Capturing Lectures: Using multimedia lecture captures to promote learning

Student Number: _Genevieve Dalton_____

Student Number: _N00083681_____

Course: _2010 MSc in Cyberpsychology___

Date Submitted: _24th Apr 2010_____

Dissertation submitted as a requirement for the degree of MSc in Cyberpsychology, Dun Laoghaire Institute of Art, Design and Technology, 2010.

Declaration

I declare this Dissertation is entirely my own work, and has not been previously submitted to this or any other third level institution.

Student printed name: _Genevieve Dalton_____

Student signature: Genevieve Dalton

Date of signature: 6th May 2010

Acknowledgements

I would like to acknowledgement the following people who assisted and supported me in carrying out this Dissertation:

Dr. Marion Palmer
Dr. Patrick Felle
Mr. Ronnie Murray

Table of Contents

Abstract

The purpose of the study is to investigate does multimedia lecture captures promote learning or lead to cognitive overload? In a classroom-based experiment, students received a lesson consisting of a multimedia lecture capture with audio, video and presentation or a paper lesson with text and graphics. The lessons used the same words and graphics in the paper based and multimedia based versions to give description of the anatomical structure of the vertebral column. On subsequent retention assessments, the paper group performed significantly better than the multimedia group. The results do not support the hypothesis, which states learning using multimedia lecture captures has no significant effect on learning outcomes versus traditional learning material. The conclusion is care should be taken before replacing traditional paper base learning material with multimedia lecture capture material.

Introduction

Online learning and blended instruction, both utilizing technology to convey educational content, is becoming increasingly popular. According to Traxler (2007) with increased access to information and knowledge anywhere, anytime, the role of education, especially formal education, is challenged and the relationships between education, society, and technology are now more dynamic than ever.

Online enrollments in the US continue to grow far in excess of the total higher education student population (Allen & Seaman, 2008). According to Allen & Seaman (2008) over 3.9 million US students took a minimum of one online course during the fall 2007 semester, which was a 12 percent increase on the previous year. Over twenty percent of all US higher education students took a minimum of one online course in the first semester of 2007. The current economic downturn has also given rise to an increase in overall enrollments and an increasing demand for online courses.

An online course is a course whose instruction is totally delivered via the Internet. Students and instructor generally do not meet face-to-face on campus, although some instructors give on-campus examinations and/or orientation sessions. Students interact with the instructor and other students via course management systems and email. This class format is very flexible for busy schedules due to the fact that you can log on to the course at any time of the day or night. Learning material includes media in the form of text, streaming video, audio and multimedia lecture captures. Lecture capture allows instructors to create audio/video recordings of classroom lectures or presentations. With lecture capture, instructors can record their presentations (both audio and video) including any material that gets projected onto the classroom's screen and they can then be published for use in online courses.

Lecture capture is defined as "an umbrella term describing any technology that allows instructors to record what happens in class and make it available digitally (EDUCAUSE, 2008). When the captured lecture is made available in digital format for download to a personal device, it is referred to as a podcast. A podcast is a series of digital multimedia

files, which is made available for access via the web, and content, can include audio, video, and image materials (Rossell-Aguilar, 2007). In the education context a podcast can include a combination of rich media with a full-motion video from VGA, along with content from DVDs, VCRs, PC, document cameras or other sources from the classroom lecture.

Tyre (2005) reported that students at Purdue University with a population of 38,000 students, downloaded 40,000 lectures in the first semester and in the fall of 2004 Duke University gave all new students an iPod and the University has since incorporated podcasting into its curriculum (Barnett, 2005).

With advances in lecture capture technology including one-step uploading and the advent of web 2.0, lecture captures and multimedia podcasts are now easy to create. Recorded lectures can now be easily shared on venues such as iTunes U or YouTube EDU. Berkeley; Harvard University; MIT; Princeton, Stanford and Yale are just some of the University value making lecture captures widely available.

Institutional strategic objectives are increasingly calling to provide services to address the significant percentage of the student population who do not attend lectures, and particularly the growing distance learner community or those that are ill or value content for revision purposes.

According to Kim (2009) the implementation of lecture capture in educational institutes is beginning to happen on a wide scale. Kim (2009) looks at policies and guidelines for sharing lectures on Web 2.0 social media publishing platforms that align with campus strategic objectives and how can our institutions use emerging technologies such as lecture capture and Web 2.0 publishing platforms to adapt and thrive in a world built on transparency, sharing, and participation?

With the availability of high speed broadband, students can now easily access captured lectures/podcasts. According to new research released in September 2008 by the University of Wisconsin-Madison involving about 7,500 undergraduate and graduate

students, an overwhelming 82 percent of students said they would prefer courses that offer online lectures over traditional classes that do not include an online lecture component (WISC, 2008). When asked why they prefer courses that offer streaming lectures online or podcast lectures, most students cited making up for missed classes, convenience, improving retention of materials covered, improving test scores, and help with material review prior to class (WISC, 2008).

Adoption of lecture capture systems is being driven by both student demand and requirement to make education more accessible (Ahead, 2009). AHEAD's (Association for Higher Education Access & Disability) recently (Nov 2009) published a Charter for Inclusive Teaching and Learning in which it highlights The National Plan for Equity of Access to Higher Education 2008-2013 states that "good practice for access becomes good practice for all learners throughout the institution (Ahead, 2009). The charter states a key aspect of this is mainstreaming the access agenda in higher education, which will mean changing practices and implementing new and innovative teaching and learning practice on an institution-wide basis.

In recent years, the use of podcasts has increased in a number of fields such as tourism, entertainment, library research, and education (Lakhal et al., 2007). While podcast technology is new and emergent, its application to teaching and learning in the classroom has the potential to offer significant advantages. For example,

- With lifelong learning on the increase, many "students" are working adults with full- or part-time jobs. Lectures available as podcasts give these students the opportunity to maximize learning while commuting or during what might otherwise have been "down time". Podcasts give students more flexibility and choice in where and when they learn outside of the classroom.
- By using podcasts students are using technology in their study that will enhance their readiness for tomorrow's workplace where employers want graduates who know how to use technology for learning and working.

Institutions who have implemented lecture capture technology along with the companies who sell the technology, publish on their websites that using it leads to improved

comprehension for the student, improved student participation, improved student satisfaction and course completion rates (Boston College, 2010; Echo360, 2010). However, there is little research evidence to support these statements and even less evidence to indicate how it actually affects the learning outcomes or whether it results in value-added learning. Just because something is popular does not always mean it is the best.

This piece of research looks at the use of multimedia learning material including audio, video, and presentation material traditional paper based material with text and graphics and their effect on the learning outcomes in relation to each other. This study also investigates if there is any relationship between the level of comfort with technology and the learning outcomes using multimedia lecture captures. The paper explores and articulates these issues and the connections between them specifically in the context of the wider and sustained development of learning on a global basis.

Rationale

The growth in multimedia lecture capture is being driven by institutional objectives and student demand but there is little or no evidence of its impact on student learning. Given the additional cost in terms of technology hardware, software and expertise and the human effort required to create multimedia lessons, it is worthwhile to ask whether they can promote learning that is as good or better than paper lessons. It is also worthwhile using the study to examine the cognitive processes underlying learning from multimedia and build on prior research in this area.

Research

The cognitive theory of learning, cognitive load, learning outcomes, Blooms taxonomy, the cognitive theory of multimedia learning, podcasting in HE and extensive works by Mayer on multimedia learning is a brief summary of the research completed as part of this study.

There are a number of learning theories which address how people learn including the cognitivism theory of learning. Cognitivism argues that the mind is a "black box" which

should be opened and understood and the learner is viewed as an information processor (a bit like a computer). According to Sweller (1988) cognitive load theory is based on the following principles of cognitive learning:

- Working memory or short-term memory is limited in capacity to about seven informational units.
- Long-term memory is unlimited in capacity and is where all information and knowledge is stored.
- Knowledge is stored in long-term memory as schemas or schemata.
- Schemas, no matter how large or how complex, are treated as a single entity in working memory. Schemas can become automated.

