Adopting Educational Technology to Enhance the Marketing Curriculum: Is it Worth the Effort?

Dawn Birch, University of the Sunshine Coast, dbirch@usc.edu.au
Michael Sankey, University of Southern Queensland, Michael.Sankey@usq.edu.au
Michael Gardiner, University of Southern Queensland, Michael.Gardiner@usq.edu.au

Abstract

A key driver for adopting educational technologies is the desire to enhance the curriculum and improve learning outcomes. Providing multiple representations of key content areas using multimedia (text, visual, aural, interactive) is purported to cater more effectively for different learning styles. However, the learning styles 'meshing' hypothesis, which proposes that delivering content in modes that match students' learning styles will lead to improved learning outcomes, has recently been challenged. This paper presents the findings of an experiment which measured the impact of multiple representations of content on learning outcomes. While, multiple representations of content did not lead to actual improvements in learning performance, students reported favourably on multimodal learning elements, in terms of improved engagement, comprehension and retention of content.

Keywords: educational technology, multiple representations, multimodal, learning styles

Adopting Educational Technology to Enhance the Marketing Curriculum: Is it Worth the Effort?

Introduction

Educational technologies and multimedia have provided opportunities for marketing academics to enhance the marketing curriculum, and design more engaging, interactive and inclusive learning environments, in particular, for distance learners. Multimedia can be used to represent the content knowledge in ways that 'mesh' with different learning styles and appeal to different modal preferences (Birch and Sankey, 2008; Moreno & Mayer, 2007). Proponents of learning styles argue that "different people learn information in different ways" (Pashler, McDaniel, Rohrer and Bjork, 2008, p. 106). For example, Fleming (2001) proposed that learners have a preferred learning style, namely, visual, aural, read/write or kinaesthetic, with many learners (about 40 percent) presenting as multimodal. Learning style should be distinguished from modal preference, which refers to the tendency for people to have a "preferred mode of taking in new information and studying" (Pashler et al., 2008, p. 106).

Using Multimedia to Provide Multiple Representations of Content

Multimedia and educational technologies have been applied in e-learning environments with the aim of catering to various student learning styles and modal preferences, and thus improving learning performance (Birch & Burnett, 2009; Cronin, 2009, Fadel, 2008; Omrod, 2008; Sankey and St Hill, 2009; Sprague & Dahl 2010). This is known as the "meshing hypothesis" (Pashler et al. 2008, p. 109). Multimodal e-learning environments allow instructional elements to be presented in more than one sensory mode, and thus "exploit the specific perceptual and cognitive strengths of different individuals" (Pashler, McDaniel, Rohrer, and Bjork, 2008, p. 109). Multimodal presentation may lead learners to perceive that it is easier to learn and improve attention rates, thus leading to improved learning performance, in particular for lower-achieving students (Chen & Fu, 2003; Moreno and Mayer, 2007; Zywno 2002). Mayer (2003) also contends that students learn more deeply from a combination of words and pictures than from words alone; known as the "multimedia effect". Neuroscience research has revealed that "significant increases in learning can be accomplished through the informed use of visual and verbal multimodal learning" (Fadel, 2008, p. 12). The use of multiple representations of content is recognised as a very powerful way to facilitate understanding (Ainsworth & Van Labeke, 2002; Moreno, 2002). Examples of multiple representations include, using PowerPoint with audio enhancement (Fig 1), interactive diagrams with accompanying transcripts and voiceovers (Fig 2), and video and audio presentations.

In recent times, the learning styles "meshing hypothesis" has been challenged, due to the dearth of experimental studies which test the claim that designing learning environments to "mesh" with students' learning styles will lead to improved learning outcomes (Pashler et al., 2008). Given the high investment in adopting and utilising educational technology, in terms of time and other resources, academics need evidence to judge the efficacy of their efforts. This research sought to address this lack of evidence by conducting an experiment to measure

the impact of multiple representations of content on learning outcomes across learning styles and modal preferences.

