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Instructor on Demand: Can Online Delivery of Lectures Promote Learning Achievement?

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Acknowledgement Page

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Abstract

Reported enrollments of students taking online courses in institutes of higher learning in the 2000-01 academic years were estimated at 3.077 million, according to the U.S. Department of Education's National Center for Educational Statistics (NCES). Dramatic enrollment increases have led to a need for research that involves both the comparison of learning achievement based on delivery mediums, and student attitudes concerning alternative delivery methods. This study compared the learning achievement of students when the deliveries of course lectures were presented both in-class and online, as well as measured attitudes of students concerning delivery mediums. Both types of lectures were presented using the same teaching methods except for the type of delivery medium. Findings support previous literature findings that the delivery medium has no bearing on learning achievement provided that the course information is presented in identical formats. Students' learning achievement showed no significant differences between each presentation mode. Findings from student perceptions also indicated that students' attitudes towards both presentation formats are equal regarding preference for the type of delivery method, being able to access each type of lecture, presence of the instructor, overall satisfaction with each delivery method, and future indication that they would potentially take each type of class. However, there were significant differences in students preferring control when scheduling courses according to their own timelines, and becoming more distracted with the online lectures. This study concluded that future research should focus not on the delivery medium as a single entity but view it as a system, which encompasses a multitude of factors including hardware, software, and people and how they interact with the newer mediums.

Chapter 1 – Introduction

Importance of Media in Learning Achievement

There has been a long-standing debate on whether the various forms of media delivery used in the classroom have any bearing on actual learning achievement of students. With increasing requirements to place college and university courses online it is important that we understand if and how new electronic forms of course delivery impact student learning. Two prominent researchers in the area of educational technology have differing views on the subject and both make good points. Richard E. Clark (1994) states that *Media Will Never Influence Learning* in his article by the same name. Robert Kozma (2000, p.7) argues that the technological capabilities of the medium are what can make the design of effective instruction possible stretching beyond its current potential. Both Clark and Kozma maybe accurate in their statements. Designing a lesson and running the same exact lesson through two differing types of media whether paper based or electronic should usually generate the same results provided all input variables are equal. There are numerous research studies that support that argument for example, Schmidt (2002, p.8) placed students in both an online learning environment alternated with a traditional classroom setting and found no significant differences in learning achievement. Caywood and Duckett (2003, p.103) also compared outcomes between traditional in-class courses and online courses of pre-service special educators and found no significant differences between groups. However, student perceptions may not be equal in both environments. Schmidt (2002, pp. 7-8) when researching student perceptions in online courses found significant differences in several categories of student perception. The bigger question maybe how do we design instruction for online environments in such a

way as to promote learning achievement, and meet the needs of the students? And, how can we use the power of new technology to its potential, and the satisfaction of the students? Taking a look at research in the area of instructional design is a significant first step.

An Experiment on Media and Learning

The opportunity to test Clark's assertion that media does not influence learning presented itself because of the purchase of a new technology for presenting lectures online. Course lectures, both online and in a classroom setting were provided, achievement levels of students were measured for both settings. Based on previous literature it was hypothesized that no significant differences in achievement levels between the online lecture and the in-class lecture presentations would be found. Likewise, attitudes of students were determined toward seven categories relating to the presentation of each type of delivery medium based on a survey questionnaire given at the end of the semester. Clark (1994, p. 23) stated that the medium does not motivate and therefore: it was hypothesized that no differences in attitudes between the online lecture and in-class lecture presentations would be found.

Chapter 2 – Literature Review

The Demand for Online Courses

Statistical Trends

The current trend in higher education is a push to place course work online and the effort is not without merit. Phipps and Merisotis (2000, p. 1) cited the statistics of a survey by the U.S. Department of Education's National Center for Educational Statistics (NCES) on distance education in institutes of higher learning and found:

> ...that from 1994-95 to 1997-98 the number of distance education programs increased by 72 percent. Moreover, an additional 20 percent of the institutions surveyed planned to establish distance education programs within the next three years. The survey estimated that more than 1.6 million students were enrolled in distance education courses in 1997-98.

According to the 2000-01 reports from the NCES, institutions offering distance education courses has doubled in the three years since their 1997-98 report.

> In the 12-month 2000–2001 academic year, there were an estimated 3,077,000 enrollments in all distance education courses offered by 2-year and 4-year institutions. There were an estimated 2,876,000 enrollments in college-level, credit-granting distance education courses, with 82 percent of these at the undergraduate level (National Center for Educational Statistics, 2000-2001, p. 1).

Whether the intent is to reach the masses or increase the bottom line, new delivery methods for learning are emerging faster than most institutions can keep up. Corporate learning organizations that develop course management systems and whose sole purpose is to accommodate the presentation of new learning environments are ubiquitous: WebEX ©, Tegrity ©, WebCT ©, and Blackboard © to name a few. The majority of these come at a significant cost including hardware, software, training, implementation, upgrades, and technical support. In Richard E. Clark's article *Media Will Never Influence Learning* he suggested that organizations invest heavily in technology, hoping

that it will improve learning. When achievements in learning are gained the assumption is that it must be the new delivery medium and, in reverse, if learning gains aren't realized then it must be due to poor decision-making as to the correct media choice by the institution (Clark, 1994, p. 27).

Currently Used Methods of Delivery

The NCES 2000-01 report described the distance education technologies that most institutes of higher learning are using in the delivery of their courses.

> The Internet and two video technologies were most often used as primary modes of instructional delivery for distance education courses by institutions during the 12-month 2000–2001 academic year. Among institutions offering distance education courses, the majority (90 percent) reported that they offered Internet courses using asynchronous computer-based instruction. In addition, 43 percent of institutions that offered distance education courses offered Internet courses using synchronous computer-based instruction, 51 percent used two-way video with two-way audio, and 41 percent used one-way prerecorded video as a primary mode of instructional delivery for distance education courses. Further, of the institutions offering distance education courses, 29 percent used CD-ROM as a primary mode of instructional delivery and 19 percent used multi-mode packages (National Center for Educational Statistics, 2000-2001, ¶ 14-15)

These technologies can no doubt deliver information to the masses, but more importantly do they promote learning? Clark (1994, p. 23) argues that the medium itself has no bearing on learning and it never will.

Instructors, Students & the Web Environment

With the advent of technology, instruction can now be delivered globally via Web pages, video feeds, or interactive presentations; the classroom is no longer the only available venue for us. On average every eight months the makers of new technologies provide us with new versions, or upgrades with claims of newer, faster, easier to learn, and more supportive and engaging environments that come at a significant cost to the institution. Preparing online courses now involves a collaborative effort of subject matter

experts (instructors) and multimedia design experts "who are conversant in various media and languages" and know that "it was necessary to collaborate with people who can both facilitate and execute the ideas" of the teaching professional (Sensiper, 2000, p. 620). Critical to the development of online courses is the use of research that provides insight into learning achievement within those environments.

In online courses the instructor is no longer the single driving force for the delivery of content to the student body, in a single environment, with simple two dimensional presentation methods (lectures, text, power-point presentations, or overhead transparencies). The idea of a traditional classroom-lecture accompanied by text readings and assignments no longer appeal to many of today's students. However, Brothen & Wambach's 1998 study (as cited by Kennedy, 2000, p. 13) found that students, when given a choice as to whether or not to attend course lectures, significant drops in student attendance did occur.