Cognitive load can be of three distinct types, intrinsic cognitive load, extraneous cognitive load, and germane cognitive load:

- Intrinsic load is the load on memory required by the thinking task at hand. It serves to quantify how much of the working memory is used by the interactivity of the units of information being processed.
- Learning, changing a novice to an expert and the formation of new schema adds to the load on working memory. Working memory must process this new information into advanced and more complex schema. The load this process places on working memory is called germane cognitive load.
- The working memory load experienced by learners as they interact with the learning materials and environment represents the extraneous cognitive load. Extraneous cognitive load does not contribute to learning.

Until recently it is being difficult to measure cognitive load, however recently DeLeeuw & Mayer (2008) developed a method to measure cognitive load during a multimedia lesson.

A learning outcome is the specification of what a student should learn as the result of a period of specified and supported study. Learning outcomes are concerned with the achievements of the learner rather than the intentions of the instructor and they can take many forms and can be broad or narrow in nature (Adam, 2004). For the purposes of this paper the learning outcomes we are concerned with are the recall of information after the

student has taken a lesson, which is defined as Remembering/Knowledge on Bloom's taxonomy (Bloom, 1956). Bloom (1956) identified three domains of educational activities:

- Cognitive: mental skills (Knowledge)
- Affective: growth in feelings or emotional areas (Attitude)
- Psychomotor: manual or physical skills (Skills)

According to Bloom (1956) the cognitive domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories, starting from the simplest behavior to the most complex and the study examined learning outcomes on the basis of knowledge recall or information, which is the lowest level or degree of difficulty. The study focused on measuring this level because it is measurable and relatively easy to measure in the context of a classroom experiment of limited duration.

Mayer's (2009) cognitive theory of multimedia learning is based on three main assumptions: there are two separate channels (auditory and visual) for processing information; there is limited channel capacity; and that learning is an active process of filtering, selecting, organizing, and integrating information. He contends that humans can only process a finite amount of information in a channel at a time, and they make sense of incoming information by actively creating mental representations. This idea of a limited channel capacity is reflected in findings by Zacks & Tversky (2003) that learning material broken into meaningful units rather than in a continuous piece leads to better learning outcomes.

When a student take a multimedia lesson, the lesson's auditory and visual information enters the eyes and ears, is briefly stored in a visual and auditory sensory memory, enters working or short term memory, and is finally stored in permanent or long-term memory. While working memory is very powerful, it is limited and can only hold a certain amount of information. For this information to enter long-term memory, it needs to be encoded which also requires resources in working memory. When the information is needed again

it has to be retrieved from long-term memory to working memory. Sweller builds a theory of cognitive load that treats schemas, or combinations of elements, as the cognitive structures that make up an individual's knowledge base. (Sweller, 1988).

Mayer's cognitive theory of multimedia learning presents the idea that the brain does not interpret a multimedia presentation of words, pictures, and auditory information in a mutually exclusive fashion; rather, these elements are selected and organized dynamically to produce logical mental constructs. This theory would apply to the use of multimedia lecture captures, which incorporate all these elements.

Paivio (2006) provides the dual coding theory, which contends the verbal (linguistic) and non-verbal (imagery) are stored independently and work together accelerating the acquisition of knowledge. Mayer et al. (2005) proposed a similar hypothesis called the dynamic media hypothesis which firstly argues that processing of multimedia requires less cognitive load than does processing of static annotated illustrations, because learners do not have to engage in cognitive processing to animate the graphics when the computer does this for them. Secondly, the multimedia content may be more interesting, entertaining, and motivating than the paper-based illustrations and text, so the learners may exert more effort in making sense of the material—that is, learners may be motivated to engage in germane (or essential) processing (Mayer et al., 2005). Such a decrease in extraneous processing and increase in germane processing should lead to better scores on retention assessment for learners receiving multimedia content than those receiving text and illustrations (Mayer et al., 2005). However, this hypothesis was not supported in this research by Mayer et al. (2005), which shows that attempts to increase the value of a lesson by adding entertaining features tend to distract learners and lead to poorer learning outcomes. More recent research by DeLeeuw and Mayer (2008) on understanding how to measure cognitive load also found adding extra content to the lesson increased cognitive load.

Mayer (2005) carried out a number of experiments comparing learning outcomes from static illustrations versus animations and narration, to investigate the cognitive theory of multimedia learning ,which held that the attention of the learner is limited as interpreted

within the framework of cognitive load theory (Sweller, 1999, 2005). If too much attention is allocated to extraneous processing, there may not be enough remaining attention for intrinsic and germane processing (such as trying to make sense of the presented explanation) (Mayer, 2005).

On the basis of this analysis, he provided two complementary explanations for why learning from static illustrations and printed text could lead to deeper learning than learning from animation and narration: (a) less load from extraneous and intrinsic processing and (b) more germane processing. More recent research by both Mayer (2009) and Rasch (2009) supported this hypothesis finding multi-sensory content leads to cognitive overload. Similar research was carried out in the by Abt and Barry (2007) found the difference in test performance of a group using audio podcast learning material versus text based material was trivial and also found that using podcasts provides little quantitative benefit for students over and above written text when learning exercise physiology (Abt & Barry, 2007). Baker et al. (2007) also found the use audio podcast did not affect the results of class quizzes and Lakhal et al. (2007) found no effect on student performance for those students who listened to audio podcasts however results suggested that listening to podcasts had a positive effect on student satisfaction.

In Hew's (2008) review on past empirical studies on the use of audio podcast in higher education settings, he found the main limitation of studies examining the impact of podcast on learner outcomes is the majority of these studies based their findings primarily on participants' self-reported data such as interviews and questionnaires. Only three of the 11 studies used examination, test or quiz scores (Abt and Barry, 2007; Baker et al. 2007; Lakhal et al. 2007). However, Hew (2008) also found two of these studies had significant limitations with regard to the sample size. For example, in a study by Baker et al. (2007), the researchers highlighted that the sample size was too small (only 4 participants who used podcast, compared with 17 who did not) for much validity to be attributed to the result. Similarly, Lakhal et al. (2007) pointed out that the number of students who listened to the podcasts was much lower than those who did not (42 versus 150). Another limitation was participants in these studies were limited mainly to

disciplines such as engineering, technology, and business and law and more research addressing the use of podcasting in other disciplines is needed.

So although these studies have documented that students generally felt that the use of podcast could enhance their learning, there was no significant difference in students' actual performance between those who used podcast versus those who did not, there is value in re-testing these findings. These studies also exclusively used podcasts with audio only whereas multimedia lectures produces podcasts, which includes video as well as audio. The objective of this research is to assess the effectiveness and efficiency of multimedia lecture captures as a learning tool, and to determine whether they have a negative, positive or no effect on the learning outcomes of the student.

This study is based on a similar study carried out by Mayer et al. (2005), which examined the effect of narrated animations versus annotated illustrations in multimedia instruction on the promotion of active learning. In this study, students received a lesson consisting of computer-based animation and narration or a lesson consisting of paper-based static diagrams and text. The results of this study support the static media hypothesis, in which static illustrations with printed text reduce extraneous processing and promote germane processing as compared with narrated animations. This research replaces the computer-based animated lesson with the multimedia lecture capture lesson, the reason being it is increasing in use in the education sector and there is very little qualitative research on it's use to date. The research question for this study is: Does multimedia lecture captures promote learning or lead to cognitive overload? Based on this the hypothesis is:

H1. Learning using multimedia lecture captures versus traditional learning material has a no significant effect on learning outcomes.

H2. A participant comfort level with new technology has a significant effect on learning outcomes when learning using multimedia lecture captures.

For the purposes of this study learning outcomes are defined as Remembering/Knowledge on Bloom's taxonomy (Bloom, 1956). These were chosen, as it was something, which was possible to assess following the lesson.

