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Multimedia Design, Learning Effectiveness, and Student Perceptions of Instructor Credibility and Immediacy

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MULTIMEDIA DESIGN, LEARNING EFFECTIVENESS, AND STUDENT PERCEPTIONS
OF INSTRUCTOR CREDIBILITY AND IMMEDIACY

by

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ABSTRACT

MULTIMEDIA DESIGN, LEARNING EFFECTIVENESS, AND STUDENT PERCEPTIONS OF INSTRUCTOR CREDIBILITY AND IMMEDIACY

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Old Dominion University, 2016
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Online learning and the use of multimedia is a quickly growing element of higher education. This experimental research study examines five common audio and video presentation designs to inform evidence-based practices that can be applied by instructional designers as they develop content for online learners. Specifically, this experiment compares instructor-only, slides-only, dual-windows, video-switching, and superimposed-slides multimedia designs in terms of learning effectiveness, perceived instructor credibility, instructor immediacy, and cognitive load created by each design. This study included a diverse sample of adult learners who were randomly assigned to treatment groups. A total of 171 participants completed the study and responded to the NASA Task Load Index (TLX) used to gauge task and cognitive load, the credibility and immediacy survey, and the 20-item post-test. A series of 5x1 Analyses of Variance and Tukey post-hoc calculations were conducted to test for statistically significant differences between groups. The results suggest that a balance can be established between instructor credibility and immediacy by showing both the instructor and instructional content during online classes. The five multimedia designs can yield similar results in recall and comprehension as long as audio, video, and content quality is a design priority. The results also indicate that the design of instructional methods has a greater impact on learning than the device used to receive that instruction. Media and technology are a means to deliver pedagogy and

foster communication; it is up to instructors and designers to use evidence-based best practices such as these to build optimal learning environments and instructional systems.

Keywords: multimedia learning theory, dual coding, online design, distance learning, cognitive load

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“This dissertation is dedicated to the proposition that the harder you work
...the luckier you get.”

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Chapter 1

Introduction

Multimedia, or the application and integration of audio, video, text, and graphics, is a growing area of learning content presentation and message design. Instructors and instructional designers have many diverse ways to enhance online and distance education with widely available multimedia tools and techniques. Also, colleges and universities should provide faculty the guidance, tools, and support to infuse video, especially asynchronous video, into their seminars, courses, and programs. This research study investigated optimal video features and production techniques to help ensure efficiency, learner achievement, student perception of instructor credibility and immediacy, and cognitive load. This experiment investigated the effectiveness of several video design techniques to help to determine how these multimedia designs can be most effectively applied in authentic learning contexts.

Online and distance learning programs are rapidly growing in higher education. Effective instructional systems design will become a much more critical factor in the success of these programs, especially as competition among institutions and online programs grows. There are several research-supported design models and theories that can be used to create successful online instruction. Mayer's (2014a, 2014b) multimedia learning theory is one example of a research-supported strategy and set of heuristics that can be applied to create successful online courses utilizing the best of today's audiovisual techniques and tools.

Multimedia design is the presentation of information using multiple communication channels, such as using both words and pictures to communicate and present information (Mayer, 2009, 2014c). Multimedia learning theory describes the cognitive processes that a learner experiences when viewing and processing instructional content that consists of auditory

(sounds, audio, narration, or speech) and visual (video, text, illustrations, or animation) information (Mayer & Moreno, 2003). Random treatment groups in true experiments have yielded results that strongly suggest humans can process visual information independently from auditory information (Mayer & Moreno, 1998; Paivio, 1971). Learning effectiveness can be enhanced when students are presented both visual content and narrated explanations for that content. Many of the classic studies in multimedia learning were conducted with short, two to three minute tutorials (Mayer & Anderson, 1991, 1992; Mayer, Bove, Bryman, Mars, & Tapango, 1996; Mayer & Chandler, 2001; Mayer, Heiser, & Lonn, 2001; Mayer & Gallini, 1990; Mayer & Moreno, 1998, 1999, 2000, 2003; Mayer, Moreno, Boire, & Vagge, 1999; Mayer & Sims, 1994). This experiment used a longer 20-minute segment of an instructional lecture and added to a new facet of the instructional design knowledge base.