Effective online instruction requires a holistic approach that includes the integrations of technology, teaching methodologies, student experiences, and navigational structures that promote learning for a mixture of audiences with multiple learning styles. Web design experts have gone as far as to categorize Websites into stages of evolution:

> David Siegel (as cited by Sensiper, 2000, pp. 617-618), a prominent Web designer, has proposed an evolving model of Web development that increasingly uses the new media in ways that take advantage of its properties. He divides Websites into three generations. In the first generation, the tendency is simply to repurpose existing material: many early Websites were pages of text hyperlinked to other text pages so that you could interactively pursue a topic given the links from page to page. In the second generation, Websites moved towards an inclusion of graphics and video, but with no clear sense of integrated experience of the site as a whole. This might be called 'thin multimedia'. Third generation

> sites take advantage of computer interactivity and utilize other elements unique to the WWW and to computers in general. In particular, they have a flow in which the different media – visual, auditory, text – interact and enhance each other.

Because the drive to move to the Web is still in its early stages most institutions that are placing course work online fall into the first generation, or at best second generation of Websites. Clark argued that learning is not attributed to the medium of course delivery but more to the inclusion of cognitive processing methods necessary for learning to occur (Clark, 1994). Although Siegel's (as cited by Sensiper, 2000, pp. 617-618) third generation Web sites seem to have all the design components required to engage the student in learning there is no mention of the inclusion of learning methods that are needed to ensure that learning occurs. This leads one to question whether it is the "level" of the Website or the learning methods used that are most important in this environment.

Online Learning Environments and Media Influence

Media, Attributes, and Learning Achievement

There are many studies that suggest that there is no significant difference of learning achievement between in-class versus online delivery of course instruction (Schmidt, 2002, p. 8; Caywood & Duckett, 2003, p.103). Ramage reviewed Thomas Russell's 2001 book "The No Significant Differences Phenomenon" in which he compiled 355 studies that support no significant differences being found between traditional classroom instruction and other technologically mediated forms of instruction (Ramage, 2002, ¶ 1). There are, to a smaller extent, studies in which significant differences in learning are found: Schutte (1999, as cited by Kennedy, 2000, p. 10) found

that online students performed 20% better than students in the traditional classroom even though the students were randomly assigned to the course and had similar characteristics. The question that emerges from this finding is what was the causal agent associated with the differences in the two groups? Was it the media, learning method, or learner characteristics?

The debate over whether media affects learning is a long-standing one in the instructional design community. According to Clark, methods should influence learning and not media. His renowned analogy stated "Media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes change in our nutrition" (Clark, 1994, p. 22). Clark's analogy is clever but the idea maybe limited in its scope: is he trying to separate the proverbial horse from the cart? What if the groceries being delivered by that truck provided us with nutritional labels that caused us to make various choices that eventually would impact our nutrition? Or, what if there was ice cream in the back with music playing as the truck drove up and down the street? Would we rush out to the street to meet the driver, and would that impact our nutritional levels?

The attributes of multimedia delivery can provide opportunities to learn that might not be inherent in other types of media delivery systems. According to Kozma certain instructional designs can only be made possible because of the technological capabilities that are incorporated into the instruction (Kozma, 2000, p. 7). Students in a high school biology class can build DNA replicas with Popsicle sticks, colored paint, and Styrofoam balls and learn about DNA sequencing. But, what happens when they can actually change the DNA sequence of a frog via a computer program and see how the

new sequence effects the physical aspects of the new frog on-screen? Will the student gain a better understanding of the material because of the new technologies as opposed to the previous example? In Ramage's literature review of Russell's book he presented that the research is oversimplified by trying to place all media studies into one category when each media delivery method can clearly have differing attributes (Ramage, 2002, ¶ 17). Trying to separate the delivery medium from its attributes is like trying to separate the personality from the instructor, or the tools used when she is delivering in-class instruction. It is a combination of delivery methods and their features that motivate or inhibit the students desire to learn. The delivery method needs to be researched holistically as a system in order to assess its impact on learning. Ramage points out that researchers Phipps and Merisotis defined gaps in research on media and learning, and suggests that the same gaps could be applied to the traditional classroom. He asks the question: "Why should the study of distance education or the effects of technology on learning be held to a higher standard?" (Ramage, 2002, ¶ 16)

For some, the medium effects on achievement debate is moot "...the search for media effects has been called off. In its place is a search for the conditions under which various media, such as animation, affect the learning process. Instead of asking, "does animation improve learning?" we ask "when and how does animation affect learning?"" (Mayer & Moreno, 2002, p. 88). Kozma (2000, p. 9) reports that research in Instructional Technologies (IT) has been historically focused on what samples were at hand to use, and were intended to test specific mediums (not unlike this study). He discussed that further research and development in educational technology should shift from the design of instruction to the design of learning environments, and that by

understanding the triad between media, design, and learning we can better contribute to the field of instructional technology (Kozma, 2000, p. 13). Ramage discussed the need for definitive research that better addresses the efficiency of technology and learning: "Studies need to review the impact of media and method, account for efficiency of design and cognitive efficiency, and to ensure that the right questions are asked and the right messages are taught (Ramage, 2002, ¶ 21)." Research doesn't need to simply focus on traditional classroom media versus electronic forms of media delivery, feeding the same information through two formats and determining whether they both achieve adequate levels of learning, is only one part of the equation. Therefore, the remainder of this literature review will focus on research that deals with meaningful learning, and what is required to support successful online students, teachers, and environments.

What Constitutes Meaningful Learning?

As educators and their institutions make the shift from traditional classroom based instruction to that of an online environment it becomes critical that we understand what constitutes meaningful learning in those environments. With new technologies come new challenges. Human interaction that takes place in a physical setting must now become human-computer interaction that should promote the same levels of achievement required in conventional settings. Additionally, the evaluative role the instructor plays in determining whether a student is being successful in learning achievement within the physical proximity of the classroom now requires that part of that interaction be placed within the instructional design of the course being offered.

Design that is supported by research will bridge the gap between the online student and the online instructor. When designing online environments that promote

learning achievement, research in the areas of audio/visual, cognition, knowledge acquisition/construction, human communication/message processing, motivation/interest, retention/transfer, and multimedia theories of learning are leading domains for consideration.

Auditory/Visual

How humans physically process information in a virtual environment is quite different than how it is processed in a traditional classroom situation. The new educational delivery methods are multimedia delivery systems. The integration of text, graphics, full-motion video, and sound (multimedia) can be presented simultaneously, vying for the attention of the learner. Knowing the proper combinations of these effects and how they enhance or detract from learning is a focus for consideration in instructional design. Auditory adjuncts are an important feature of the *dual-processing model* (as cited by Moreno & Mayer, 2000, p. 117) of multimedia learning:

> The model is based on three major assumptions: (a) learners have at least two different information-processing channels, such as a visual channel and an auditory channel (Baddeley, 1992; Paivio, 1986); (b) each channel (or type of working memory) has a limited capacity (Baddeley, 1992; Chandler & Sweller, 1991); and (c) major steps of cognitive processing within each channel (or each type of working memory) involve selecting relevant material for further processing, organizing the selected material into a coherent representation, and integrating the verbal and visual representations with one another and with relevant material from long-term memory (Mayer & Wittrock, 1996; Paivio, 1986).