Demand for multimedia lecture capture learning material is being driven by student's requirements for increased access to location independent rich classroom material, with the recent advances in technology making this access a practical option for the average student. The use of multimedia lecture capture is an emerging trend so it is very important to find supporting evidence of the efficacy of these tools for enhanced learning. A possible outcome would be knowledge retention is higher for group of students who took the multimedia lesson versus students who took the paper lesson. However, previous research would indicate that opposite is the more lightly outcome (Mayer, 2005; Zacks & Tversky, 2003; DeLeeuw and Mayer, 2008; Sweller, 1999, 2005; Rasch, 2009).

Method

For the purposes of this study, the term *multimedia lesson* is used to refer to the lecture capture lesson and the term *paper lesson* is used to refer to the traditional paper based lesson. The lesson topic was the anatomical structure of the vertebral column and it was chosen because it is something that very few people would have studied previously, thereby reducing the risk of prior knowledge influencing the results of the retention assessment. The same subject matter expert constructed the two lessons with the same information in each lesson, both lessons contained the same words and the same set of graphics. However the multimedia lesson also presented the words in spoken form, which may carry more information in terms of the expression of the voice and presented a video image of the lecturer using a model of the vertebral column to show a more real like image of various components in the set of core images.

Participants

The participants were 20 college students recruited from the undergraduate psychology programme at the Dun Laoghaire Institute of Art, Design and Technology. There were 8 women and 12 men. 10 participants served in the paper group and 10 served in the multimedia group.

The mean age was 20.45 years (*SD* 1.90), with a range from 18 to 27. There was a no significant difference in the ages for the paper group (M=20.30, SD=1.16) and the multimedia group (M=20.60, SD=2.50) conditions; $t(18)=-.344$, $p = .735$.

Participant recruitment

A number of steps were taken to recruit participants for the experiment:

1. An initial email invitation outlining the experiment and the benefits of participation was sent 3 weeks prior to the experiment to the programme coordinator for year 1, 2 and 3 psychology undergraduate programmes. They then forwarded this invitation to the class student representatives. This email also indicated that students who participated in the experiment would be included in a draw for an MP3 player as an incentive for participation.
2. Following a poor response to the email, a similar email was sent to the lecturers of the classes who again sent it onto the class student reps and also mentioned the experiment in their classes.
3. An email invitation was also sent to the Psychology Society who encouraged their members to participate.
4. A week in advance of the experiment, leaflets outlining the experiment and inviting students to participate were handed out in classes.
5. Thirty minutes prior to the experiment, additional participants were recruited.

Materials

Students learned about the anatomical structure of the vertebral column via a web based multimedia lecture capture lesson containing video, audio and presentation or a paper-based lesson including text and illustrations. Paper based text and graphic material was

chosen as the comparison because it is the most typical formal of lesson material. Both groups took the same paper based retention assessment following the lesson.

The paper-based materials used in the study are included in the Appendix A and they consisted of:

1. An experiment invitation leaflet
2. An experiment outline document
3. A participant consent form
4. An experiment instruction document
5. A lesson document
6. A retention assessment form

All of the documents were printed on A4 paper in black and white except the lesson document and retention assessment form, which were both printed in colour. They all used Times New Roman font size 12.

1. The experiment invitation leaflet outlined the experiment and the benefits of participation along with inviting student to take part.
2. The experiment outline document gave a brief introduction to study, outlined its purpose, the procedure, risk and the option of voluntary participation or withdrawal at any stage.
3. The participant consent form is where the student provided consent and also included questions about the participants' age, gender, and a comfort-rating question on new technology adoption rating.
4. The experiment instruction document included step-by-step instructions for the participants to follow and the last step detailed the experiment debrief information.
5. The paper-based lesson consisted of a two-page lesson document. It contained 10 illustrations of various parts of the vertebral column with arrows and labels on each one, indicating the anatomical term used for the various parts and components thereof. Beside each illustration there was a text paragraph giving a definition of these anatomical terms and also in some cases the symptoms that may occur with various problems with these components.
6. The retention assessment form included a table with 20 true/false questions based

on the content of the lesson. The form also included three illustrations on which half of the questions were based. The questions were statements about various anatomical components of the vertebral column and symptoms of problems with the same.

The multimedia lesson consisted of an html flash based video of the lecturer delivering a lesson in a lecture theatre synchronized with a Microsoft PowerPoint presentation on the lesson. There is a screenshot of the multimedia lecture capture included in Appendix A. The presentation contained the same illustrations as the paper based lesson and similarly had arrows and labels on each one indicating the anatomical term used for the various parts and components thereof. In the video the lecturer used a model of the spinal column as an aid to point out the various components and he spoke to each component, using the same words as in the paper based lesson to give a definition of the anatomical terms and also in some cases the symptoms that may occur with various problems with these components. The lesson lasts 16 minutes.

Apparatus

The apparatus for the multimedia lesson consisted of 10 Fujitsu Siemens desktops with 19-inch flat screens. The multimedia lesson was captured and prepared using the Echo 360 lecture capture system http://www.echo360.com/. It was then published as a download and was loaded locally on each PC to ensure that network download speed did not have an impact on the end users experience. The users used either their own MP3 headphones or were provided with college headphones.

Although this is a replication of a similar experiment carried out by Mayer et al. (2005), because there is a much greater degree of technology dependence in this experiment there was a much higher level of preparation. As per Robson's (2007) guidelines for conducting research experiments, a plan was developed and an experiment pre-test and pilot was carried out before the experiment.

As the experiment was heavily dependent on technology, a number of technology checks were carried out before the experiment was run to ensure that technology failure would

not result in an experiment failure. One month prior to the experiment, all PCs in the lab were checked to ensure the multimedia lesson could be accessed and the sound was working. This test uncovered a couple of issues. The lesson could not be accessed over the Internet, due to a firewall restriction on a flash component of the lesson on the college network. Because of this it was decided the lesson would be run from the local hard drive on the PCs and it was copied onto the PCs the night before the experiment. The sound was not working on a number of the PCs and a call was logged with the IADT ICT Support group to look at them and they resolved a number of the sound issues.

Procedure pilot

Once any technology issues were resolved, a pilot of the experiment was carried out using two participants, one completing the paper based lesson and one completing the multimedia lesson. Because the experiment was run with two groups of students in separate locations with two experimenters, a script for the experiment informed by the pilot was developed to ensure the same tasks and procedure was carried out for both groups. The pilot also gave indicative timings for the experiment, which were also used in the experiment script. A copy of the script is included in Appendix A.

Procedure

Once the participants arrived for the experiment, they were randomly assigned to two groups and were then asked to go the relevant rooms. All the students in one room completed the paper-based lesson while the students in the other room completed the multimedia-based lesson. Because both groups of students completed the lesson in parallel the experiment was administered by two people one in each room, the experimenter and an assistant.

Ross and Morrison (2004) stressed that an important component of the quasi-experiment study is the use of pretesting or analysis of prior achievement in order to establish group equivalence. Therefore, participants were asked if they have any prior experience in the anatomical structure of the vertebral column and were asked to not to complete the experiment in the event they replied yes.

When participants entered the relevant room of the experiment they were each seated at a desk, participants in the multimedia group were seated in front of a computer. They were then asked to take 10 minutes to read the experiment outline document. They were also informed they were free to leave the experiment at any time without prejudice. They then signed the participant consent form and filled out the participant questionnaire, which was part of this form.

Participants in the multimedia group were then given head phones if they did not have their own. Participants in this group viewed the multimedia lesson on the vertebral column on the computer in front of them. Participants in the paper-based group were asked to review the lesson document for the same length of time as the multimedia lesson.

When the lesson period was finished, the participants from each group were asked to turn over the assessment form, which was placed face down on the desk and they were then given 5 minutes to answer the 20 true or false retention questions. The assessment forms had the same study ID number as the study consent forms so they could be matched together.

On completion of the experiment, the experiment consent and retention assessment forms were then collected from all participants in each room. The experiment coordinator and assistant then outlined the experiment debrief to the participants and they were thanked for their participation. The draw for the MP3 player was then held and participants were then free to go. The participants had the option of keeping the experiment outline and the instructions/debrief documents if they wished.

