 2000).

The transmodal model makes it possible to provide a resource rich learning environment, one that presents information in ways that utilise multiple sensory channels to enhance both students' enjoyment of the learning experience and ultimately their assessment outcomes. Chen and Fu (2003) state that, 'multimodal information presentation makes people feel that it is easy to learn and they can maintain long attention, which will benefit the learning process and increase the learning performance' (p. 359). In this context, the use of images is important, particularly for those entering higher education straight from school, the 'millennial' or 'Net Generation' (Oblinger & Oblinger, 2005). Stokes (2002) argues that using visual content in teaching can actually improve learning outcomes. This is particularly 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). Although visual images are an integral part of human cognition, unfortunately they have tended to be marginalised and undervalued in contemporary higher education (McLoughlin & Krakowski, 2001).

This discussion however cannot be limited to visual literacy because learners in contemporary societies are required to decode information from a wide variety of media (Grisham, 2001). There is also significant support for the potential benefits of utilising multimedia in learning and teaching environments to match students' different learning styles (Ellis, 2004). For example, if material such as verbal texts (audio), diagrams, drawings, photographs, and videos are regarded as texts to be read and understood, 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 multiliterate and multicultural society that we have today.

Use of multiple representations, particularly in computer-based learning environments is recognised as a powerful way to facilitate understanding, e.g. 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 transmodal delivery provides a further 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 desired by Net Geners (Hartman, Moskal, & Dziuban, 2005).

However, representation of information in multiple ways in the electronic environment needs to be handled carefully as excessive cognitive demands may be placed on the learner. If, for example, learners have to direct their attention simultaneously to different representations that combine dynamic components, such as complicated sound, animated movement and interactive text, their cognitive capacity can be overburdened resulting in them learning very little (Bodemer & Ploetzner, 2002). If multiple representations are to be used then important issues concerning cognition first need to be considered.

Two theories are worth considering in the design of the transmodal model, namely cognitive load theory and dual coding theory. Cognitive load theory suggests that when large volumes of information are presented simultaneously, the learner can experience overload in their working memory, owing to limited working memory capacity. In effect, the learner becomes overwhelmed with what is presented, resulting in a loss of direction and focus (Sweller, 1999). Therefore, it is essential that learning material is clear and concise as the 'Bells and whistles' can often impede learning (Doolittle, 2002). In the context of multimedia, the main factors influencing cognitive overload are designs incorporating text, graphics and animation. Although these might focus the learner on the exciting or entertaining aspects of a presentation, the learner often bypasses thoughtful analysis of the underlying meaning (Stokes, 2002).

Dual coding theory on the other hand suggests that the working memory consists of two distinct processing systems, one verbal and the other nonverbal.

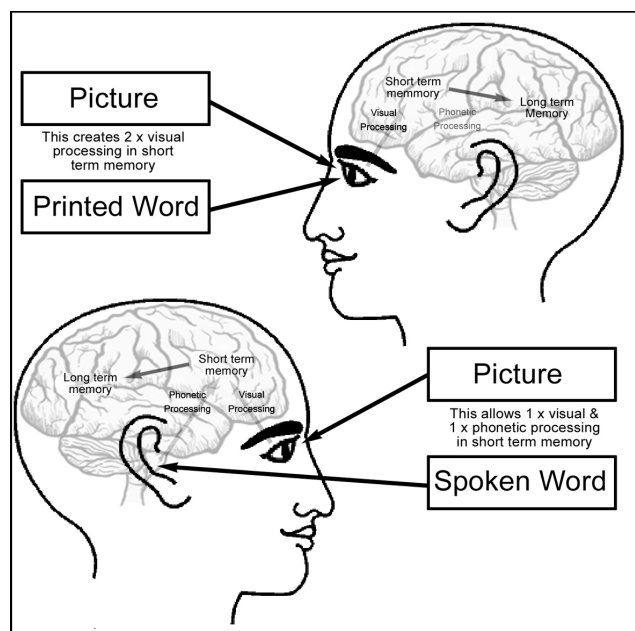


Figure 1: If picture and spoken text are used together working memory can process the two representations concurrently.