In their research Moreno and Mayer discussed two competing theories regarding auditory adjuncts "...--arousal theory, which favors auditory adjuncts, and coherence theory, which rejects auditory adjuncts" (Moreno & Mayer, 2000, p. 118). If Arousal Theory holds, adding interesting elements like sound, music, etc. to a multi-media presentation should peak the students' interest, increasing their arousal and attention,

which will result in better achievement results when testing for retention and transfer. If Coherence Theory holds, then the elimination of extraneous sounds or auditory adjuncts will result in better understanding, retention, and transfer (Moreno & Mayer, 2000, p. 118). Their research found "...the major result is that adding sufficient amounts of entertaining but irrelevant auditory material to a multimedia instructional message was detrimental to student learning". In their findings, coherence theory supported retention and transfer while arousal theory rejected it (Moreno & Mayer, 2000, p. 123). Their suggestions for designing instruction that complements auditory adjuncts and also promotes retention and transfer are:

> When presenting a multimedia explanation, only include complementary stimuli that are relevant to the content of the lesson. The most straightforward practical implication is that instructional software designers should carefully limit the amount of auditory material in multimedia lessons rather than add auditory materials for reasons of appeal or entertainment (Moreno & Mayer, 2000, p. 124).

Educational technology that incorporates research regarding the physical interactions between humans and technology can effectively alleviate the challenges students have with information that competes for attention from the auditory and visual facilities.

Cognition

When reviewing cognitive theories in educational technology ways are examined in which the technology can best be utilized to help the learner process information that will construct new knowledge that can both be retained and transferred to new situations. Cognitive or constructivist approaches center around the ideas of John Dewey, Jean Piaget, and Jerome Bruner in which humans construct knowledge as active participants and that this process happens in a social framework. Therefore, research areas that

designers might consider when planning instruction are those that focus on knowledge acquisition/construction, human communication/message processing, and motivation/interest.

Knowledge Acquisition / Construction

Mayer et al. distinguishes between knowledge acquisition and knowledge construction:

1) According to the knowledge acquisition view, learning involves adding new pieces of information to one's memory. The instructor's job is to present information, and the learner's job is to receive it. The key to effective instruction is access to vast amounts of information (Mayer, Smith, Borgman & et. al., 2002, p. 38).
2) According to the knowledge construction view, learning occurs when the learner mentally builds a cognitive structure. This process involves active cognitive processing by the learner, including selecting relevant information, mentally organizing it into a coherent structure, and integrating it with existing knowledge. The instructor's job is to guide the learner's cognitive processing, and the learner's job is to actively process the new, incoming material. The key to effective instruction is to prime effective cognitive processing in the learner (Mayer, et al., 2002, p. 38).

In order for online students to acquire and construct knowledge efficiently they need to be capable of finding and synthesizing information. As such, online instructors will need to be versed in how to mentor students through this process while understanding how to create online content that can help them plot their own cognitive processes, thus enabling construction of new information independent of the instructor.

Human Communication / Message Processing

As students move into cyber space for learning experiences, both instructors and students need to be educated in the art/science of human communications. Human interactions have been extensively studied in research arenas, and according to Reynolds

1988 the *transmission hypothesis* states (as cited by Moreno & Mayer, 2000, p. 725): "...human communication involves three processes: first, encoding an idea into a signal by a sender; second, the transmission of the signal to the receiver; and third, the decoding of the signal by the receiver". When translated to online environments the *transmission hypothesis* becomes the *information delivery theory of multimedia* learning:

> A straightforward theory is that learning involves adding information to one's memory (see Mayer, 1996, in press). According to this theory, the computer is a system for delivering information to learners. The instructional designer's role is to present information (e.g., as words or pictures, or both) and the learner's role is to receive information (Mayer & Moreno, 2002, p. 90).

The instructional designer encodes the information, the online media transmits the information to the student, and the student decodes the information. If there are any disconnects between the encoding, transmissions, and decoding processes the message can become distorted or lost in translation, thereby hindering communication.

When developing communications within an online environment research has shown that the application of the same societal rules that govern human-human interactions can also be applied to human-computer interactions, according to Reeves and Nass (1996, as cited by Moreno & Mayer, 2000, p. 725) it is a natural progression for people to want to act in an online environment as they would in everyday life. This makes message processing easier for the student because they don't have to learn a new schema for communicating online. The personalization of messages has also been attributed to better problem-solving transfer and retention when used in computer games (Moreno & Mayer, 2000, p. 725).

Motivation / Interest

Interest and motivation are characteristics that can compel learners into an online course or in reverse drive them away, all the while impacting the learning process. Stephenson cites the importance of motivational principles and the learning environment in the 2003 review of research on elearning in the workplace:

> Bonk and Wisher (2000) prescribe a revisit to the principles of learner centered learning articulated by the American Psychology Association in 1995 which set out 14 principles grouped around Cognitive and Metacognitive Factors, Motivational and Affective Factors, Developmental and Social and Individual Differences (Stephenson, 2003, p. 11).

According to Mayer, the work of John Dewey argues that given effort-based versus interest-based learning that interest will prevail when it comes to knowledge acquisition (Mayer, 1998, p. 56). Multimedia environments are, by their nature, meant to be interactive. By understanding learner characteristics and how to create environments that promote interaction with the individual online educational environments could potentially enhance the student experience thereby sustaining the interest of the student.

Retention & Transfer

Mayer and Wittrock's research (as sited by Mayer, 2002, p. 226) indicates that meaningful learning occurs when retention and transfer are promoted.

> Two of the most important educational goals are to promote retention and to promote transfer (which, when it occurs, indicates meaningful learning). Retention is the ability to remember material at some later time in much the same way it was presented during instruction. Transfer is the ability to use what was learned to solve new problems, answer new questions, or facilitate learning new subject matter (Mayer & Wittrock, 1996).

Mayer defines retention as remembering or being able to retrieve stored knowledge that is relevant to a given situation from long-term memory. Being able to recognize/identify and recall/retrieve information when presented with material is a necessary component

for meaningful learning (Mayer, 2002, p. 228). Moreno and Mayer's research has shown that information can be retained better when it is personalized. They call this a *self-referential effect* "in which retention is facilitated by having people process information and relating it to aspects of themselves" (Moreno & Mayer, 2000, p. 724).

When presented with a learning scenario students use transfer to understand the problem, applying what they know, analyzing the problem, evaluating it and creating new solutions for the scenario (Mayer, 2002, p. 226). Mayer examines the six 6 cognitive processes for retention and transfer as outlined in Bloom's Taxonomy and has developed 19 sub-categories that are intended to be mutually exclusive (Mayer, 2002, pp. 228-232). These sub-categories could be used as guidelines when developing instructional design that promotes learning and transfer by facilitating cognitive processes in online environments. The categories and sub-categories as defined by Mayer 2002 are as follows:

1. Retention
    - 1.1. Remembering
        - 1.1.1. Recognizing
        - 1.1.2. Recalling
2. Transfer
    - 2.1. Understand
        - 2.1.1. Interpreting
        - 2.1.2. Exemplifying
        - 2.1.3. Classifying
        - 2.1.4. Summarizing
        - 2.1.5. Inferring
        - 2.1.6. Comparing
        - 2.1.7. Explaining
    - 2.2. Applying
        - 2.2.1. Executing
        - 2.2.2. Implementing
    - 2.3. Analyze
        - 2.3.1. Differentiating
        - 2.3.2. Organizing
        - 2.3.3. Attributing

2.4. Evaluate
    2.4.1. Checking
    2.4.2. Critiquing
2.5. Create
    2.5.1. Generating
    2.5.2. Planning
    2.5.3. Producing

According to Mayer old methods of basic skills instruction such as Learning Hierarchies (modular learning in which it is assumed that successful completion of higher-order tasks automatically assumes lower-order tasks were completed successfully), Mastery Learning (breaking a learning unit into smaller components and mastering each one before moving on to the next), and Componential Analysis (breaking a reasoning task into cognitive processes of encoding, inferring, applying, and responding) are inadequate when trying to promote problem-solving transfer (Mayer, 1998, p. 51). He states that problem-solving expertise is not only made up of cognitive factors but require the inclusion of motivational and metacognitive processes as well (Mayer, 1998, p. 51).