Ethics

All research proposals involving data collection involving human participants requires prior ethical approval to ensure the safety, rights, dignity and well-being of the participant and those of the researcher. This is to ensure ensuring that the design of the research respects the rights of those who are the participants of the research. The ethical issues and how they were to be addressed were outlined in the Department of Learning

Sciences Ethical Approval form (Dolsec Form A), a copy of which is included in Appendix A. This was submitted to IADT's Department of Learning Sciences Ethics Committee and who approved it in May 2009.

A copy of the A email prior to the experiment was sent to all participants explaining fully in readable English the background to the experiment, the details of how the experiment would be completed, how and for what purposes the data collected from the experiment would be used and that it would be fully anonyms.

The participants were asked to confirm they were over 18 years and to confirm consent before commencing the experiment. They were made aware they could leave the experiment at any stage and were reassured at the end of the survey its confidentiality and anonymity.

Finance

The experiment had a cost of approximately 100 Euros associated with it, 55 of which was spent on the purchase of an mp3 player, which was used as an incentive to encourage student participation in the experiment. The balance was spent on dissertation printing and binding. Existing learning material in video, audio and text format was used free of charge in the experiment, with permission from the academic owner. Emailing invitations were free of charge using existing email account. SPSS software used to the analysis the statistics was available free of charge in IADT.

Results

Hypothesis 1

Learning using multimedia lecture captures versus traditional learning material has no significant effect on learning outcomes.

For the retention assessment, the participants received one point for each of the 20-true/false questions they gave a correct the answer for and their points were added together to give a total for each individual student. There was a maximum score of 20 and a minimum score of 0.

Graph 1

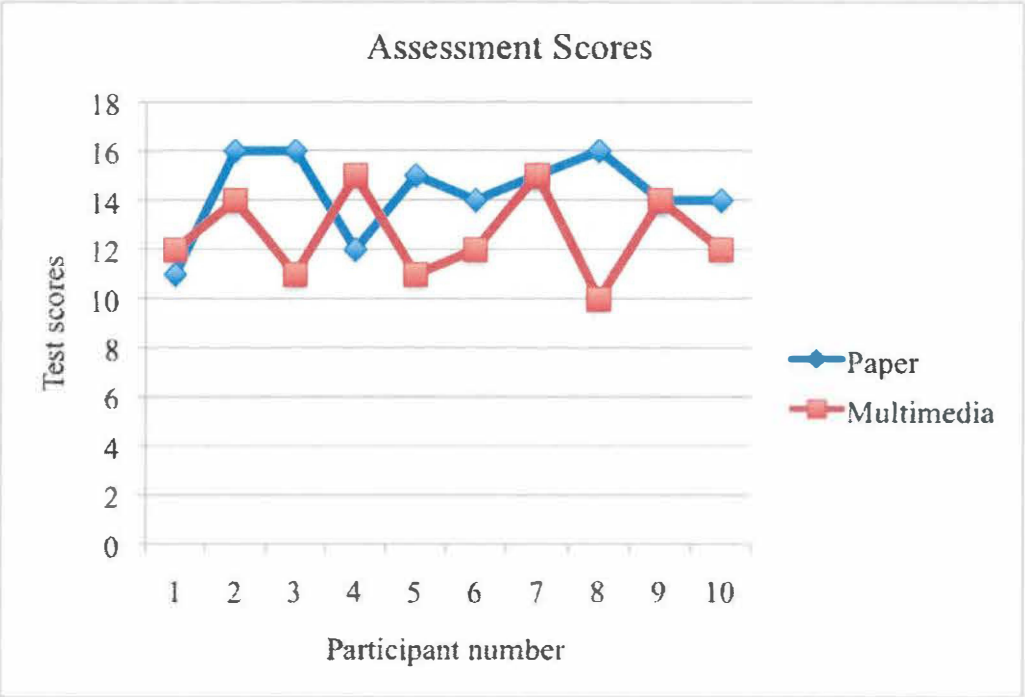


Table 1

Mean Scores, Standard Deviations, and t tests for the Differences Between Paper and Multimedia Groups on Retention Assessment.

Group	M	SD	t	p
Paper (n=10)	14.30	1.70		
Multimedia (n=10)	12.60	1.78		
			2.19	0.04

In this experiment an independent-samples t-test was conducted to compare participant retention in the paper group versus the multimedia group. There was a significant difference in the scores for the paper group (M=14.30, SD=1.70) and the multimedia group (M=12.60, SD=1.78) conditions; $t(18)=2.19$, $p = .042$.

This research concludes that H1 is not supported.

Hypothesis 2

A participant comfort level with new technology has a significant effect on learning outcomes when learning using multimedia lecture captures.

Participants were also asked to rate their comfort level with new technologies, rating themselves as positive (love or like new technology and use before most people), neutral (use new technologies when most people do) or negative (last to use new technologies or only when they have to). Participants were scored from 1 to 5 on their comfort level, with those least comfortable with new technology scoring 1 and those most comfortable with new technology scoring 5. There was a maximum score of 5 and a minimum score of 1.

Seven out of 10 in the multimedia group rated themselves as positive or neutral about new technologies. There was no significant difference in the scores for the positive/neutral group (M=12.860 versus the negative group (M=12.00).

This research concludes that H2 is not supported.

Participant observations

It was noted by the experimenter that the participants in the paper based group seemed less attentive to the lesson material after the first 5 minutes of the experiment.

Discussion

This study found that there is a significant effect on learning outcomes learning using multimedia lecture captures versus traditional learning material. Participants who took the paper based lesson scored significantly better than participants who took the multimedia lesson. These results would support the idea that it does lead to a cognitive overload and reduces average retention levels and they do not support the hypothesis that learning using multimedia lecture captures versus traditional learning material has no significant effect on learning outcomes.

Previous research has found conflicting evidence in relation to this research study. It is conceivable that the multimedia group should score the highest on the retention assessment because the narrated video requires less effort to process and creates more interest. However, research by Mayer (2005) would indicate, participants who received the paper lesson containing should perform the best because they are encouraged to engage in germane processing and can reduce extraneous processing.

There are a number of reasons why the multimedia lesson could have led a higher cognitive load than the paper lesson. The paper group were presented with a visual stream only whereas the multimedia group were presented with audio, video and presentation content streams simultaneously which would have an increase cognitive load. The paper lesson involves presentation of all the learning material at one time where the learner can easily control the pace and order of presentation. Whereas with the multimedia lesson the material is presented in a sequential order where the learner has no control over the pace of the lesson. Research by Zacks & Tversky (2003) found that learning material broken into meaningful units rather than in a continuous piece leads to better learning outcomes. The paper group viewed the learning material on two facing sheets of paper whereas the multimedia group viewed it on a computer screen, which was wide screen and of a high resolution and although it is unlikely this would have affected the results, it cannot be ruled out that it could have cause extraneous cognitive load, for example there could have being a glare on the screen from a window.

Because the study focused on lowest level on learning on Bloom's taxonomy, we do not have any supporting evidence on the impact of multimedia lecture captures on higher order learning such as comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956). We do know from Bloom (1956) that knowledge recall must be mastered before the next level one can take place, which would suggest the results if the higher levels were to be measured would be unlikely to be better for multimedia lecture captures. However, future studies could build on this research and examine the effect of multimedia lecture captures on higher order learning.

The overall comfort rating of the participants with new technology had no significant impact on the scores of either the multimedia or paper groups. This could mean that although their preference would be to use the multimedia lesson media because they feel comfortable with the technology, it doesn't mean they will retain any more information on the lesson. However, further research specifically on student preferences for learning materials would need to be completed to support this statement.

It is also interesting to note that while students in the paper group seemed less attentive to the learning material, they did in fact score higher on average on the retention test. This would indicate this is very little correlation between perceived lack of attention and actual attention.

The implications of this are significant given the increasing using of multimedia in the delivery of learning content and the move toward online learning. Careful consideration should be given to how the multimedia lesson is designed taking into account the cognitive load of the learner while taking the lesson. The lesson should be designed so it does not exceed the processing capacity of the learner. Until recently it was difficult to measure cognitive load, however DeLeeuw & Mayer (2008) developed a method to measure cognitive load during a multimedia lesson. This method of measurement should be used to determine what is the optimal design of a multimedia lesson, for example reducing redundancy by not displaying words that are spoken.