Based on these previous studies, an effective design approach was developed to create successful presentations that blended full motion instructor video, static or animated slides, and instructor audio into cohesive presentations accessible online. However, limited empirical research has been conducted to determine the most effective mix of video, presentation slides, and audio. Experiments that control variables and use the latest mobile device types, high definition video, and Internet streaming technologies, are also missing from the existing body of knowledge. Additionally, studies that focus on adult learners also appear limited, particularly adult online learners. Future practical applications of this study's findings will illustrate how to most effectively use widely available instructional and multimedia design tools. For instance, video and audio recording, editing, presentation, and screen capture tools are widely available, often free, and are often included in modern learning management systems. This study provides

research-supported guidance and best practices to illustrate how designers and instructors can best use these tools.

The purpose of this experiment was to compare the effects of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs on learning effectiveness, perceived instructor credibility, nonverbal immediacy, general immediacy, instructional environment design, and cognitive load when viewed by distance learning students during online classes at a mid-sized, public, metropolitan university. Each of these multimedia designs varied the appearance of the video image of the instructor and the integration of presentation slides. The “instructor-only” design was a 20-minute segment of an authentic lecture that showed only a high-definition video recording of the instructor. The second design was “slides-only” and showed only static high-resolution presentation slides for the duration of the 20-minute lecture. The “video-switching” version transitioned and switched between the instructor camera and presentation slides, slides remained on the display long enough for students to read them, then the presentation switched back to the instructor’s video. Participants were able to see both the instructor’s video and the instructor’s slides during the “dual-windows” presentation. This version simultaneously displayed a small window of the instructor’s video and a larger window of the instructor’s slides on the viewer’s screen. The “superimposed-slides” design showed the instructor’s video with the instructor’s slides as a digital video layer just over and behind the instructor’s shoulder.

Each multimedia presentation version was 20-minutes long and used the same recorded lecture, including the same content, instructor video, presentation slides, and audio narration. These presentation designs were used during five experimental treatments to compare learning effectiveness, online student credibility and immediacy perception results, and cognitive load.

For the purposes of this study, online, e-learning, or distance learning students are operationally defined as learners participating in a class from a different location than the instructor. The instructor can be in a classroom or studio while the online or distant student is synchronously or asynchronously viewing the course video from an Internet enabled device.

Chapter 2

Literature Review

This chapter presents the theoretical instructional design foundations and the guiding research questions for this experimental study. The conceptual framework in this chapter presents a number of research threads from the domains of learning processes and media applications that illustrate the use of video to enhance learning. These experiments suggest several effective techniques that can be used to boost motivation, increase the efficiency of encoding of information, and improve learning effectiveness. Relationships between nonverbal communications such as eye-contact, gestures, and smiling have been compared to verbal communications such as humor, tone, and vocal expressions. These traits created a sense of immediacy, or the sense that the student and the instructor were working together towards a common learning goal. Immediacy in this research was also the students' perceived reduction of distance and a greater sense of social presence with the instructor. The research indicates that information comprehension, or the perception of learning effectiveness, was enhanced as the learner felt the increased immediacy of the instructor or teacher.

Immediacy, Credibility, and Perception

Factors that impact learning, affective learning characteristics, and cognitive components of learning are several elements of the Learner and Learning Processes domain of the instructional design body of knowledge (Richey, Klein, & Tracey, 2011). Factors that impact learning summarized by this review include the motivational or discouraging effects of learners' perceptions of distance and instructor immediacy. Affective learning characteristics include the communicative effects of eye-contact and the connecting of a face to a voice. Cognitive components of learning include the importance of instructional strategy over delivery

methodology. These collected studies from the Learner and Learning Processes subdomain of instructional design knowledge fundamentally guided this study.