Mayer outlines three necessary components for efficient problem-solving expertise: 1) Skill – "domain specific knowledge relevant to the problem-solving task", 2) Metaskill – "strategies for how to use the knowledge in problem-solving", and 3) Will – "feelings and beliefs about one's interest and ability to solve the problems" (Mayer, 1998, p. 50).

If, as Mayer and Moreno point out, retention and transfer are two of the most important educational goals for promoting meaningful learning, then the inclusion of activities that incorporate cognitive processes and the components necessary for efficient problem-solving expertise is paramount to the design of online courses. Multimedia

environments are ideal systems for creating pre-defined molds that instructors could simply plug in relevant information regarding course preparation.

Multimedia Theories of Learning

It is necessary when developing online course materials to look at research in the area of multimedia theories of learning. Mayer and Moreno explain the *Cognitive Theory of Multimedia Learning*:

> According to this theory, the cognitive process of integrating is most likely to occur when the learner has corresponding pictorial and verbal representations in working memory at the same time. Instructional conditions that promote these processes are most likely to result in meaningful learning (Mayer & Moreno, 2002, p. 91).

In instances where the text and animation are delivered simultaneously on screen the attention of the learner is split not allowing her to attend fully to all of the presented material. This according to Mayer is known as the Split-attention Hypothesis (Mayer, Heiser & Lonn, 2001, p. 190). Kalyuga, Chandler, and Sweller (1998, as cited by Mayer et al., 2001, p. 187) have coined the term "redundancy effect" in which redundant material, which is not necessary to the presentation, can actually impair student learning in multimedia environments. Mayer also discusses a Coherence Effect regarding the addition of video clips into multimedia environments " ...adding interesting but conceptually irrelevant video clips to a multimedia explanation can have negative effects on students' understanding of the explanation (Mayer, et al., 2001, p. 196). Mayer and Moreno outline a set of seven principles for the design of multimedia presentations involving animation:

1. Multimedia Principle – "...students learn more deeply from animation and narration than from narration alone. The theoretical rational for this principle is that students are better able to build mental connections between corresponding words and pictures when both are presented (i.e.,

animation and narration) than when only one is presented (i.e. narration) and the learner must mentally create the other (Mayer & Moreno, 2002, p. 93).

2. Spatial Contiguity Principle – "...students learn more deeply when on-screen text is presented next to the portion of the animation that it describes than when on-screen text is presented far from the corresponding action in the animation" (Mayer & Moreno, 2002, pp. 93-95).
3. Temporal Contiguity Principle – "...students learn more deeply when corresponding portions of the narration and animation are presented at the same time than when they are separated in time" (Mayer & Moreno, 2002, p. 95).
4. Coherence Principle – "...students learn more deeply from animation and narration when extraneous words, sounds (including music), and video are excluded rather than included. The theoretical rationale is that the learner may attend to the irrelevant material and therefore have less cognitive resource available for building mental connections between relevant portions of the narration and animation" (Mayer & Moreno, 2002, p. 95).
5. Modality Principle "...students learn more deeply from animation and narration than from animation and on-screen text. The theoretical rationale is that the learner's visual channel might become overloaded when words and pictures are both presented visually, that is, learners must process the on-screen text and the animation through the eyes, at least initially" (Mayer & Moreno, 2002, p. 96).
6. Redundancy Principle "...students learn more deeply from animation and narration than from animation, narration, and on-screen text. It is based on the same theoretical rationale as the modality principle" (Mayer & Moreno, 2002, p. 96).
7. Personalization Principle "...students learn more deeply from animation and narration when the narration is in conversational rather than formal style. The theoretical rational is that students work harder to understand an explanation when they are personally involved in a conversation" (Mayer & Moreno, 2002, pp. 96-97).

As designers our first instinct is that if we can peak the interest of the learner in online environments then they should automatically want to become engaged thus learning course content. According to Mayer "Interest theory also predicts that an otherwise boring task cannot be made interesting by adding a few interesting details". Interest for the learner is a combination of how the individual interacts with the situation (Mayer, 1998, p. 57). Renninger, Hidi & Krapp (as cited by Mayer, 1998, p. 57) differentiate between two types of interest: 1) "Individual interest refers to a person's

dispositions or preferred activities, and therefore is a characteristic of the person" and 2) "situational interest refers to a task's interestingness, and therefore is a characteristic of the environment". Mayer's research on adding interesting elements has found that "...adding seductive details did not improve learning of the important information although the details themselves were well remembered (Mayer, 1998, p. 57).

When designing online instructional environments, research in the area of multimedia effects can assist in the learning process. Cognitive, interest, split-attention, and coherence effects are only a few areas in which research has contributed to the field of instructional design. Instructional design research can benefit distance education as it relates to the improvement of learning.

What Makes a Successful Online Environment?

Partnerships and Benchmarks

Successful online environments need to be multifaceted because learners are individuals who have many differing learning styles and characteristics. Realistically, learning environments themselves do not simply exist with an instructor and a solitary student. The system itself is made up of an institution, an instructor(s), student(s), and tools (including hardware, software, and knowledge) required to take an online course. There is a dynamic between these four areas that needs to be in harmony if we are to create environments that promote educational learning goals.

Educational institutions in the United States and worldwide have invested heavily in the business of online education. And in many situations it seems as though the institution has the decision making power as to what course management systems to invest in leaving the students and instructors to deal with what is provided. In Robert

Kozma's review of seven articles on educational technology research that appeared in the 1998-99 special issue of *Educational Technology Research and Development* he finds that one of the constant themes that cross these articles is the idea of collaborative partnerships between practitioners and researchers. Kozma explains what a true instructional technology partnership should and should not be:

> A partnership is not achieved by having researchers "attune their agendas to practitioner needs" and having "practitioners become better readers of research." Partnerships are formed by extended collaboration, and collaboration, in turn, results from engaging others in a process that is a synthesis of the needs, goals, skills, and experiences of both communities. (Kozma, 2000, p. 12)

Institutions that are interested in collaboration could extend their purchasing decisions to include the practitioners, researchers, and instructional design experts in their communities. The National Education Association (NEA) and Blackboard, Inc© commissioned the Institute for Higher Education Policy to examine benchmarks that are essential to Internet-based distance education. There are seven categories with 24 benchmarks that were deemed essential for internet-based distance education to be successful (Phipps & Merisotis, 2000, pp. 2-3). These are listed below:

1. Institutional Support
   - 1.1. "A documented technology plan that includes electronic security measures (i.e., password protection, encryption, back-up systems) is in place and operational to ensure both quality standards and the integrity and validity of information" " (Phipps & Merisotis, 2000, p. 2)
   - 1.2. "The reliability of the technology delivery system is as failsafe as possible" " (Phipps & Merisotis, 2000, p. 2)
   - 1.3. "A centralized system provides support for building and maintaining the distance education infrastructure" (Phipps & Merisotis, 2000, p. 2)
2. Course Development
   - 2.1. "Guidelines regarding minimum standards are used for course development, design, and delivery, while learning outcomes--not the availability of existing technology--determine the technology being used to deliver course content" (Phipps & Merisotis, 2000, p. 2)

2.2. "Instructional materials are reviewed periodically to ensure they meet program standards" (Phipps & Merisotis, 2000, p. 2)
2.3. "Courses are designed to require students to engage themselves in analysis, synthesis, and evaluation as part of their course and program requirements" (Phipps & Merisotis, 2000, p. 2)