This study also suggests it may be premature to abandon textbooks in favour of multimedia technology like Youtube just because of it popularity with students. Multimedia lecture captures may be popular but the research does not suggest that they provide more educational value than traditional paper based learning material. Some educators believe that technology is the way of the future in education, this study however suggests caution should be used in replacing textbooks with technology.

This study however does not take into account learner's preference or motivation for learning. Other studies along with the popularity of podcasts and multimedia lecture captures shows that learners in many cases prefer this type of medium for learning material. Today's generation of learners have being downloading music, videos and podcasts to their mp3 players for the last number of years and are very familiar with this type of medium (Tyre, 2005; Barnett, 2005, WISC, 2008). Because of this they may also be more highly motivated to use this type of medium because they have grown up with multimedia in their everyday life. Because of this educators should look at making it available as complementary material along with the traditional textbooks, giving learner the option to choose which type of material they wish to learn from. A flaw of this study is the fact it did not include a satisfaction scale to see which type of material was most liked by the students, which would have given an insight into the learner's preference.

Another limitation of this research is it does not take into account the learning style of the participants, which may have a significant influence on the results. Again if lecture capture material were made available as complementary or supplemental material, learners with different learning styles would have the option to use it if they wished. A recommendation for future research would be look at the learning style of the individual in combination with their use multimedia and paper based material to see if this has a significant impact on the learning outcomes.

Participant recruitment was a challenge with this experiment and as a result the sample size is relatively low. Future studies could look at conducting similar research using a large sample size. Most of the students who took part in the experiment were from 3rd Year which would indicate students are more lightly to see a benefit in participation

nearer to the time when they will have to possible run a research experiment themselves. A recommendation for participant recruitment in future research involving an experiment would be to target students who are nearing the completion of their own research, to target smaller groups and engage with them face to face rather than sending an email. It should be noted that the experiment is based on a selective population (i.e., students in a psychology course at IADT), so the results might not generalize to a population that includes lower ability or lower literacy individuals.

In summary it is hoped this research would be useful to researchers as they continue to study and build a knowledge base about the use of multimedia lecture capture in higher education settings. Other factors worthy of future study including researching the use of multimedia lecture captures along with looking at students learning preferences, motivation, and styles, and examining higher order learning.

Conclusion

In this study the impact of multimedia lecture captures on knowledge recall and retention was investigated in relation to recall and retention using traditional paper based learning content. The study found that retention was lower for the group of students who took the multimedia lesson than the student group who took the paper lesson. The study also found that participant's comfort level with new technology has no impact on retention for the students who took the multimedia lesson. These findings support previously research in the area, which has found that multimedia content can lead to cognitive overload.

However, this study was not comprehensive enough to indicate that multimedia lecture capture is ineffective in all situations. Although the multimedia lecture captures did not improve knowledge recall and recognition, there may be situations in which they are still a benefit. The learner may have a preference for this type of learning material, they learner may be more motivated to use this type of material, the learner may have a learning style which is more suited to this type of material. Other type of learning content and learning at a higher level may be more suitable to this type if delivery mode.

Overall, this research should not be taken to mean we should not use multimedia lecture captures as aid to learning. However, the research suggests when it is used, it should be as a supplementary learning aid used in conjunction with traditional material and a blended learning environment where there are options for learners with different learning styles and preferences. Subsequent research is needed to determine what situations would best suit the use of multimedia lecture capture as an instructional learning aid.

There is a temptation to use new technology in teaching and learning with the assumption it will improve the learning outcomes for students. However, this study and previous studies have found this not to be the case and care should be taken in replacing traditional learning material with technology enhanced learning material.

References

Abt, G., & Barry, T. (2007). The quantitative effect of students using podcasts in a first-year undergraduate exercise physiology module. *Bioscience Education eJournal,* 2007(10).

Adam, S. (2004). *Using Learning Outcomes.* Report for United Kingdom Bologna Seminar 1-2 July 2004, Heriot-Watt University (Edinburgh Conference Centre). Edinburgh, Scotland.

Ahead. (2009). Charter for Inclusive Teaching and Learning. Retrieved December 6, 2009 from http://www.ahead.ie/publications.php

Allen, I. E., & Seaman, J. (2008). *Staying the Course: Online Education in the United States, 2008.* Needham, MA: Sloan Consortium.

Baker, R., Harrison, J., Thorton, B., & Yates, R. (2007). *An analysis of the effectiveness of podcasting as a supplementary instructional tool: A pilot study.* Paper Presented at the 2007 EABR & ETLC Conference. Ljubljana, Slovenia.

Barnett, M. (2005). Tech Trends: Podcasting hits the mainstream. Retrieved April 21, 2010 from http://www.usnews.com/usnews/biztech/articles/050705/5podcast.htm.

Bloom, B. S. & Krathwohl. D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals, by a committee of college and university examiners, Handbook 1: Cognitive domain.* New York: Longmans.

Boston College (2010). Instructional Design and eTeaching Services. Retrieved April 21, 2010 from http://idesweb.bc.edu/ides/website/teaching_tools/lecture_capture

DeLeeuw, K. E., & Mayer, R. E. (2008). A comparison of three measures of cognitive load: Evidence for separable measures of intrinsic, extraneous, and germane load. *Journal of Educational Psychology, 100,* 223-234.

ECHO360. (2010). Echo360 Benefits the Entire Campus Community. Retrieved April 21, 2010 from http://www.echo360.com/benefits/

EDUCAUSE (2008). College students prefer classes with online learning. Retrieved Jan 5, 2010 from http://www.news.wisc.edu/15640

Hew, K. F., (2008). Use of audio podcast in K-12 and higher education: a review of research topics and methodologies. *Educational Technology Research and Development. Boston:*Springer.

Kim, J. (2009). Capturing Lectures: No Brainer or Sticky Wicket? *Educause: Center for Applied Research: Research Bulletin, 2009(4),* 1-10.

Lakhal, S., Khechine, H., & Pascot, D. (2007). Evaluation of the effectiveness of podcasting in teaching and learning. In G. Richards (Ed.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, 2007,* 6181–6188. Chesapeake, VA: AACE.

Mayer, R. E., Hegarty, M., Mayer, S., & Campbell, J. (2005). When static media promote active learning: Annotated illustrations versus narrated animations in multimedia learning. *Journal of Experimental Psychology: Applied, 11,* 256-265.

Mayer, R. E. (2009). *Multimedia learning* (2nd ed). New York: Cambridge University Press.

Paivio, A. (2006). *Mind and its evolution; A dual coding theoretical interpretation.* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Rasch, T. & Schnotz, W. (2009). Interactive and non-interactive pictures in multimedia learning environments: Effects on learning outcomes and learning efficiency. *Learning and Instruction, 19(5),* 411-422.

Robson, C. (2007). *How to do a Research Project: A Guide for Undergraduate Students.* Oxford, UK: Blackwell Publishing.

Ross, S. M., & Morrison, G. R. (2004). Experimental research methods. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology (2nd ed.,* pp. 1021–1043). Mahwah, NJ: Lawrence Erlbaum Associates.

Rossell-Aguilar, F. (2007). Top of the pods–in search of a podcasting ''pedagogy'' for language learning. *Computer Assisted Language Learning, 20(5),* 471–492.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12,* 257-285.

Sweller, J. (1999). *Instructional design in technical areas.* Camberwell, Victoria, Australia: ACER Press.

Sweller, J. (2005). Implications of cognitive load theory for multimedia learning. In R. E. Mayer (Ed.), *Cambridge handbook of multimedia learning* (pp. 19 –30). New York: Cambridge University Press.

Traxler, J. (2007). Defining, Discussing, and Evaluating Mobile Learning: The moving finger writes and having writ... *International Review of Research in Open and Distance Learning, 2007(8),* 1-2.