A number of diverse affective learning experiments searched for possible relationships between instructor or presenter immediacy and content recall and comprehension. In one example of a true quantitative experiment, researchers found a positive correlation between eye-contact, instructor credibility, teacher immediacy, and positive student attitudes (Jayasinghe, Morrison, & Ross, 1997). This study simultaneously recorded the same 15-minute instructor presentation from two video cameras, one a high-angle camera and the other an eye-level camera. The presenter was not able to make virtual eye-contact with the high-angle camera as it was mounted above their head on the rear wall of the classroom studio. Participants in eye-level camera treatments reported higher levels of instructor immediacy and positive attitudes towards the learning design. These researchers also found that positive instructor immediacy and design attitudes were reported when students are able to sit closer to smaller monitors rather than being farther from a single larger classroom display. This study could be contrasted against another experimental study that also used a scripted video, however, instead of capturing a single presentation and using it four ways, this presentation was given four times (Titsworth, 2001). The researcher found that students responded more favorably to the study's lower immediacy trials and theorized that their presenter may have provided an unnatural amount of immediacy. The presenter may have portrayed an uncommon degree of eye-contact by looking into the camera for the entire duration of the presentation. Also, giving the mini-lecture four different times could have introduced unintentional variables as it would not have been possible to deliver four identical presentations.

Similar to Jayasinghe et al. (1997), Hanson and Teven (2004), measured for instructor credibility in video trials, and similar to Titsworth (2001), used four different videos. These 7-minute scripted videos were kept as consistent as possible and only varied the presenter's camera eye-contact, movement around the classroom, gestures, and natural levels of enthusiasm. Care appeared to be taken to include immediacy traits and the researchers looked to keep the presentation natural without the immediacy scripted. This experiment found that the treatments that gauged the highest levels of instructor immediacy also considered the presenter the most credible. Though this study did not specifically measure for it, this credibility should lead to motivation, which could result in learning effectiveness and retention.

Other learning factors and affective characteristics research also indicate the connection between mediated communication and effective learning. Another example of college classroom research used a 15-minute video module in an experiment comparing verbal and nonverbal immediacy to recall and comprehension (Witt & Wheelless, 2001). Five hundred and eighty-seven students in 27 classrooms viewed the video, were assessed for their learning, nonverbal, and verbal immediacy perception, and were also asked to recall facts given during the presentation. These researchers found participants recalled more presentation facts during nonverbal immediacy treatments as compared to specific verbal immediacy only and low overall immediacy treatments. Another studio produced video created specifically for an experiment found similar results. These researchers asked their presenter being recorded to look into a camera for 30% of their presentation and to give the lecture again while never looking into the camera (Fullwood & Doherty-Sneddon, 2006). The content of the two presentation videos was kept as identical as possible while a third treatment group listened to only the audio. This research found that the recall was greatest when the presenter looked into the camera, followed

by the gaze aversion and the audio-only versions. This finding is similar to an earlier face-to-face experiment that gave participants verbal task instructions to trials with eye-contact and without eye-contact (Fry & Smith, 1975). These investigators found that students recalled the steps in the procedure and performed better on task when the presenters maintained one-on-one eye contact with the participants when explaining the task. These research studies suggest that learning can be enhanced when the students are able to both see and hear their instructors and teachers.

Cognitive Learning and Media

A cognitive learning research thread through these Learner and Learning Processes studies are commonalities, and differences, in the presentation medium and video technology. Some experiments used small displays for participants to view the treatment videos (Antonietti, Cocomazzi, & Iannello, 2009; Bodie & Michel, 2014; Fullwood & Doherty-Sneddon, 2006; Jayasinghe et al., 1997). Others researchers used large classroom displays, or exclusively used classroom projectors (Jayasinghe et al., 1997; Morrison, Watson, & Ramlatchan, 2013; Titsworth, 2001). While the video display size should have no effect on the ability to deliver content, it could alter students' perception of instructor immediacy and potentially lead to learning effectiveness. For instance, Jayasinghe, Morrison, and Ross (1997) found that students in closer proximity to smaller screens reported higher levels of student satisfaction and perceived learning. Presumably, students were allowed to use a device of their choice to view the video in at least two recent research studies (Bowers, Freyman, McLellen, Paxton, & Spiegel, 2013; Wei, Chen, & Kinshuk, 2012). Could the multitude of new monitors, workstations, laptops, tablets, phones, and other devices add a new variable to these types of studies? Alternatively, is the type of device used to view content irrelevant? This study assumes the stance that the technology

medium used for learning is not as effective as the instructional strategy. The teaching methodology should be more influential to student achievement than the device used to communicate that instruction (Clark, 1983, 1994; Clark & Feldon, 2005, 2014; Morrison, 1994). The differences between viewing content on large displays, small screens, laptops, tablets, or other mobile devices should have a minimal influence on the effectiveness of a common multimedia presentation played on those devices.

