Using digital lectures to assist student learning

by
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Abstract

This study explores the use and usefulness of digital lectures as a resource to augment conventional face-to-face lectures for students in an undergraduate business course. Twelve digital lectures were provided to students enrolled in a third year finance unit of study. The digital lectures were prepared at the desktop using proprietary software to record on-screen activity (including lecture slides, real-time annotations and demonstrations) and voice-over narration. Each lecture was made available online and on CD concurrently with the face-to-face lecture (attendance at which was voluntary). Twelve principles of multimedia design (Mayer 2009), based on dual-coding theory (Paivio 2006) and a model of the working memory (Baddeley 1992; Baddeley 1999), influenced the design of the digital lectures. A framework was developed to explain the potential learning benefit for students from using digital lectures. It highlighted issues of access, control and learning as being important. A voluntary survey was independently conducted after the semester finished to establish how students used the digital lectures and whether they found this resource aided their learning. Forty students from a class of 52 completed the survey. Students reported using the digital lectures to supplement rather than replace the face-to-face lectures. Of the twelve lectures in the unit, students reported attending nine face-to-face lectures and viewing nine digital lectures, on average. A range of positive statements about the value of digital lectures to aid student learning recorded very high mean levels of agreement. In these student responses, all three characteristics of access, control and learning emerged to explain why students used the digital lectures consistently and regarded them as a valuable resource. The high value placed by students on these digital lectures is subsequently confirmed by anonymous student unit evaluation information collected by the university.

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1. Introduction

Student populations are becoming increasingly diverse, and many students have to juggle demands of work, study and family, giving rise to stronger demands for flexibility. At the same time, the traditional-age students of the "net generation" (Oblinger and Oblinger 2005), having grown up with the ready availability of information, bring an expectation that learning resources will be available anytime, anywhere (Caruso and Kvavik 2005).

The most recent 2007 report on online learning in Commonwealth countries concluded that while there has been growth in on-line learning, the growth has been incremental, and the expected shift away from the traditional face-to-face provision has not occurred (Becker and Jokivirta 2007). The authors argue that "the vast majority of growth in the formulation and integration of institution-wide online learning strategies has focussed on the enhancement of on-campus teaching and learning rather than off-campus delivery" (Becker and Jokivirta 2007, p.39). This finding is consistent with the findings of the 2004 report which found that more than 80% of responding universities used the online mode to provide on-campus flexibility (Garrett and Jokivirta 2004, p.41). However, the authors concluded that, despite predictions to the contrary, online learning had not challenged the traditional on-campus learning model. They argued that "significant impact on an activity as complex, tradition-bound and semi-conscious as learning will … take much longer to realise" (Garrett and Jokivirta 2004, p.41).

This sentiment has also been echoed by Smith, Salaway and Caruso (2009). In a US-based survey, they concluded that respondents wanted the use of IT to be balanced with the human touch in their learning environment. A final open-ended question of their survey saw students citing a preference for "real books and people" and said that "shiny new tech is still not a substitute for well-trained, passionate instructors" (Smith, Salaway et al. 2009, p.12).

Against a backdrop of evolution rather than revolution in student learning, this study explores how a group of students responded when offered digital lectures in addition to conventional face-to-face lectures. In reality, the research is a pilot study of how students use digital lectures. The hypothesis is that students will blend their use of digital and face-to-face lectures, rather than becoming exclusive users of digital lectures or face-to-face lectures.

In terms of a link between this research and the conference theme of "Educating For Employability", digital lectures are being increasingly used by employers to train staff. The exposure that students have to digital lectures as a result of this research should increase their IT literacy in a working environment.

2. Digital Lectures In Teaching

The word "digital" can be used to designate "… a digitally generated or computer-mediated counterpart of a previously existing object or action"(Oxford English Dictionary 2002). Adapting this meaning of the word, a digital lecture is defined here as a digitally generated or computer-mediated counterpart of a face-to-face lecture.

While digital lectures can potentially take a variety of different forms, in their essence they are a series of words and/or pictures in a digital form. At one end of the scale, this description can cover an audio recording of a face-to-face lecture which is accessible on-line. It could also cover a series of PowerPoint slides in a digital form. At the other extreme, in terms of resource requirements, is a digital recording in a dedicated studio of a lecture which then has interactivity features incorporated. The capturing and streaming of face-to-face lectures in universities, is an increasingly common form that digital lectures are taking.

The type of digital lecture used in this study

The digital lectures used in this study differ from standard recordings of face-to-face lectures made available online. Each digital lecture was recorded prior to the face-to-face lecture. Recording was done at the desktop using proprietary software to record on-screen activity and voice-over narration. The on-screen activity included PowerPoint slides, Word documents, Excel files, scanned images, websites, video images of the lecturer to accompany the narration, and real-time annotations from a drawing tablet. Each digital lecture was made available to students as a Flash file. An advantage of the Flash file format was ease of viewing: it could be viewed in a web browser, such as Internet Explorer, without the need for students to download any additional software.