3. Teaching/Learning
   3.1. "Student interaction with faculty and other students is an essential characteristic and is facilitated through a variety of ways, including voice-mail and/or e-mail" (Phipps & Merisotis, 2000, p. 2)
   3.2. "Feedback to student assignments and questions is constructive and provided in a timely manner" (Phipps & Merisotis, 2000, p. 2)
   3.3. "Students are instructed in the proper methods of effective research, including assessment of the validity of resources" (Phipps & Merisotis, 2000, p. 3)
4. Course Structure
   4.1. "Before starting an online program, students are advised about the program to determine (1) if they possess the self-motivation and commitment to learn at a distance and (2) if they have access to the minimal technology required by the course design" (Phipps & Merisotis, 2000, p. 3)
   4.2. "Students are provided with supplemental course information that outlines course objectives, concepts, and ideas, and learning outcomes for each course are summarized in a clearly written, straightforward statement" (Phipps & Merisotis, 2000, p. 3)
   4.3. "Students have access to sufficient library resources that may include a "virtual library" accessible through the World Wide Web" (Phipps & Merisotis, 2000, p. 3)
   4.4. "Faculty and students agree upon expectations regarding times for student assignment completion and faculty response" (Phipps & Merisotis, 2000, p. 3)
5. Student Support
   5.1. "Students receive information about programs, including admission requirements, tuition and fees, books and supplies, technical and proctoring requirements, and student support services" (Phipps & Merisotis, 2000, p. 3)
   5.2. "Students are provided with hands-on training and information to aid them in securing material through electronic databases, interlibrary loans, government archives, news services, and other sources" (Phipps & Merisotis, 2000, p. 3)
   5.3. "Throughout the duration of the course/program, students have access to technical assistance, including detailed instructions regarding the electronic media used, practice sessions prior to the beginning of the course, and convenient access to technical support staff" (Phipps & Merisotis, 2000, p. 3)

5.4. "Questions directed to student service personnel are answered accurately and quickly, with a structured system in place to address student complaints" (Phipps & Merisotis, 2000, p. 3)

6. Faculty Support
   6.1. "Technical assistance in course development is available to faculty, who are encouraged to use it" (Phipps & Merisotis, 2000, p. 3)
   6.2. "Faculty members are assisted in the transition from classroom teaching to online instruction and are assessed during the process" (Phipps & Merisotis, 2000, p. 3)
   6.3. "Instructor training and assistance, including peer mentoring, continues through the progression of the online course" (Phipps & Merisotis, 2000, p. 3)
   6.4. "Faculty members are provided with written resources to deal with issues arising from student use of electronically-accessed data" (Phipps & Merisotis, 2000, p. 3)
7. Evaluation and Assessment
   7.1. "The program's educational effectiveness and teaching/learning process is assessed through an evaluation process that uses several methods and applies specific standards" (Phipps & Merisotis, 2000, p. 3)
   7.2. "Data on enrollment, costs, and successful/innovative uses of technology are used to evaluate program effectiveness" (Phipps & Merisotis, 2000, p. 3)
   7.3. "Intended learning outcomes are reviewed regularly to ensure clarity, utility, and appropriateness" (Phipps & Merisotis, 2000, p. 3)

Researcher Focus

Mayer and Moreno report that multimedia presentations are effective at delivering many different types of instruction that can cater to different learning preferences (Mayer & Moreno, 2002, pp. 90-91). Meyer discusses how the current focus of instructional design is more concentrated on the creation of elearning communities than the realm of learning methodologies. She discusses her formulation of three important areas of research in online instruction: 1) the role of individual differences, 2) instructional design, and 3) specific skills that are enhanced by online environments (Meyer, 2003, ¶ 3). Learning styles can influence the success rates of students in online courses. In fact some students may do better in online courses than others.

> ...students with a high motivation to learn, greater self-regulating behavior, and the belief they can learn online do better; as do students with the necessary computer skills. These are not particularly profound insights, although they do tend to explain why online learning will work as well as other forms of education for good students, but may not work as well for students who struggle because of a lack of motivation or self-confidence (Meyer, 2003, ¶ 5).

Meyer also reports that students can develop specific skills that are enhanced by taking Web-based courses particularly critical thinking, and writing (Meyer, 2003, ¶ 15).

Kennedy (p. 22) discussed an emerging theory of online learning. This theory does not support designing courses around delivery methods but rather around students and their needs. She discusses 5 variables that the students bring into the environment that have impact in an online learning environment: 1) purpose for taking the course, 2) interactions with instructors, 3) study habits, 4) attitude about computers, 5) experience with online technology (Kennedy, 2000).

Perez-Prad and Thirunarayanan discovered three themes from their qualitative study of online versus classroom-based sections of a course that led to successful learning experiences of students online. They include peer-interaction and cooperative learning environments, the difficulties and benefits of Web-based instruction, and perceptions of the split between student/instructor responsibilities for learning (Perez-Prad & Thirunarayanan, 2002, p. 195).

In a study by Schmidt (2002, p. 9) online student short answers were analyzed and there were identifiable themes for likes/dislikes when taking an online session. Favored were freedom to study at will, working at remote locations and at their own pace, and reviewing sessions more than once. Dislikes included technology problems, lack of interaction with the professor, and perceived longer wait times for responses to questions.

Stephenson (2003, p. 13) outlines characteristics for successful approaches to online work-based learning. He states that there are four features that make this possible: 1) intelligent and intuitive tools, 2) an extensive database, 3) imaginative design, and 4) a shared commitment. When studying work place related elearning environments there are experiential features of course delivery that suggest "that online work-based learning will succeed where it is: 1) personalized, 2) managed by the user, 3) relevant to the user's everyday work and aspirations, 4) supported by the employer, 5) linked to just-in-time specialist material, and 6) fully supported within a real learning milieu" (Stephenson, 2003, p. 16). These are all characteristics that can transition the work-based environment easily into the online environment of higher education.

Online environments that are successful will begin with the collaborative partnerships between institutions, practitioners, researchers, and instructional designers. The use of benchmarks as outlined by the Institute for Higher Educational Policy and a focus on student-centered learning being two components that can help the student achieve his or her educational goals along with those of the institution.

What Makes a Successful Student in an Online Environment?

Student Preparedness

Of all the factors in the online course the student is the element that is of utmost importance. In Kozma's research he elaborates this point:

> ...we need to shift the focus of our work from the design of instruction to the design of learning environments. This is not just a shift from content- to learner-focused instruction. It is an acknowledgement that learning outcomes are owned by learners (Kozma, 2000, p. 13).

In some instances students are required to take a particular course to meet degree requirements and the only option for taking this course is via an online medium. Not all

students are necessarily good candidates for online instruction. Some students lack the focus and discipline required to take an online course, and require the structure that the classroom can provide.

Attrition Rates in Online Courses

Researchers Phipps and Merisotis suggest that there is a need to research attrition rates in distance education.

> ...evidence suggests that there may be a bipolar distribution where students are either quite successful or dropping out. This further supports the conclusion in "What's the Difference?" that student attrition in Internet-based distance education courses is an important research topic in the evaluation and assessment programs of institutions (Phipps & Merisotis, 2000, p. 21).

Hyllegard and Burke's research also supports that online course attrition rates are higher than those in traditional course settings and points to other research studies that indicate similar findings.

> Our results are consistent with other recent studies indicating that online courses tend to have unusually high attrition and failure rates, along with a disproportionate number of students earning high grades. These course outcomes suggest that some students flourish in the online environment, while others flounder. Indeed, distance education experts have repeatedly stated that online courses are not for everyone (Elliot, B., Ambrosia, A. & Case, P., 1999; Gilber, S.D. 2000) (as cited by Hyllegard & Burke, 2002, p. 26).