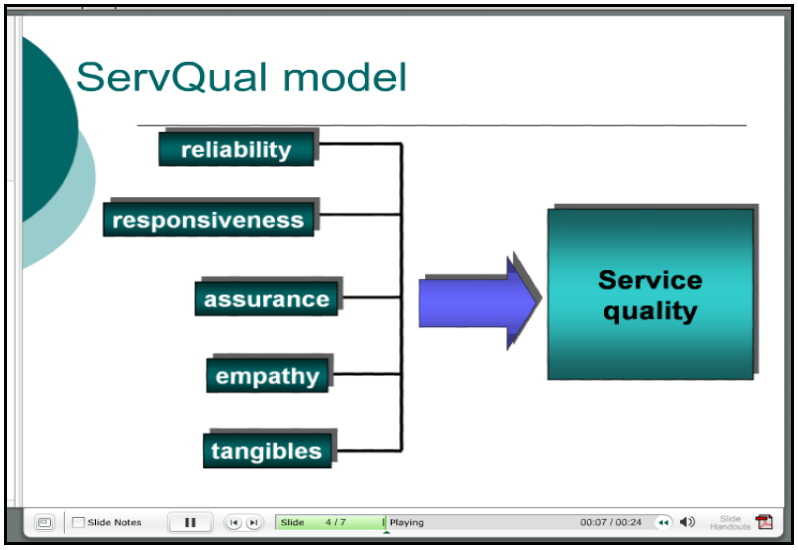

Fig 1. Audio-enhanced PowerPoint Presentation

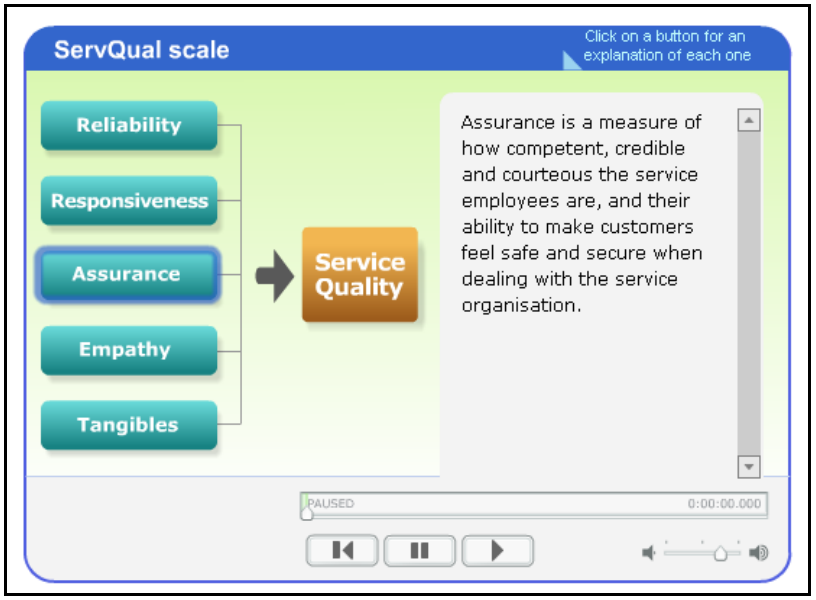

Fig 2. Interactive Narrated Diagram with a Text-based Transcript

Methodology

An experimental design was selected to allow for the manipulation of the ways content was presented and the measurement of students' learning performance. To determine students'

predominant learning style, participants were requested to complete the VARK learning styles inventory online. Sixty students were assigned to one of six experimental groups (each group comprised ten students across five learning styles), with each student being exposed to two learning concepts (drawn from services marketing theory) across two different learning conditions (ranging from text only through to multiple representations involving PowerPoint with audio and interactive diagrams with audio and transcript).The experiment was conducted in a computer laboratory. To measure prior learning, students were asked to complete a pre-test for each concept and then complete an identical post-test once they had completed the learning for each concept. To control for confounding factors, a standardised set of instructions, format and setting were used for every group. A post-experiment survey was conducted to identify modal preferences by investigating which learning elements were considered to be most helpful in assisting learning. Students were asked which of the two learning concepts were: (a) the easiest; and (b) the most enjoyable to learn. Open-ended questions allowed students to further express what they felt had been the most helpful resource/s they had been exposed to in their two allocated learning conditions.

Findings and Discussion

Approximately two thirds of the participants (68.4%) were females. Students aged from 17 - 60 years participated with the majority being under 30 years of age (70.0%). The majority of students had a predominant multimodal learning style (35.0%), with equal numbers of kinaesthetic (21.7%) and read/write (21.7%) learners. Visual (16.7%) and aural (6.7%) learners were under represented in the sample. The proportion of students in each learning style category is similar to other studies of learning styles, and thus appears to be representative (Fleming 2001). The majority of the students in the sample (60%) had a grade point average of 5.0 or above (out of 7.0). There were no significant differences across the six experimental groups with respect to gender, age or grade point average.

The experimental data did not reveal any differences in learning performance across the six groups and the six different conditions for either of the two concepts. This lack of support for the learning style "meshing" hypothesis is consistent with the findings of other experiments conducted by Massa and Mayer (2003) and Constantinidou and Baker (2002). However, in terms of modal preferences, most students reported (on a 7 point scale) that all of the learning resources were helpful with the more enhanced multimodal learning resources (more representations of content) considered to be the most helpful. The Friedman test indicated that the enhanced PowerPoint with audio (5.62) and interactive diagrams with audio and transcript (5.42) were ranked higher than the other learning resources (text (3.98), written study guide (4.16), printed PowerPoint slides (4.22), interactive diagram with script only (4.20), interactive diagram with audio only (3.66)). Kinaesthetic learners, in particular, found the recorded PowerPoint presentations to be very helpful (5.7), while aural learners found the interactive diagram with transcript and audio to be very helpful (6.5). Visual (2.3) and kinaesthetic (2.6) learners rated the textbook reading as being the least helpful, indicating that these learners may be at a disadvantage when the learning resources are primarily text-based.