Tyre, P. (2005). Professor In Your Pocket. Retrieved April 21, 2010 from http://www.newsweek.com/id/51275

WISC (2008). 7 Things You Should Know About Lecture Capture. Retrieved April 7, 2010 from http://www.educause.edu/blog/pkurkowski/NewELI7ThingsBriefExploresLect/168033

Zacks, J. M. and Tversky, B. (2003). Structuring information interfaces for procedural learning. *Journal of Experimental Psychology: Applied, 9,* 88-100.

Note: The word count for body of thesis excluding tables & graphs is 5,738 words.

Appendix A

Dolsec Approval Form A

DEPARTMENT OF LEARNING SCIENCES

ETHICAL APPROVAL FORM A*

Title of project _PODCASTS – DO WE LEARN MORE OR LESS?_____

Name of researcher _____Genevieve Dalton_____

Name of supervisor _____Dr. Marion Palmer_____

		Yes	No	N/A
1	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	X		
2	Will you tell participants that their participation is voluntary?	X		
3	Will you obtain written consent for participation?	X		
4	If the research is observational, will you ask participants for their consent to being observed?			X
5	Will you tell participants that they may withdraw from the research at any time and for any reason?	X		
6	With questionnaires, will you give participants the option of omitting questions they do not want to answer?	X		
7	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	X		

* Draft version – 10/07

8	Will you debrief participants at the end of their participation (i.e., give them a brief explanation of the study)?		X		
9	Will your project involve deliberately misleading participants in any way?			X	
10	Is there any realistic risk of any participants experiencing either physical or psychological distress or discomfort?			X	
11	Does your project involve work with animals?			X	
12	Do participants fall into any of the following special groups?	Schoolchildren (under 18 years of age)		X	
		People with learning or communication difficulties		X	
		Patients		X	
		People in custody		X	
		People engaged in illegal activities (e.g., drug-taking)		X	

If you have ticked **Yes** to any of questions 9 to 12 you should refer to the PSI Code of Professional Ethics and BPS Guidelines and consult with your supervisor without delay. You will need to fill in Ethical Approval Form B and submit a separate application to the Department of Learning Sciences Ethics Committee (DOLSEC).

There is an obligation on the researcher to bring to the attention of the DOLSEC any issues with ethical implications not clearly covered by the above checklist.

I consider that this project has **no** significant ethical implications to be brought before the DOLSEC.

I am familiar with the PSI Code of Professional Ethics and BPS Guidelines (and have discussed them with my supervisor).

MULTIMEDIA LECTURE CAPTURE

Signed _____ Print Name _____ Date _____

Applicant

Signed _____ Print Name _____ Date _____

Supervisor

Experiment schedule/script

DL155 N00083681 Research Experiment Schedule

No	Date	Time	Task	Status
1	01/02/10		Book A117 & A115 rooms for 24/02/10 4-6pm. Book 10 headsets.	
2	07/02/10		Pilot experiment with a couple of users and adjust steps accordingly.	
3	10/02/10		Order Apple iPod Shuffle.	
4	10/02/10		Programme coordinator to send out email invitation to students, ask them to bring mp3 player headphones.	
5	17/02/10		Reply by email to 50 students confirming study date, time & location of study. Ask students to exclude themselves from the study if they have studied *basic anatomy* previously.	
6	23/02/10		Buy chocolate bars.	
7	23/02/10	7pm	A117 - Check PCs work and copy Lecture Capture to local drive.	
7	23/02/10	7pm	Print 46 copies of Experiment documents and fill in Study IDs & Lesson Type on the Consent forms. Print raffle tickets with Study IDs.	
8	24/02/10	4pm	A117 – Tag PCs that do not work. Log onto all other PCs, run Lecture Capture from local drive but do not kick off. Ensure sound is enabled and PC is not too far under the desk.	
9	24/02/10	4:30pm	Randomly select students for both lesson type and direct to A117 or A115 as relevant. Give chocolate bars as "thankyou" to any excess students.	
10	24/02/10	4:25pm	In both rooms distribute copies of Experiment Outline, Consent, and Instruction/Debrief documents to student .	
11	24/02/10	4:40pm	Welcome students and ask them to read the Experiment Outline document. Advise them they are under no obligation to take part in study but if they wish to do so, they must sign the Consent form.	
12	24/02/10	4:50pm	A117 - offer headsets to any students, who do not have their own and instruct them to start lecture by clicking on the "High Speed Version" button – lesson will take 16 mins.	
13	24/02/10	4:50pm	A115 – Distribute hard copies of the lesson to students and inform them they have 16 mins to	

			study.	
14	24/02/10	4:55pm	Place a copy of the Experiment Assessment document face down on each student space. Make sure the student ID number matches the consent form.	
15	24/02/10	5:10pm	Instruct students to turn over or give them the Assessment form and ask them to check the Study ID assigned to them is the same as on the consent. They have 5 minutes to complete the Assessment.	
16	24/02/10	5:20pm	Collect the Consent and Assessment Forms. Thank the students and let them know the can keep the Experiment Outline, Instructions/Debrief & Lesson documents.	
17	24/02/10	5:25pm	Draw winning ticket for iPod Shuffle and give to winning student.	
18	24/02/10	5:30pm	A117 – Remove Lecture Capture from local drive, and log off each PC.	
19	24/02/10	5:55pm	Gather up any documents left.	

Experiment email invitation

Subject: **Chance to win an iPod Shuffle**

Dear fellow psychology student,

This is an opportunity to actually take part in a psychological research study, which is being conducted by Genevieve Dalton who is a second year student in the M.Sc. in Cyberpsychology, IADT.

There are no costs for participating in this study and as a thank you for participation, you will included in a ***draw for an iPod Shuffle***. A raffle for the will take place after the experiment and the winner will receive their iPod Shuffle following the draw.

An increasing number of instructors are capturing their lectures in multimedia format (video, audio and presentation) so students can access for learning outside the classroom. This is being driven by the need make education more accessible. The purpose of this study is to look at the impact of multimedia lecture captures on student learning.

The study should take no longer than 45 minutes and it is scheduled to take place at 4:30pm on Wednesday February 24th in rooms A117 & A115. Anyone over 18 years of age is eligible to participate.

If you would like to take part, please email gen.dalton@ucd.ie with your name, and the first 44 students who apply will be selected.

Many thanks,

Genevieve Dalton

Experiment invitation flyer

Don't miss a great opportunity to take part in a innovative psychology experiment on the impact of multi media on learning – along with the chance to win an iPod Shuffle!

If you are free on this Wednesday 24th Feb 4:30-5:30pm, you can sign up by emailing gen.dalton@ucd.ie or just come along to rooms A117 & A115 at 4:30pm on the day. Bring your personal MP3 player headphones with you if you think of it.

Anyone over 18 years of age and who has not previously studied basic anatomy in college is eligible to participate.

Experiment outline document

RESEARCH STUDY OUTLINE & EXPLAINATION
DUN LAOGHAIRE INSTITUTE OF ART, DESIGN & TECHNOLOGY

TITLE: Using multimedia lecture captures to promote learning

RESEARCHER:

Name:	Genevieve Dalton
Email:	gen.dalton@ucd.ie
Tel:	087-6390197
School, Dept:	School of Creative Technologies, Learning Sciences
Course:	M.Sc. in Cyberpsychology (DL155)

INTRODUCTION:
This an opportunity to take part in a research study, which is being conducted by Genevieve Dalton who is a second year student in the M.Sc. in Cyberpsychology. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following document, which provides you with the information you will need when considering whether to participate in this study.

Note: This study has being approved by the Department of Learning Sciences Ethics Committee (DOLSEC), IADT.

STUDY PURPOSE:
An increasing number of instructors are capturing their lectures in multimedia format (video, audio and presentation) so students can access for learning outside the classroom. This is being driven by the need make education more accessible. Through this study, we hope to better understand the impact of multimedia lecture captures on student learning.

You are being invited to take part in this study because you are current student in the B.Sc. in Applied Psychology course in IADT and anyone 18 years of age is eligible to participate. IADT is the only institution participating in this study.