Attrition rates for students are important considerations in online environments because they indicate success of an online course. Meyer discusses how learning styles influence the success rates of students in online courses.

> No educator will be especially surprised to learn that success in a Web-based learning environment is heavily influenced by what the student brings to the learning situation. There is evidence that students with certain learning styles (e.g., visual) or behavioral types (e.g., independent) do learn better in the Web environment (Meyer, 2003, ¶ 4).

Attrition rates could possibly be alleviated with a focus on the tools provided to the student in an online environment, along with development of self-efficacy, and other student attributes.

Incorporating Research in Online Learning

Stephenson's review of practices in E-teaching environments indicates a lack of research applications that enhance the learning environment.

> A recent review of current practice in E-teaching (Bonk et al, 2001) also revealed deficiencies in the pedagogical underpinning for much of what is provided. The review concluded that many online instructors needed help in familiarizing themselves with the research on effective use of the medium. The review also recommended that institutions should help develop and research different types of pedagogical tools for elearning that foster student higher-order thinking and collaboration (Stephenson, 2003, p. 10).

Instructors need to be consumers of new ways of presenting information within their online courses. The inclusion of knowledge bases can help the student construct their own knowledge in their task activities. Mayer et al. discuss in their article *Digital Libraries as Instructional Aids for Knowledge Construction* the concept of knowledge bases as they relate to the Alexandra Digital Earth Prototype (ADEPT) project. This digital library is a large-scale project that helps instructors design lessons based on information that is a collection of concepts with labeled relationships between each. The instructor can then go in and create what the researchers call a "structured view of the knowledge base" in which they organize content into coherent structures for instruction purposes.

> We are working on services for creating what we call "view" of the knowledge base, which are intended to be helpful in guiding instruction. The views limit the size of the knowledge base by focusing on a small set

> of highly interrelated concepts, and reduce the complexity of the knowledge base by imposing a coherent structure or organization on the concepts. Thus, services for constructing views allow a way of producing lessons that are manageable size and that are well organized (Mayer, et al., 2002, p. 40).

This type of information retrieval system can allow instructors to understand how the student arrives at their conclusions regarding various course assignment tasks.

> ADEPT will allow instructors to review the evidence that students use in developing a conclusion by revealing the incremental work conducted by the student in answering the question, akin to how math instructors view students' work (Leazer, et al., 2000, p.337).

Although digital libraries and knowledge bases are still in their developmental stages the concept has merit. Providing instruction with related modules can help the instructor create structure for their course content, and can be used by the student to construct meaning in developing her own learning schemas. And, it is highly likely that we will be dealing with more information behemoths in the future.

Teacher Reflection

Classroom courses and online courses have similarities especially in the area of reflection. Teacher reflection of their courses can improve both their course presentation and learning outcomes for their students. The idea of action research is to make the teacher become responsible for their own improvement as instructors (Schmidt, 2002, p. 2). McNiff, (1999, as cited by Schmidt, 2002, p. 2) "defined action research as the name given to an increasingly popular movement in educational research that encourages teachers to be reflective of their own practices in order to enhance the quality of education for themselves and their students".

Successful teachers in online courses move their pedagogies from teacher-centered, to learner-centered, and develop communication methods that ensure student

understanding of course requirements. Effective use of tools that increase higher order thinking skills, such as the inclusion of knowledge bases could possibly enhance the student's ability to develop learning schemas that promote better understanding. Constructivist learning theories state that learners build knowledge for themselves as they learn, both socially and individually. Part of constructivist ideals center around the instructor as a guide to help the student discover, analyze, interpret, or predict information. Tools that can guide the learner to information and allow the student to build their own definitions about the course content can support student understanding of course material, while assisting the instructor with course management. Through reflection and communication with students the instructor can revise course content so that it supports the student while meeting the goals and objectives of the course.

Research Question

This study looks at the second of Siegel's (as cited by Sensiper, 2000, pp. 617-618) Website generations, the inclusion of graphics and video, and tests Clark's assertion that the medium should have no affect on learning or motivation. Clark stated in his article that the "...that media not only fail to influence learning, they are also not directly responsible for motivating learning" (Clark, 1994, p. 23). As such, this study addressed two research questions.

Question One

"If the content of a course is presented using the same teaching methods through two different delivery mediums, is the learning achievement of students equal"?

Question Two

"Are student attitudes towards online lecture presentation and in-class lecture presentation equal"? I

Chapter 3 - Methods and Materials

Participants

The participants of this study were 168 students enrolled in an educational technology introductory course at a mid-sized university in the south. The course began with 168 students with 5 dropping the course by the end of the spring 2004 term. The ages ranged from 18-55 with 87.65% falling within the 18-25 year range. The class was composed of 68% female and 32% male students. The number of students by class rank was 9% freshmen, 40% sophomore, 32% junior, 15% senior, and 4% at the graduate level.

Materials

The course content consisted of 12 lectures, six of which were delivered online and 6 delivered in a traditional classroom setting. The online lectures were video taped and placed online with Tegrity© software. The software allowed the inclusion of the video taped lecture along with a PowerPoint presentation that provided Internet links to the various topic contents. The in class lectures were also presented using PowerPoint presentations with internet links to various topic contents that could be accessed by the student outside of class via a WebCT© portal. The same instructor, utilizing the same instructional methods for both the online lecture and the in-class lecture presentations, gave all lectures.

To measure achievement there was a mid-term and final examination, each containing 50 multiple-choice questions (see Appendix A for question samples). The mid-term was comprised of lectures 1-6 and the final contained lectures 7-12. Each exam

had 25 questions pulled from the online lecture material and 25 from the in class lecture material respectively.

An attitude survey was given to students at the end of the term right before the final examination took place (see Appendix B). The survey gathered descriptive statistics about the students along with 15 questions regarding attitudes toward online versus in class lectures. Fourteen of the questions were paired into seven categories asking opposing questions regarding the lecture. Category 1 (Preference) addressed preference for the type of delivery method: either in-class or online. Category 2 (Access) dealt with access to each type of class: was it easy for the student to either come to class or view the online lectures? Category 3 (Scheduling) regarded preference on scheduling: did the student like the structure of coming to class versus the freedom of viewing the class at will online? Category 4 (Presence) discussed the presence of the instructor: did the student like seeing the instructor live in the classroom or videotaped as part of the online lecture? Category 5 (Distraction) dealt with distraction in both environments: was the in-class lecture more distracting or was the online lecture more distracting for the student? Category 6 (Satisfaction) discussed overall satisfaction with the lecture: online and in-class. And, Category 7 (Future) was determining future indication of participation: would the student be likely to participate in another traditional classroom lecture or online lecture of this type? Examples of the opposing questions were, "I prefer the online lectures" versus "I prefer the in class lectures". Each question was identical with the change being the delivery method. The survey used a 5 point Likert scale with the following indicators: 1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, and 5 = Strongly Disagree.

Procedure

Students were informed the first day of class that they would be required to alternate their viewing of in-class lectures and online lectures from week-to-week. The first class lecture was online with the next being in-class. This alternating delivery method pattern continued until the end of the term. To eliminate problems with access to the online lectures students with lower bandwidth options, such as dial-up, were provided discs that could run independently of the Internet with the same exact lecture content provided online. Below is a screen shot of the online lecture delivery that the students viewed during this portion of the class (Figure 1).