The verbal system processes narrative (spoken) information while the nonverbal system processes visual (image and text). Therefore, one way to enhance the capacity of working memory is to utilise both processing systems simultaneously (Mayer, 2003). By using the human visual system to process information in parallel with verbal information (see Figure 1), it is possible to bypass or reduce the 'bottleneck' effect that can occur within working memory (Zhang, Johnson, Malin, & Smith, 2002). For example, if text can be presented in audio format, the learner can listen to a narration while simultaneously viewing an illustration, thereby using both areas of the working memory. Clearly, a CD offers a very suitable delivery platform for this kind of media rich presentation.

A further advantage of using a CD is that it allows hyperlinks to different media elements designed to suit a combination of learning styles, e.g. 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. If students have a degree of control over their learning experience they are more likely both to enjoy the experience more and adopt appropriate information processing approaches (Shu-Ling, 2001).

The ECO2000 and MGT2004 transmodal environments have included a considerable number of learning resources and multiple representations: HTML and PDF texts of the content, multimedia enhancements (see Figures 2 and 3), a complete web site to support the required text book, links to online resources including USQConnect that hosts a course home page containing discussion groups, announcements and additional PowerPoint presentations. The intent was to represent key concepts of the course in multiple ways to cater for a range of different learning preferences. Examples 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. All of these use the Macromedia 'Flash' plug-in and fully utilise the features of HTML to allow contextual linking within the learning environment. This material will be demonstrated at the conference.

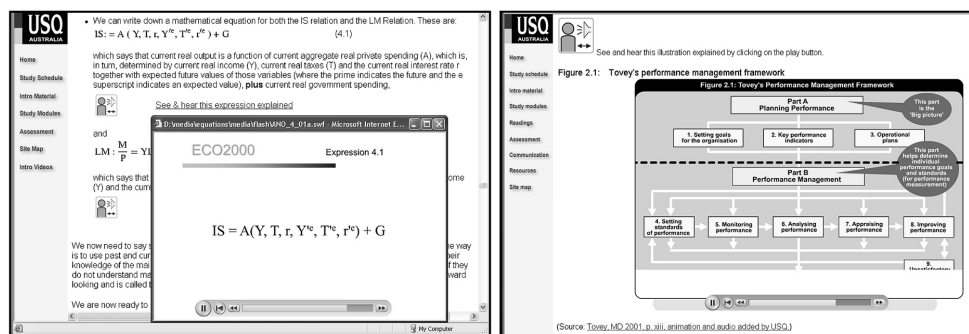


Figure 2: Example of the multiple representations used in ECO2000 (left) and MGT2004 (right)

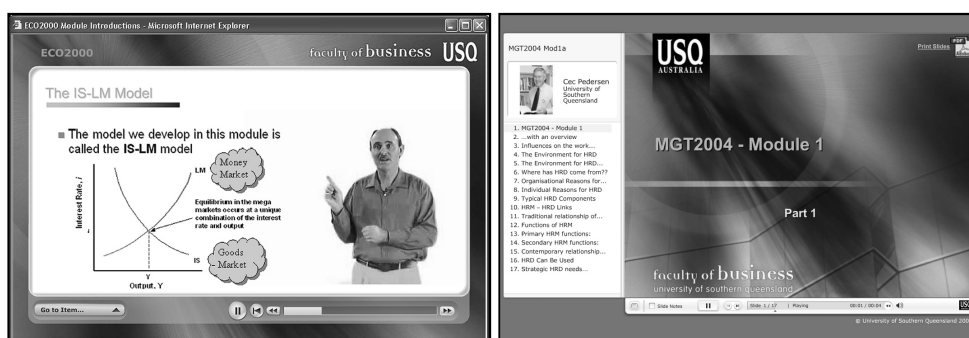


Figure 3: Multimedia introductions using a combination of PowerPoint with video (left) or audio (right)

In order to assist students in using multiple representations they were encouraged to complete a VARK learning styles (modal preference) inventory (Fleming, 2001) in the third week of the semester. This was intended to help them identify the representations that best suit their modal preference. The inventory was available on the course CD and was automatically scored. The CD contained a further series of study tips based on the four modal preferences (Visual, Aural, Read/write, and Kinaesthetic).