STUDY PROCEDURES:
The experiment is expected to take no longer than ***45 minutes approximately*** and consists of the following tasks:

1. Sign the consent form and answer some demographic questions.
2. Review a lesson on an "Introduction to the Vertebral column" in either a lecture capture containing text, pictures, audio, & video or a pdf document containing text and pictures. This will just over take 16 minutes.
3. Complete a paper based assessment with 20 True/False questions, which will take approximately 10 minutes.
4. Study debrief, which will take approximate 2 minutes.

STUDY RISKS, BENEFITS, COSTS & COMPENSATION:
Your participation in this study involves no physical or psychological risks. To ensure confidentiality of all of your responses, you will be assigned a ***Study ID*** number, which will be used in all analysis and write up of the study.

Benefits to you will include the experience of taking part in a psychology experiment and also possibly a better understanding of the impact of the multimedia lecture captures on student learning. Benefits to education include a better understanding of whether and how multimedia lecture captures contribute to improved student learning.

There are no costs for participating in this study and as a thank you for participation, you will included in a ***draw for an iPod shuffle***. A raffle for the will take place after the experiment and the winner will receive their iPod Shuffle following the draw.

VOLUNTARY PARTICIPATION IN, AND WITHDRAWAL FROM, THE STUDY:
The decision whether to be in this study is entirely up to you. Participation is voluntary. You can refuse to participate, or withdraw from the study at any time without giving a reason, and such a decision will not affect your relationship with IADT, either now or in the future. Nor will a refusal or withdrawal of participation result in the loss of any other benefits to which you are otherwise entitled. Signing this form does not waive any of your legal rights.

CONTACTS:
If you have any questions, please ask, and we will do our best to answer them. If you have additional questions in the future about the study, please contact Genevieve Dalton at gen.dalton@ucd.ie or (087) 639 0197 for information. You are welcome to keep this copy of the study outline and explanation.

If you have any questions on your rights as a research subject, please contact the by the Department of Learning Sciences Ethics Committee (DOLSEC), IADT.

Thank you for taking time to read the study outline and explanation.

Experiment participant consent form

CONSENT TO PARTICIPATE IN A RESEARCH STUDY
DUN LAOGHAIRE INSTITUTE OF ART, DESIGN & TECHNOLOGY

TITLE: Using multimedia lecture captures to promote learning

RESEARCHER:

Name:	Genevieve Dalton
Email:	gen.dalton@ucd.ie
Tel:	087-6390197
School, Dept:	School of Creative Technologies, Learning Sciences
Course:	M.Sc. in Cyberpsychology (DL155)

STATEMENT OF CONSENT:
I have reviewed the study design outlined above and have had any questions I have about the study answered to my satisfaction. I understand that my participation is voluntary and that I can withdraw from the study at any time without prejudice. Signing this form does not waive any of my legal rights.

I ACKNOWLEDGE THAT I HAVE READ THE ABOVE EXPLANATION OF THIS STUDY THAT ALL OF MY QUESTIONS HAVE BEEN SATISFACTORILY ANSWERED, AND I AGREE TO PARTICIPATE IN THIS STUDY.

Study ID #: _____
Lesson Type: [ ] Multimedia [ ] Paper

_____ Signature of study volunteer

_____ Printed name of study volunteer

Date _____

1. What is your gender?
[ ] Male
[ ] Female

2. What age are you? _____Yrs_

3. Which of the following best describes you?
[ ] I love new technologies and am among the first to experiment with and use them.
[ ] I like new technologies and use them before most people I know.
[ ] I usually use new technologies when most people I know do.
[ ] I am usually one of the last people I know to use new technologies.
[ ] I am skeptical of new technologies and use them only when I have to.

MULTIMEDIA LECTURE CAPTURE

I CERTIFY THAT I HAVE EXPLAINED FULLY TO THE ABOVE SUBJECT THE NATURE AND PURPOSE, PROCEDURES AND THE POSSIBLE RISK AND POTENTIAL BENEFITS OF THIS STUDY.

_____ Signature of researcher

Date _____

Experiment instruction & debrief document

RESEARCH STUDY INSTRUCTIONS AND DEBRIEF
DUN LAOGHAIRE INSTITUTE OF ART, DESIGN & TECHNOLOGY

TITLE: Capturing Lectures: Using multimedia lecture captures to promote learning

RESEARCHER:

Name:	Genevieve Dalton
Email:	gen.dalton@ucd.ie
Tel:	087-6390197
School, Dept:	School of Creative Technologies, Learning Sciences
Course:	M.Sc. in Cyberpsychology (DL155)

1. READ OUTLINE AND COMPLETE THE CONSENT FORM

2. COMPLETE THE LESSON

Multimedia lecture capture lesson
Click on the button "High Speed Version" on your PC
The lesson should take approximately 16 minutes, the supervisor will let you know when the time is up.

Traditional pdf document lesson
The lesson should take approximately 16 minutes, the supervisor will let you know when the time is up.

3. COMPLETE THE PAPER BASED ASSESSMENT HANDED OUT BY THE SUPERVISOR.

4. THANK YOU VERY MUCH FOR TAKING PART IN THIS STUDY

The study in which you have participated in was designed to better understand the impact of lecture multimedia lecture captures on student learning.

If you have questions about this study or you wish to have your data removed from the study at any time, please contact Genevieve Dalton, at the following e-mail address: gen.dalton@ucd.ie

MULTIMEDIA LECTURE CAPTURE

We thank you sincerely for contributing and assure you that your data is confidential and anonymous, and if published the data will not be in any way identifiable as yours. Your contribution is very useful for investigating mobile phone dependence and anxiety.

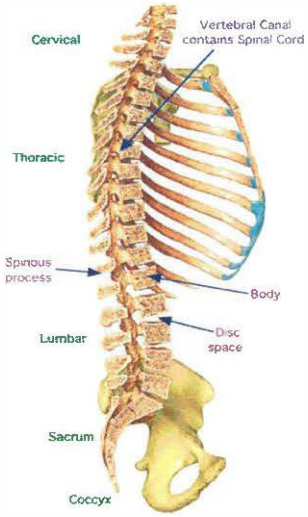
Experiment paper based lesson

Introduction to the Vertebral column

Dr. Patrick Felle
School of Medicine and Medical Science, University College Dublin

These notes are purely for use in a research project in collaboration with Ms. Genevieve Dalton, UCD IT Services

In order to discuss the structure of the vertebral column there are a few important anatomical terms we must know.
Saggital plane – this describes a plane through the body from front to back (the route an arrow will take going straight through an opponent when shot from directly in front or behind – saggitarius = archer)
Coronal plane – a plane through the body from one side to the other – corona = crown)
Anterior = in front
Posterior = behind
Lateral = to one side



The vertebral column comprises a series of bones one placed atop the other with a number of joints between each adjacent pair.

It is divided to a number of parts
Cervical spine – the neck region
Thoracic spine – the chest region
Lumbar spine
Sacrum
Coccyx

The sacrum and coccyx each comprise a number of vertebrae which have fused together.

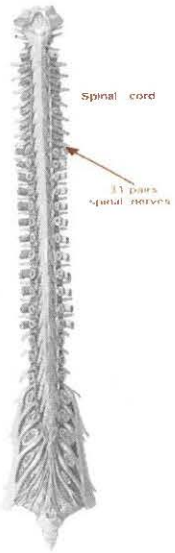
This midline saggital diagram shows the vertebral bodies one on top of the other with a disc space between. The "spinous process" points posteriorly.

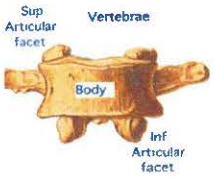
Kyphosis / Lordosis
The normal spine is curved in the saggital plane.

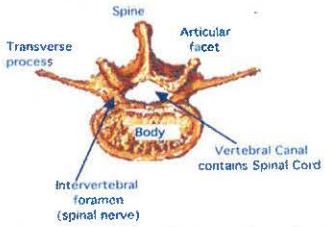
Lordosis
This is a convex-forward curvature – Cervical / Lumbar lordosis
Kyphosis
This is a convex-backwards curve. Thoracic / Sacral. Thoracic kyphosis is exaggerated in "dowager's hump", where vertebral bodies collapse due to osteoporosis

Scoliosis
The spine should be straight in the coronal plane. Abnormal curvature is called Scoliosis and may be a serious condition, impinging on nerve roots and causing respiratory problems due to alterations in shape of the chest cavity.