Design issues with digital lectures

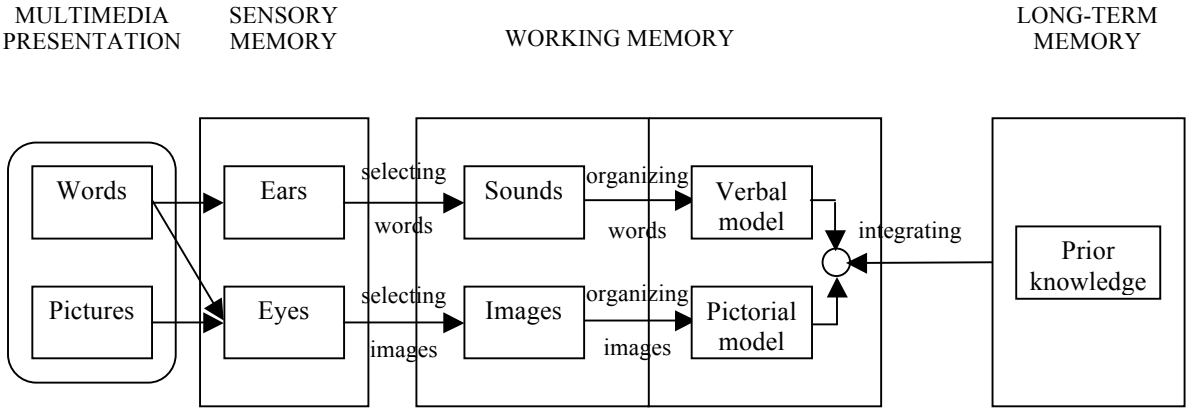
(Mayer 2009) has defined multimedia as involving the presentation of material using both word and pictures. Under this definition, the words can be spoken and/or written and the pictures static and/or dynamic. According to this definition, the digital lectures used in this research qualify as a form of multimedia. This is likely to be an important connection to make, given the extensive research that has been done on the way that people learn from words and pictures.

The benefits of using a multimedia format for the digital lectures are supported by research in the field of cognitive science and, in particular, Richard Mayer's cognitive theory of multimedia learning (Moreno and Mayer 2000; Mayer 2005; Mayer 2009). This theory proposes that meaningful learning can be enhanced by presenting information in both visual and auditory formats. This theory is based on three main assumptions. The first of these is the dual-channel assumption, where separate channels are available for receiving verbal (spoken) and visual information in sensory memory. The key references here are Paivio's (1986) dual-coding theory and Baddeley's (1998) model of the working memory. The second assumption is the limited capacity assumption of Sweller's (1988) cognitive load theory, where working memory has limited capacity to deal with unfamiliar incoming information. And the third assumption is the active processing assumption, where humans actively process information in order to build mental models through cognitive processes including "paying attention, organizing incoming information, and integrating incoming information with other knowledge" (Mayer 2005, p.36).

Multimedia learning therefore takes place when new information is organised and connections (or structural relations) are made between the verbal and visual elements within the working memory. These are then integrated with existing knowledge within the long-term memory (Chandler and Sweller 1991; Van Merrienboer and Sweller 2005; Mayer 2009). Figure 1 (Mayer 2009, p.61) shows the progression of the

three cognitive processes that constitute multimedia learning. These are selecting, organising and integrating along the two processing channels.

Figure 1: Cognitive theory of multimedia learning



Source: (Mayer 2009, p.61)

Cognitive overload has become a "red flag" in multimedia design (Sorden 2005). So while presenting information in both verbal and visual formats can promote meaningful learning, superfluous information presented in either mode can hamper learning.

These theoretical foundation have led Mayer (2009, p.266) to develop twelve principles of multimedia design. These principles have, in turn, guided the design of the digital lectures used in this research. Mayer (2009) organises his twelve principles according to the theoretical function that they serve. To this end he identifies three theoretical functions: reducing extraneous processing, managing essential processing and fostering generative processing. Tables 1 - 3 provide a summary of the three theoretical functions and their twelve related principles.

Also covered in Tables 1 – 3 is the impact that each principle had on the design of the digital lectures used in the present study. The argument advanced here is that these digital lectures were designed so as to be consistent with Mayer's twelve principles of multimedia design.

Mayer (2009) has also advanced two boundary conditions for design principles, which are summarised in Table 4. In that table it is argued that these two boundary conditions probably increase the multimedia design effects due to the newness of the concepts and the inherent difficulty of the mathematical and graphical exposition used in finance.

It is also possible that there is a third boundary condition at work with these students; that of language familiarity. Many of the students studying this finance unit are international students for whom English is a second language. It could be argued that the multimedia design effects will be stronger for these students. One rationale for this argument is that the ability of the student to pace the delivery of the content will allow

the student to learn better. Discussion later in the paper highlights the evidence for this boundary condition in the results for this study.