Student perception of transmodal delivery

As noted above, ECO2000 and MGT2004 were two courses used to trial transmodal delivery. Research into students' perceptions of this delivery method commenced in March 2004, focusing primarily on the use of the CD and associated multiple representations. In Week 3 of each semester two surveys were administered: a self-reporting learning styles inventory, and a ten-item questionnaire using five-point Likert type scales. Two focus groups were also conducted, one each for on- and off-campus students. The focus groups were also used to triangulate data from the ten-item survey. In the final week of the semester a longer survey of 31 items (both quantitative and qualitative) was administered. As in Week 3, focus groups were again convened. The main objective of this survey and focus groups was to more closely examine student perceptions of the learning material, particularly the use of the CD-based environment, the use of multiple representations and multimedia elements.

From the total student population (from both courses) of 288 the resultant usable data set contains responses from 170 students, 62 from ECO2000 and 108 from MGT2004 (107 females and 63 males). Gomm (2004) suggests that, for a population size of 300 the required sample size would be 169 participants. Hence, this figure falls within the recommended sample size required for this type of survey research. As this paper can only accommodate a summary of the data, full details of the questions asked of students, demographic details and further research results 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+), who comprised approximately one third of the data set. The majority of the 30+ group were female students studying off-campus. 118 students were Australian (69%) with the remainder coming from 14 other nations. The second largest national grouping was a cohort of 30 Malaysian students making up 18% of the sample. 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 their use of the learning environment and the perceived value of the multiple representations.

By the last week of semester students were indicating that they preferred the CD to printed learning resources, indicating that they would prefer to be supplied with the CD rather than printed materials if they had a choice and could easily access (buy) a printed version. The majority of comments made by students relating to the CD were of this complimentary nature, such as:

"I believe the study materials for this course need no improvement as they are the best I have ever experienced during my studies." (E023)

"Commendations! This material was the most superior learning package I have ever been able to use for distance education...I hope all courses at USQ adopt this form of study materials." (M048) [real names have been coded for anonymity]

In Week 3 students in both courses overwhelmingly either agreed or strongly agreed (73%) that the multiple representations were very helpful in their learning the materials (see Figure 4). On-campus students did not agree as often as off-campus students, but this is understandable given the question referred to the multiple representations being 'very helpful', and these students had the advantage of attending lectures and tutorials. Nevertheless, still well over half (64%) of the on-campus students either agreed or strongly agreed. 79% of off-campus students agreed or strongly agreed (23% strongly agreed).

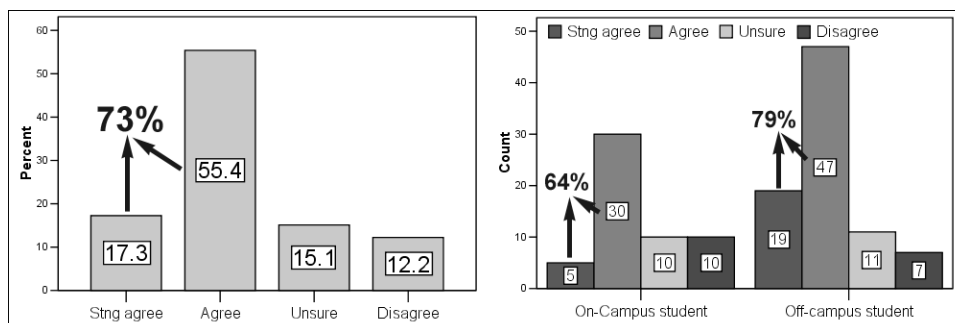


Figure 4: Percentage of agreement for both courses and mode of study

This 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. Further comments made by on-campus students clearly indicated a preference for the face-to-face experience while at the same time acknowledging the importance of using the multiple representations to aid their understanding:

“I feel that I have been helped immensely...you can actually see how certain variables can change the graphs such as interest rates or whatever is happening; instead of looking at two still pictures in the textbook, you can actually see what those lines mean and how they change when these things happen.” (E015)

“...it's great to have all the different representations to get the picture as a whole.” (M123)

“I think that it will increase our chances of understanding in a much better way. It provides something for every kind of learner.” (M119)

“I think it is absolutely imperative that you have different ways of learning so that it's not disadvantaging one particular group or forcing someone to learn in a way they are not comfortable with.” (M011)

Again, these comments demonstrate a strong recognition of the perceived advantages of using multiple representations to help form understanding ('get the picture as a whole'), and also demonstrate an altruistic concern for other students who may not learn in the same way, a sentiment repeated many times in the on-campus focus groups.