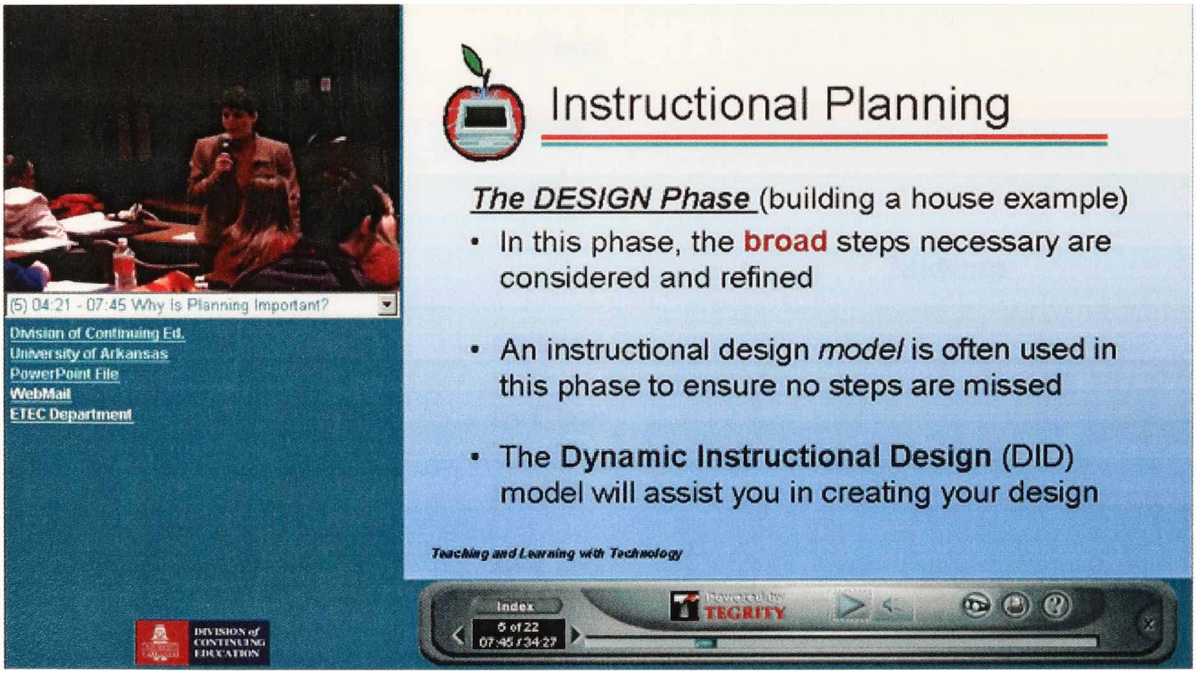

Figure 1 – Example of Online Lecture Presentation

Two versions of the mid-term and final exam were provided to students. Questions were the same with the order being arranged differently between tests A & B to ensure academic honesty. The midterm was administered after the first six lectures and the final after the second six lectures (see Table 1 below). Table 1 describes the lecture numbers,

and indicates if they were presented online or in-class, along with the point at which the midterms and final examinations where scheduled.

Table 1

Course Schedule for Online Lecture and In-class Lecture Presentation with Midterm and Final Schedules

Lecture Number	Lecture Type	Exam Administration
1	Online	
2	In-Class	
3	Online	
4	In-Class	
5	Online	
6	In-Class	
		Midterm
7	Online	
8	In-Class	
9	Online	
10	In-Class	
11	Online	
12	In-Class	
		Final

Chapter 4 – Results

The purpose of this study was to determine whether there was a difference in achievement levels of students when course lectures were delivered via two different delivery methods: 1) in class lectures, and 2) online class lectures and, to assess attitudes towards the two presentations of the course lecture. The research questions were twofold. First, "If the content of a course is presented using the same teaching method through two different medium delivery methods, is the learning achievement of students equal"? And secondly "Are student attitudes towards online lecture presentation and in-class lecture presentation equal"?

To answer question 1 an independent samples t-test were performed. Table 2 below summarizes the means, standard deviations, and standard error of the mean, for the percentage of students that achieved correct answers for questions associated with the online class lecture and those associated with the in class lectures for the mid-term, final and a combination of both exams.

Table 2

Mean Data for Midterm Exam, Final Exam, and Both Exams Combined

Exam	Delivery Type	Exam Version	N	M	SD	SE
Midterm	Online	Version A	25	80.76	14.35	2.87
Midterm	In-Class	Version A	25	77.92	20.51	4.10
Midterm	Online	Version B	25	78.68	15.32	3.06
Midterm	In-Class	Version B	25	76.28	16.88	3.38
Final	Online	Version A	25	84.64	18.44	3.69

Table 2 (continued)

Exam	Delivery Type	Exam Version	N	M	SD	SE
Final	In-Class	Version A	25	82.28	16.06	3.21
Final	Online	Version B	25	83.40	16.54	3.31
Final	In-Class	Version B	25	78.68	16.52	3.30
Combined	Online	Version A	50	84.02	17.35	2.45
Combined	In-Class	Version A	50	80.48	16.23	2.30
Combined	Online	Version B	50	79.72	14.73	2.08
Combined	In-Class	Version B	50	77.10	18.61	2.63

Table 3 below outlines the independent t-test results, showing degrees of freedom, the t statistic along with the significance level.

Table 3

Independent T-test for achievement levels on examination

Exam	Exam Version	*df*	*t*	*p*
Midterm	Version A	48	-0.53	.601
Midterm	Version B	48	-0.57	.573
Final	Version A	48	-0.48	.632
Final	Version B	48	-1.01	.318
Combined	Version A	98	-1.05	.295
Combined	Version B	98	-0.78	.437

*$p<.05$

The findings of question 1 "If the content of a course is presented using the same teaching methods, through two different delivery mediums, is the learning achievement of students equal", support that learning achievement in both online lecture presentations and in-class lecture presentations are equal. In other words, students performed equally well on both online and in-class exam questions.

To address question 2 an attitude survey was conducted to evaluate student's preferences regarding the delivery methods of the course. Fourteen of the questions were paired into seven categories asking opposing questions regarding the lecture: 1) preference for the type of delivery method, 2) access to each type of class, 3) preference on scheduling, 4) presence of the instructor, 5) distraction in the environment, 6) overall satisfaction, and 7) future indication of participation (see Appendix B). Results were analyzed using a paired-samples t test. Table 4 below shows the means and standard deviations of the 14-paired questions, along with the standard error of the mean, the t score and the significance value of the t-test.

Table 4

Attitude Survey Categories Paired Samples T-test Results

Variable	*N*	*M*	*SE*	*t*	*p*
Preference	161	-0.22	.19	-1.17	0.25
Access	158	.20	.15	1.31	0.19
Schedule	161	.44	.16	2.70	0.01*
Presence	159	-0.02	.12	-0.16	0.87
Distraction	159	.32	.13	2.53	0.01*

Table 4 (continued)

Variable	*N*	*M*	*SE*	*t*	*p*
Satisfaction	161	.12	.11	1.06	0.29
Future	160	.01	.13	0.09	0.93

*$p<.05$

The findings of question 2 "Are student attitudes towards online lecture presentation and in-class lecture presentation equal?", supported no significant differences in attitudes on five of the seven categories: 1) Preference, 2) Access, 3) Presence, 4) Satisfaction, and 5) Future (see Table 5 below). Table 5 describes the seven categories and how the questions were paired. Each question indicates the type of delivery method, along with the number of students that answered the questions, the mean scores on each question, and the standard deviations.