The common threads of these affective learning and cognitive elements found in these earlier studies guided the research design of this experiment. The instructional materials in this study worked to maintain a natural level of engaging eye-contact. The presenter maintained eye-contact and was also free to look at their notes and gesture naturally as they would in a traditional classroom. The video presentations used in this study's treatments were approximately 20-minutes in length. This general amount of time was found in previous studies to be representative of an authentic learning environment, long enough to potentially result in learning effectiveness, and short enough for a practical experimental study (Morrison et al., 2013). This present experiment also included a wide diversity of students and their device and screen size preferences with the expectation that the version of the presentation should have a greater impact on learning than the device the student uses.

Multimedia Learning Theory

The Media and Delivery Systems domain of instructional design knowledge, especially elements of learner characteristics related to media use and factors related to media and delivery system use, also helped craft this study's research design (Richey et al., 2011). The ability to process audio and visual information independently and the ability to effectively focus germane cognitive resources are aspects of learner characteristics related to media use. Eliminating split-

attention effects and integrating visual and audio information sources are factors related to delivery system use. The delivery systems and media research articles included in this review also illustrate the evolution of multimedia learning. Multimedia learning theory can be used in the context of this study to guide the development of each presentation version; multimedia design principles will be used to develop each treatment strategy. This review also focuses on gaps in the instructional design element of learner characteristics and media use, where theoretical applications have historically not been studied.

Experiments with random treatment groups and digital multimedia appeared to start with static illustrations with and without text (Mayer & Gallini, 1990). These early results seemed to indicate the unique advantages of using multiple media technologies at the same time in the same presentation. Mayer's cognitive theory of multimedia design evolved from this use of text and illustrations and was first based on the dual-coding findings of Paivio (1991), and then integrated the working memory findings of Baddeley (1992) and Sweller (1991). Dual-coding theory states that humans will process video, slides, or animation separately from audio and narration. Learners cognitively combine that information in working memory, then store that information in long-term memory for future retrieval. Humans also have finite short-term and working memory resources, and these limited germane cognitive resources should be guided to focus on intrinsic content rather than extraneous design distractions.

Cognitive load theory describes working memory assets as a function of germane resources, intrinsic load, and extraneous load (Pass & Sweller, 2014; Sweller, Ayers, & Kalyuga, 2011). Intrinsic cognitive load describes the fundamental difficulty of the subject matter and extraneous load describes instructional design characteristics of a presentation that can distract the learner. The logical chunking and sequencing of content can reduce intrinsic load and

removing distractions from the material can reduce extraneous load; these two actions will increase working memory resources available for germane processing. In the context of multimedia learning, germane resources are the cognitive assets remaining to integrate and understand presented information. Learners use their germane cognitive resources to encode and combine audio and visual information into patterns of ideas or schemata for long-term storage. The cognitive theory of multimedia combines this cognitive load theory with dual coding theory and working memory models, to create a series of presentation design principles (Mayer, 2014b).

Multimedia learning theory describes a series of processes that are taking place as a student is creating a new schema (Mayer et al., 2001). The first step in the learning process from this perspective is the initial viewing and listening to instructional content and immediate storage in short-term memory. In this step, any text is essentially visual words that when presented with diagrams, both the diagrams and the text are processed by a visual processing channel. When words are presented via audio, this narration is managed by the audio processing channel while visuals are simultaneously being processed by the visual channel. The intrinsic content is separated from the extraneous content in this first phase of working memory. Next, the remaining germane resources in working memory create relationships between the visual and verbal information and recalls previous knowledge from long-term memory. Recalled schemata are then compared to new information where the learner creates understanding. Finally, the new schema can be created, or existing schema modified, and stored in long-term memory.

Mayer's cognitive theory of multimedia builds on this dual processing and proposes three main learning principles (Mayer, 2014b; Mayer & Moreno, 2003). The first principle is the assumption that learners have independent channels for verbal and visual information, and using both channels simultaneously is more efficient than using either channel alone. The second

principle is that the two processing channels in working memory have limited capacity for both short-term storage and active processing. The third principle states for learning to occur working memory must be available and able to actively process, pull previous information, and create and actively store new or modified schema into long-term memory.