Interestingly, a higher percentage of 30+ students agreed more often than younger students. In the context of the question this should not be surprising given the high percentage of 30+ students studying off-campus and of this group the high percentage of those identifying themselves as V.A.R.K (multimodal). International students also agreed more often than Australian students. Typical of their comments:

“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 compliment (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 their preferred learning modality earlier in the course and that this had been actively reinforced by the lecturing staff. In the qualitative data pool, 62 student's made mention of the fact that the multiple representations were helpful to their understanding of the concepts, compared to seven students who did not find them helpful. From those participating in the focus groups it became clear that the strong support evident in Week 3 continued into Week 14. In some cases the acceptance level became even stronger, indicating that students not only found them helpful to their learning, but in some cases invaluable, as this comment indicates.

“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)

When students were asked to rate their response to the statement (Question 1): 'The animations/multiple representations catered for their approach to learning', an extremely high 80 per cent of students either agreed or strongly agreed. As seen in Table 2, There was however a noticeable difference in the ratio of agreement between the two courses. For ECO2000 92% of students agreed as against 73% of the MGT2004 students. A possible reason for this discrepancy is that the multiple representations used in the courses were different. In ECO2000 the presentations on the whole were generally shorter and there were more of them. For example, they dealt more specifically with the concept of an individual equation, as opposed to the longer explanation of a broader concept, of say a theoretical model, as was the case in MGT2004, as seen in Figure 3 above.

Table 2: Levels of agreement for both courses and individually for Survey 2, Question 1

Question 1	Frequency	Cumulative %	% in ECO2000	Cumulative %	% in MGT2004	Cumulative %
Strongly agree	27	15.9	19	19	14	14
Agree	109	80.0	73	92	59	73
No opinion	16	89.4	8	100	10	83
Disagree	18	100	0	100	17	100
Total students	170		19	19	14	14

Again, when students were asked to respond to the statement (Question 5): *'The multimedia introductions catered for my approach to learning'*, it can be seen (in Table 3) that a much higher percentage of ECO2000 students responded either in agreement or in strong agreement (71%) as against the MGT2004 students (56%). There are two plausible explanations for this. Firstly, the introductory presentations differed in length. The ECO2000 introductions were between 9 and 12 minutes, whereas MGT2004 presentations were between 12 and 17 minutes. Secondly, the multimedia presentations for each course utilised a slightly different combination of media. The ECO2000 presentations used a combination of PowerPoint and a video of the lecturer presenting the material, while the MGT2004 presentations utilised a combination of PowerPoint and audio (Breeze) with a still image of the lecturer being present (see Figure 3). Consequently, the MGT2004 presentations tended to have less visual impact and as a result were slightly less engaging.

Table 5: Levels of agreement for both courses and individually for Survey 2, Question 5

Question 5	Frequency #	Cumulative %	% in ECO2000	Cumulative %	% in MGT2004	Cumulative %
Strongly agree	39	22.9	34	34	17	17
Agree	65	61.2	37	71	39	56
No opinion	35	81.8	19	90	21	78
Disagree	30	99.4	10	100	21	99
Strongly disagree	1	100	0	100	1	100
Total students	170		62		108	

The use of the video over audio appears to be the stand out difference between the two types of presentation. But a presenter needs to be extremely sure in front of a camera before attempting to use video in this way. The use of audio in most cases is more realistic, but it would be useful to investigate how these can be made more interesting, perhaps by using more intonation or multiple voices.