Table 5

Student Mean Attitudes by Category

Scale 1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, and 5 = Strongly Disagree

Category / Question	Delivery Method	*N*	*M*	*SD*
Preference				
Q1	Online	161	2.57	1.40
Q2	In-Class	161	2.79	1.26
Access				
Q3	In-Class	159	2.43	1.28
Q4	Online	160	2.25	1.28
Scheduling				
Q5	In-Class	162	2.65	1.24
Q6	Online	161	2.22	1.13
Presence				
Q7	Online	161	2.26	1.07
Q8	In-Class	160	2.29	0.98
Distraction				
Q9	In-Class	160	3.24	1.18
Q10	Online	161	2.93	1.14
Satisfaction				
Q11	Online	161	2.43	0.99
Q12	In-Class	161	2.31	0.89
Future				
Q13	Online	160	2.59	1.27
Q14	In-Class	161	2.58	1.01

In the Preference category students' mean scores were close to neutral on the measurement scale. For Access they "agreed" that getting to class and online was relatively easy. Also, students "agreed" that being able to see the instructor was important in the Presence category and that overall both types of lecture presentations were acceptable in the Satisfactory category. When indicating whether they would take future courses delivered by both types of presentations their attitudes fell in the midrange between "agree" and "neutral". There were however significant differences in two of the categories: 1) Scheduling, and 2) Distraction. Students mean attitude scores were closer to the "neutral" category with preference toward fixed times and locations for traditional classes as opposed to being closer to the "agree" category which indicated they would like to view online lectures based on their own schedules. Under the category of distraction students mean scores were closer to the "agree" category with respect to the online lecture being distracting as opposed to the mean for the in class lecture being closer to the "disagree" category.

Chapter 5 – Discussion

This study supports previous literature regarding media effects on learning achievement when the only consideration is media delivery method (Schmidt 2002, p. 11; Caywood & Duckett, 2002, p.103; Ramage 2002, ¶ 1). This experiment found that there were no significant differences in learning achievement between students scores in the online lectures versus the in class lectures. However, it does not completely support Clark (1994) that *Media Will Never Influence Learning.* When comparing only the mean scores in relation to the online lecture questions and those to the in-class lecture questions the online question means were anywhere from 2.36 to 4.72 points higher than their in-class counterparts. While not a significant difference, it is an interesting observation. What is the causal factor for this trend? Was it the ability of the students to watch the video segments more than once? One explanation for why these trends are noticeable maybe that the information in our online lectures was relevant to the content of the lesson. There were no inclusions of auditory materials simply for appeal or entertainment. The previous literature review discussed the importance of removing extraneous auditory additions to multimedia content (Mayer & Moreno, 2000, p. 124). Mayer & Moreno's (2002, p. 93) Spatial Contiguity Principle "in which students learn more deeply when on-screen text is presented next to the portion of the animation that it describes than when on-screen text is presented far from the corresponding action in an animation" could account for the trends observed. The in-class lecture provided the instructor opportunity to move freely throughout the auditorium requiring students to split their attention from the information presented on the overhead projector, thereby moving it further away from the lecturer. Could it have simply been chance that these

small differences were skewed in favor of the online course? The reasons cannot be determined from this study; however, they do indicate a need for research into what could have caused these slight trends.

The attitude survey also indicated no significant differences in the mean scores of students regarding a preference for: 1) the type of delivery method, 2) the ability to access either treatment, 3) the presence of the instructor being an important factor in each scenario, 4) overall satisfaction with either treatment, and 5) whether or not the student would choose to participate in future courses similar to this one, either online or in class. However, there were two categories in which significant differences were found: 1) the ability to schedule when and where lectures were observed was an important factor to the students, and 2) the online lectures seemed to be somewhat more distracting to the students than the in class lectures. The students preferred having control over when and where they would take a course as opposed to having that control removed by having to conform to fixed times and dates for lecture locations. It's not surprising that differences were observed in this category. Most persons like to be in control of anything associated with their lives. In Brothen & Wambach's 1998 study (as cited by Kennedy, 2000, p. 13) the students chose not to attend lectures when the lecturer didn't require them to.

Also of interest is the distraction that students felt during the online lectures being significantly greater than the distraction in the in-class lecture format. Both were presented using the same teaching methods and under the same time formats. The majority of the lectures were presented between thirty and fifty minutes. Learning styles may have been a factor in this difference. Meyer (2003, ¶ 4) reported that learning styles influence the success rates of students in online courses. Many of the students in this

course may have had learning styles that were more comfortable in a traditional classroom setting. Kozma (2000. p. 14) stated that the tools and environments we create should help students to take charge of their own learning. It was assumed that the online delivery medium was easily navigable and there were no interventions to help students learn to navigate the environment before the start of the course. The perceived distractions may have been associated with frustration that the students felt with the technology. Future research could focus on questions of student characteristics such as attention span to determine if these variables could possibly keep the learner engaged in the lesson.

Continuing research in the area of simple medium delivery methods is moot. Research should focus on online or multimedia environments as a system, with many competing variables and components. Does this seem to be a daunting task? Yes. Can it be accomplished with great rewards? Yes. Some might argue that we don't have the time to cater to all the tedious details that are associated with placing a learner-centered course online. We live in an information rich society. It is the future and we must embrace it and create new models of learning with these fascinating new technologies that have been provided. It should be done with sound research principles and the help of institutions of higher education, instructional design specialists, and subject matter experts in the various disciplines, keeping the learner at the center, creating a successful journey to achievement in online environments.

Appendix A

Sample questions from exams

1. America Online (AOL) would be an example of an:
    a. Internet service provider
    b. Newsgroup
    c. Intranet
    d. Chat Room
2. The Internet can provide which type(s) of communication?
    a. Text only
    b. Text and video
    c. Audio and video
    d. Text, audio, and video
3. The ideal term limit for a technology plan is:
    a. 2-3 years
    b. 4-6 years
    c. 6-8 years
    d. 8-10 years
4. An example of a non projected visual would be a:
    a. Bulletin board
    b. Magnetic board
    c. Flip chart
    d. All of the above

Appendix B

Form 1

Attitudes Toward Online Lectures vs. Traditional Classroom Lectures

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Descriptive Statistic Questions

I have taken an online lecture in the past: Y N

My age is between: 18-25 26-35 36-45 46-55 55-older

My gender is: M F

My education status is: Freshman Sophomore Junior Senior Graduate Student

I used the online lectures when studying for exams: Y N

Agreement – Disagreement Questions	Scale				
	SA	A	N	D	SD
1. I preferred the online lectures	1	2	3	4	5
2. I preferred the in-class lectures	1	2	3	4	5
3. Getting to class for lectures is easy for me	1	2	3	4	5
4. Getting to a workstation to view online lectures was easy for me	1	2	3	4	5
5. I prefer having a fixed time, date, and location for a course lecture	1	2	3	4	5
6. I prefer being able to view a course lecture based on my own schedule	1	2	3	4	5
7. I liked being able to see the lecturer in the chapters presented online	1	2	3	4	5

Form B1 (continued)

Agreement – Disagreement Questions	Scale				
	SA	A	N	D	SD
8. I liked being able to see the lecturer in a live classroom setting	1	2	3	4	5
9. I got distracted during the classroom lecture	1	2	3	4	5
10. I got distracted during the online lecture	1	2	3	4	5
11. I was satisfied with the online lecture presentation	1	2	3	4	5
12. I was satisfied with the traditional in-class lecture presentation	1	2	3	4	5
13. I would like to take another online lecture like the ones presented in this course	1	2	3	4	5
14. I would like to take another in-class lecture like the ones presented in this course	1	2	3	4	5
15. I would like to have a choice as to whether to take a course online or in a classroom setting	1	2	3	4	5

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