In response to the open-ended questions, students commented on how the various learning resources facilitated hindered learning, while others commented on hedonic attributes, for example which learning resources were easiest, more interactive or more enjoyable to use (Table 1).

Table 1 - Comments Regarding Learning Resources Across Learning Styles

Visual learners said…

- Comments related to facilitation or hindrance of learning:
  - There was less information to read – less information overload
  - The most helpful is the diagram with script and audio as there are two different modes of learning available.
  - The first Concept for me was information overkill, it appeared that there was so much for me to absorb with the diagram as well as the reading.
  - The readings gave me what I needed to know without fluffing around with extras that may well have confused me, the information got straight to the point.
- Comments related to hedonic attributes:
  - I prefer having a visual aid while listening to the speaker

Aural learners said…

- Comments related to facilitation or hindrance of learning:
  - The visual provided a much better understanding
  - Reading the visual diagrams certainly aided in memory retention
  - The interactive diagram assisted with retaining information
- Comments related to hedonic attributes:
  - I like to see something and also hear it

Read/Write learners said…

- Comments related to facilitation or hindrance of learning:
  - I find the reading the most useful and I tend to get distracted with listening and I tend to understand more with reading.
- Comments related to hedonic attributes:
  - Clicking on topics had definitions popping out of the screen
  - I liked the interactive part because it was fun to play around while learning

Multimodal learners said…

- Comments related to facilitation or hindrance of learning:
  - It combines two powerful teaching styles; visual and audio. When you can integrate two or more teaching styles together, there is greater potential for learning.
  - Pictures that I click on made it easier to understand the flow, and having the audio to read while I was looking at the diagram
  - It was overwhelming with all of the text and I found that I couldn't understand it as well as I could with the interactive diagram.
- Comments related to hedonic attributes:
  - There was a variety of different approaches to learning the material and I could utilise all of them if I wanted
  - The interactive diagram was fun to do as I got to click on things.
  - It is hard to focus on reading the text for a long time. Interactive learning is easy and more importantly it is enjoyable.
  - I found the text book reading the least helpful because I found it to be less fun and sort of boring.

Kinesthetic learners said…

- Comments related to facilitation or hindrance of learning:
  - The interactive study guide with audio helps to cement my knowledge - also the interactive diagram
  - The diagram really helped. The colours helped me when I was picturing what I had learnt
  - It is helpful to have things explained several times and in several different ways.
  - Having the audio made concepts more confusing - like it 'clouded' over what was supposed to be a simple concept.
- Comments related to hedonic attributes:
  - It was more attractive and normally visual mechanics seem better tools for learning for me
  - Simply reading a text book doesn't engage me and I tend to become disinterested and start skimming through the text, identifying only what I believe I may be assessed on.
  - It was much more interesting to listen and interact, as I find that when I'm just reading I have to read over and over again for the concept to sink in.

A thematic analysis of the qualitative data (333 comments) using both Leximancer and NVivo software identified four main themes: (1) the usefulness of having a combination of resources (139 comments); (2) the usefulness of audio (50 comments); (3) the place of reading within online environments (59 comments); and (4) the right amount of choice (14 comments). The use of audio in online learning environments has long been purported to provide advantages for student learning (Clark and Mayer, 2003; Fahy, 2005; Hazari, 2004). However, it is when audio is used in conjunction with other resources, such as images or text, that the advantage appears to be most prominent. In line with previous studies, this combination of resources was not only seen to provide information, but also led to a greater perceived understanding of the materials being presented and made learning more enjoyable (Calandra, Barron & Thompson-Sellers, 2008; Clark and Mayer, 2003). Comments related to text-based elements primarily concerned the lack of interest in using reading materials or the boring nature of the reading (40). Comments concerning the right amount of choice revealed the potential for cognitive overload and being given too much choice. However, the quantitative analysis revealed that most students considered a choice of resources and the reinforcement that choice allowed were fundamental to their appreciation of the learning environments.

Implications, Limitations and Directions for Future Research

While the findings did not reveal improvements in actual learning performance, the qualitative data clearly indicates that students have modal preferences and perceive learning resources with higher representations of content to assist their comprehension, understanding and retention of content, and to be more interesting and enjoyable to use. In particular, students expressed a strong preference for a combination of learning resources and options. Given these findings, the importance of improving student progression and retention, and engendering a joy of learning leading to life-long learning, marketing educators should be encouraged to continue to explore the use of educational technology and multimedia for enhancing the marketing curriculum and developing multiple representations of content.