Measuring Cognitive Load in Multimedia Design

Effective multimedia learning design reduces both intrinsic and extraneous cognitive load to maximize available germane resources for learning. However, an instrument was needed to measure the effectiveness of design variations as researchers looked to maximize learning efficiency and effectiveness. The United States' National Aeronautics and Space Administration's (NASA) Task Load Index (TLX) is one such effective instrument that can be used to measure cognitive load in multimedia presentations (Windell & Wiebe, 2007). The NASA TLX procedure was the result of a three-year research project by the Human Performance Group at the NASA Ames Research Center and is based on the desire to consolidate workload assessment instruments within NASA (National Aeronautics and Space Administration, Human Performance Research Group, 1986). This multidimensional instrument measures a participant's subjective perception of performance, required effort, encountered frustration, and temporal, physical, and mental demand during a given task. Instructional designers and educational psychologists have used this measure to quantify cognitive load during training and educational activities (van Gog & Pass, 2008). In these studies, the NASA TLX has been used after the learning task to collect data from research participants to gauge the effectiveness of approaches to reduce extraneous cognitive load. Assessing participants after a multimedia learning activity is a common method of collecting the immediate perception of cognitive load experienced during learning (Brunken, Plass, & Leutner, 2003). The NASA TLX has grown to become the

most used approach to measure cognitive load, especially the utilization of the measure's mental effort subscale (de Winter, 2014). While there are many other tools and techniques, the NASA-TLX is a reliable and efficient approach to measure a learner's perception of cognitive load during multimedia learning.

Previous Multimedia Research Designs

The research experiment in this study will also focus on eliminating external variables and employing a pre-test and post-test experimental design similar to Mayer's original multimedia research. Mayer's media use research studies published in educational psychology in the 1990s and 2000s are true quantitative experiments that measured for empirical learning effectiveness. Volunteers in these studies were randomly assigned into all treatment groups, all groups used the same computer labs for presentation playback, and all participants took the same pre and post-tests (Mayer & Anderson, 1991, 1992; Mayer & Moreno, 1998, 1999, 2000, 2003). These researchers have tried to remove all external and confounding influences leaving only the independent presentation design and dependent pre-test and post-test variables. In these experimental designs the researchers have also used the same instructional materials and measures. Thus, variances across the different studies cannot be attributed to the use of different content or instruments.

At this time few similar studies apply multimedia learning theory, use a true experimental approach, employ adult learners as participants, and use online, mobile devices. The intended population of interest in past multimedia design studies was traditional college students. The sample used to generalize to the larger population in multimedia learning research has historically been young undergraduates (Mayer et al., 1996, 1999, 2001; Mayer & Chandler, 2001; Mayer & Gallini, 1990; Mayer & Sims, 1994). The common assumption in these studies

is that the demographics of these samples are diverse enough to allow the findings of these experiments to be generalized to other student populations in higher education. However, it is possible that different results could have been achieved had the samples included older students, more experienced junior, senior, or graduate students, or students not majoring in psychology. For instance, mature adult learners have a diverse set of needs that differentiate them from traditional college students. Adult learners are less flexible to change, require organized content, value time, and are motivated by external factors (Knowles, 1980; Morrison, Ross, & Kemp, 2004). This population could be more susceptible to extraneous load, aggravated by any split-attention effects in the presentation, and be much less impressed with video production quality as they focus only on immediately relevant information. The present experiment expanded its population sample and included a diverse group of students, including experienced online adult learners.

Multimedia Variations

As with early work with new animation technology in the 1990s, Mayer continued to explore new instructional design tools and early virtual reality applications using new multimedia learning predictions (Moreno & Mayer, 2002). Treatments using desktop monitors were compared to groups using head mounted displays; the narrated animations resulted in greater learning outcomes than groups viewing animations with text. These findings continue the dual coding assumptions of multimedia learning theory, and also shows that the specific technology or media used is less important than the instruction techniques and how the technology and media are used. Desktop monitors produced comparable or slightly superior results as new wearable technology, and the strategy of visuals and narration together were more impactful in both technology trials than visuals and text together without audio.