Also of interest is the responses made by students with different modal preferences. The 58 students who identified themselves as multimodal on the VARK instrument were skewed towards agreement for all questions relating to the helpfulness of the multiple representations. On the other hand, responses by the 23 students who identified themselves as read/write learners were skewed towards disagreement (though a majority still agreed), citing mainly a lack of access to the print based resources as their main concern. However, on closer inspection it can be demonstrated that R students they were not necessarily rejecting the use of the multiple representations. Instead, they saw them more as an additional resource to aid their learning. This is seen in the following comments made by R students:

"Helped me to understand the concepts better, a good compliment to the text." (E045)

"I used the audio a lot; I thought that was probably the best feature of the CD. I also printed out all the material, but it's also good to have that there in case you need it." (M014)

These responses demonstrate that R students did see the benefit of presenting materials in this way and indicated that they were happy to receive materials in this form, so long as they could also have easy access to a printed version. Clearly, for these students the multiple representations were being utilised primarily as a resource to support and reinforce the printed materials.

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. This is typified in the following comment:

“... if I had trouble understanding something from the hard copy I’d go and find other means of understanding...mainly the audio.” (M009)

The researcher then sought further clarification by asking:

“So having an additional representation of information you found helpful?” (MS) “Definitely, 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 reinforces the point made earlier in relation to the Week 3 data; that is, the importance 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 from an off-campus MGT2004 student and the other from an on-campus ECO2000 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 transmodal learning environments used in this study. This was demonstrated both in the survey responses and in comments made by students. This acceptance was consistently positive both in Weeks 3 and 14. There was no evidence in the student responses to suggest that cognitive overload was a problem.

Improvement in final grades

The final grades attained by students in the two courses do show a significant improvement from the previous offers of these same courses. This result is true when compared with both previous year’s results and those of 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 time the fail rate fell to 7.6%. The same is true for MGT2004; the last offer of this course had a fail rate of 21.7% with an average over the previous four offers of 25%. This time the fail rate fell to 15.6%. Figure 5 illustrates how the combined failure rate fell from 20% to 12%. Fewer students also deferred their assessment (IS), down from 9% to 7%. Consequently, 10% more students attained passing grades over all.

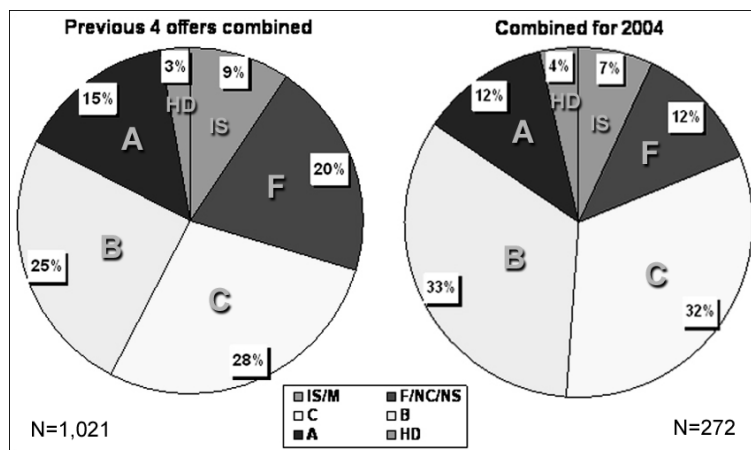


Figure 5: Comparison of final grades from past four offers in 2004 (all students)

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 certainly worthy of continued investigation.

Conclusion

It was seen in the feedback given by students enrolled in two courses, ECO2000 'Macroeconomics for Business and Government' and MGT2004 'Human Development' that higher levels of student engagement were possible when utilising multiple representations to cater for a range of different learning styles. This was achieved by providing a more complete representation of the information being presented, thereby increasing the opportunity of students to engage with their learning materials. This was further demonstrated by the weight of both quantitative and qualitative agreement by students enrolled in these courses. Importantly this was achieved whilst also maintaining a balanced environment for more traditional learners, at the same time as integration of a range of multimodal learning and teaching strategies for those who learn in non-traditional ways. These results will be used to further develop the resources made available to USQ students via transmodal delivery in an effort to further improve the learning experience and assessment outcomes of students.

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