It is difficult to make any inferences from the quantitative data regarding the impact of providing multiple representations of content on learning performance due to small sample and limitations of the experimental methodology. In addition to the small sample size, there was a predominance of higher-achieving students, multimodal learners and a lack of aural and visual learners in the sample. Given the literature indicates that multimodal learning may be of greater benefit to lower-achieving students, this may be one factor that explains the lack of impact of multiple representations of content on learning performance within this experiment (Zwyno, 2003). Future research should involve a larger sample, higher representation of lower-achieving students, and a more even representation across learning styles. In addition to exploring differences across learning styles and modal preferences, differences across gender and age groups, lower versus higher achieving students, English Second Language (ESL) versus English First Language students (EFL), and on-campus versus distance learners could also be investigated. Ideally, future research would involve investigating learning performance under more natural study conditions to reduce possible testing effects. The difficulties experienced with the experimental methodology in this study may provide some explanation for the dearth of empirical data on the impact of multimodal presentation of content on learning styles, despite calls from educators for evidence that technology-enhanced learning leads to improved learning outcomes.

References

Ainsworth, S., and Van Labeke, N., 2002. Using a multi-representational design framework to develop and evaluate a dynamic simulation environment. Proceedings of the International Workshop on Dynamic Visualizations and Learning, Tubingen, Germany.

Birch, D., Burnett, B., 2009. Advancing E-Learning Policy and Practice: Influences on Academics' Adoption, Integration and Development of Multimodal E-Learning Courses. In:Standsfield, M. (Ed.), Institutional Transformation through Best Practices in Virtual Campus Development: Advancing E-Learning Policies.

Birch, D., Sankey, M., 2008. Factors influencing academics' development of multimodal distance education courses. International Journal of Educational Development using ICT 4 (1).

Calandra, B., Barron, A.E., Thompson-Sellers, I., 2008. Audio use in e-learning: What, why, when, and how? International Journal on E-Learning 7 (4), 589-601.

Clark, R.C., Mayer, R.E., 2003. E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning, Jossey-Bass/Pfeiffer, San Francisco, CA.

Chen, G., Fu, X., 2003. Effects of multimodal information on learning performance and judgment of learning. Journal of Educational Computing Research 29 (3), 349-362.

Constantinidou, F., Baker, S., 2002. Stimulus modality and verbal learning performance in normal aging. Brain and Language, 82, 296-311.

Cronin, J. J., 2009. Upgrading to Web 2.0: An experiential project to build a marketing Wiki. Journal of Marketing Education 31(1), 66-75.

Fadel, C., 2008. Multimodal Learning Through Media: What the Research Says, Cisco Systems, San Jose, CA.

Fahy, P.J., 2005. Planning for multimedia learning. In: Mishra, S., Sharma, R.C, (Eds.), Interactive Multimedia in Education and Training. Idea Group Inc, London, pp. 1-24.

Fleming, N.D., 2001. Teaching and Learning Styles: VARK strategies. Neil D Fleming, Christchurch, New Zealand.

Hazari, S., 2004. Applying instructional design theories to improve efficacy of technology-assisted presentations. Journal of Instruction Delivery Systems 18 (2), 24-33.

Massa, L.J., Mayer, R.E., 2006. Testing the ATI hypothesis: Should multimedia instruction accommodate verbalizer-visualizer cognitive style? Learning and Individual Differences, 16, 321-336.

Mayer, R.E., 2003. Elements of a science of e-learning. Journal of Educational Computing Research 29 (3), 297-313.

Moreno, R., Mayer, R., 2007. Interactive multimodal learning environments. Educational Psychological Review 19, 309-326.

Moreno, R., 2002. Who learns best with multiple representations? Cognitive theory implications for individual differences in multimedia learning. Proceedings of EDMEDIA 2002 Conference: Denver, Colorado, USA, June.

Omrod, J.E., 2008. Educational Psychology: Developing Learners (6th ed.). Pearson Upper Saddle River, NJ.

Pashler, H., McDaniel, M., Rohrer, D., Bjork, R., 2008. Learning styles: Concepts and evidence. Psychological Science in the Public Interest 9 (3), 105-119.

Sankey, M., St Hill, R., 2009. The ethics of designing for multimodality: Empowering nontraditional learners. In: Demiray, U., Sharma, R. (Eds.), Ethical Practices and Implications in Distance Education, Ideas Group International, London, pp. 126-155.

Sprague, E.W., Dahl, D.W., 2009. Learning to click: An evaluation of the personal response system clicker technology in introductory marketing courses. Journal of Marketing Education 32 (1), 93-103.

Zywno, M.S., 2002. Instructional technology, learning styles and academic achievement, Proceedings of 2002 ASEE Annual Conference and Exposition, Montreal, Quebec, Canada, Session 2422.