A major function of the vertebral column is to support the spinal cord. The spinal cord runs from the base of the skull to the lumbar spine and gives off 31 pairs of spinal nerves. Each of these carries motor innervation (to muscles) and sensory information (carrying sensation from the body to the central nervous system).



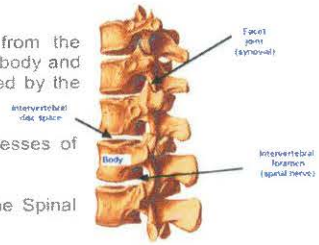




Vertebrae differ from one another depending on their position in the vertebral column. For instance, those cervical vertebrae are smaller, with the lower lumbar vertebrae much larger.

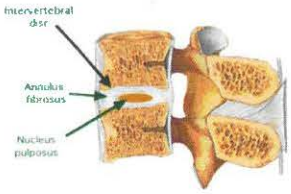
Each vertebra comprises a body anteriorly, with a "neural arch" posteriorly. These surround the **Vertebral Canal**, through which runs the spinal cord.
There is a **spinous process** directed posteriorly and transverse processes laterally on either side. There are **articular processes** running up and down from the neural arch, each articulating with the corresponding process of the vertebra above or below as appropriate. The joints formed are called "**Facet Joints**"

When you look at the vertebral column from the lateral side, there is a space between each body and the one above or below. This space is filled by the **intervertebral disc**



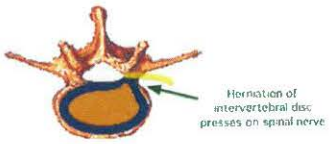
Posteriorly we see the **facet joints** between the articular processes of each vertebra and the one above or below.

We can also see the **Intervertebral foramen**, through which the Spinal Nerve runs.



The intervertebral disc between the vertebral bodies forms a cushion for the spine.
It comprises an outer tough layer, the **annulus fibrosus**, and an inner gelatinous layer, the **nucleus pulposus**.

If there is a weakening in the annulus fibrosus, the nucleus pulposus may burst through (herniated) and press on the spinal nerve. This can affect either the motor or sensory component of the nerve, or both. If it affest the motor component it can cause muscle weakness or paralysis. If it affects the sensory part it can cause loss of sensation (anaesthesia) or a disordered sensation, e.g. pain.



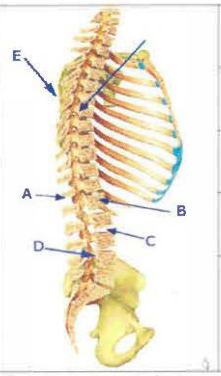
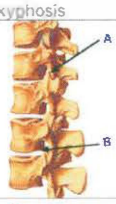
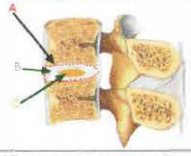
Similar effects on the spinal nerve may ensue from disease process at the facet joint impinging on the spinal nerve.

Experiment retention assessment form

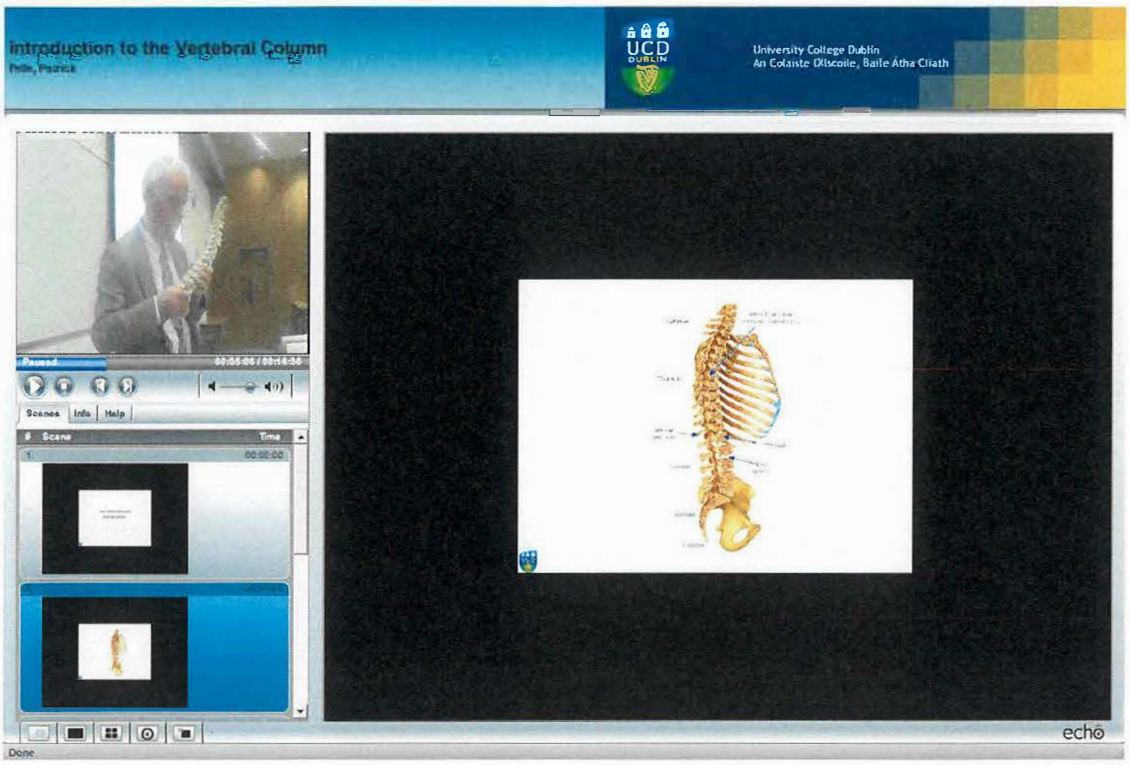
RESEARCH STUDY ASSESSMENT
DUN LAOGHAIRE INSTITUTE OF ART, DESIGN & TECHNOLOGY

TITLE: Using multimedia lecture captures to promote learning
COURSE: M.Sc. in Cyberpsychology (DL155)
Study ID #: _____

Please complete the test by answering True or False to the following questions.

Vertebral Column assessment			
	Question		Ans
1	A saggital plane describes a plane through the body from front to back		
2	In the anatomical position, the thumb is lateral to the little finger		
3	The nose is medial to the eye		
4	Spinal nerves carry either motor or sensory information but not both		
5	The sacrum is the lowermost part fo the vertebral column		
		6 A is the Lamina of a vertebra	
		7 B is the Body of a vertebra	
		8 C marks the space where the intervertebral disc lies	
		9 D is the Sacral region of the vertebral column	
		10 E the curvature of the vertebral column at E is called a Lordosis	
11	The sacrum comprises a number of vertebrae fused together		
12	Scoliosis is an abnormal curvature in the saggital plane		
13	Degeneration and collapse of vertebral bodies in the thoracic region may lead to kyphosis		
14		14. A marks a facet joint	
15		15. B marks the intervertebral foramen.	
16		16 The structure A bounded by the red dotted line is the intervertebral disc	
17		17. The grey part marked B is the nucleus pulposus	
18		18. The part marked C is a gelatinous structure	
19	When a motor nerve is affected the person loses sensation over some part of the body		
20	Disease of the facet joint never causes nerve problems		

Screenshot of multimedia lecture capture lesson



SPSS results tables

Group Statistics

	Lesson type	N	Mean	Std. Deviation	Std. Error Mean
Assessment Score	Paper lesson	10	14.3000	1.70294	.53852
	Multimedia lesson	10	12.6000	1.77639	.56174

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Assessment Score	Equal variances assumed	.300	.590	2.185	18	.042	1.70000	.77817	.06512	3.33488
	Equal variances not assumed			2.185	17.968	.042	1.70000	.77817	.06491	3.33509