Though the results would not be as efficient, early research studies in multimedia learning theory do also apply to the use of text and diagrams (Mayer, 1989). A series of media comparison studies found that good instructional design was applicable independently of the media (Mayer, 2003). Dual channel processing, limited working memory, and the need to actively create schemata applies to the use of computer or paper based designs. In another study it was found that when both the media and the design methodology are varied, user-controlled text with diagrams can be more effective than narrated animations without user controls (Mayer R., Hagerty, Mayer, S., & Campbell, 2005). The ability for participants to review and re-review the diagrams with text was compared to treatments where participants were not able to control the playback of the narrated animation. Both the media and the design methodology were different in these experiments. The ‘low-tech’ text and diagrams treatment with user controls outperformed the ‘high-tech’ animation without user controls. The inclusion of user controls and the integrated text with graphics results of these studies was applied to the design and development of the multimedia used in this experiment.

Multimedia learning theory and the use of both audio and video can inform and predict the successful application of other multimodal interactive learning environments. Results from asynchronous narrated animation or presentations should be generalizable to synchronous conferencing and distance-learning applications where audio and video is shared to and from all participants (Moreno & Mayer, 2007). The use of live, synchronous web conferencing was the variable being adjusted in this study, the method of presentation is unchanged and thus learners should benefit from the efficiency of dual coding. Similarly, if the method remains constant, the use of different media such as comparing desktop and mobile device screens should not matter as long as students can see and hear the presentation.

Multimedia learning theory provides additional results supporting instructional methodology being more important than instructional media. For instance, adding chapters and headings to a presentation improved learning effectiveness for both desktop and mobile device treatments groups and both groups performed equivalently (Sung & Mayer, 2013). This study found that while students may have different preferences, learning effectiveness should not be impacted by device type though it can be affected by methodology changes. Interestingly, culture may have more of an impact on media learning effectiveness than the type of instructional media itself (Sung & Mayer, 2012). Learning effectiveness is equivalent, though some students in some cultures may prefer to use phones over larger workstations. The common thread through these studies is the idea that multimedia learning theory can be successfully applied using a variety of technologies.

Social Presence in System Design

Humans use verbal as well as nonverbal cues to communicate. Education, teaching, and learning are fundamentally communication activities, and nonverbal cues, expressions, and gestures are important aspects of that interaction (Anderson, 1979; Argyle, Lefebvre, & Cook, 1974; Jayasinghe et al., 1997). The eyes, in particular, with their ability to both send and receive information, play a critical role in that communication.

Eye contact is a primordial and foundational aspect of communication that has been studied within a number of disciplines. Eye contact is used to gain and keep attention during conversations, predict future actions and perceptions, and describe the intentions of each member of a conversation (Frischen, Bayliss, & Tipper, 2007). These eye contact perceptions and activities are essential components of communication immediacy and social presence. Communication immediacy is the reduction of psychological distance through body relaxation,

body orientation, facial expressions, and eye contact (Mehrabian, 1968a, 1970, 1971).

Immediacy communicated through nonverbal cues such as eye-contact can help a communicator foster positive attitudes in their addressees (Mehrabian, 1968b). During instruction, learners gauge the credibility of instructors in large part through this availability of eye contact (Jayasinghe et al., 1997). While proximity to the source is significant for engagement, it has been suggested that a learner's seated position in a classroom can be less important than the instructor's ability to establish eye-contact with that learner (Breed & Colaiuta, 1974). Thus, the question has been raised: can one extrapolate these local classroom findings to an audience of online students where the learner and instructor are geographically and temporally separated? The snap to contact theory suggests that, when in doubt, a person will assume that another person is making eye contact (Chen, 2002). This inherent desire to look for eye-contact can also be explained by equivalency theory which states that eye-contact is a function of immediacy and physical proximity (Argyle & Dean, 1965). Specifically, during communication between two participants, the participants will attempt to engage in eye-contact the farther they are from each other. Thus, as in normal face-to-face communication, learners in distance learning and online environments may inherently be seeking some form of eye contact from the distance learning instructor. Students may prefer being able to see an instructor rather than a presentation consisting mostly of slides.

Eye contact is an important aspect of communication, and one can apply the latest high-definition technologies to make virtual eye contact much more realistic. A review of equivalency theory in distance education suggests that by increasing the resolution of the communication medium, the learning environment will become more effective in recreating a traditional face-to-face and eye-to-eye classroom (Simonson, 1995, 1999; Simonson, Schlosser,

& Hanson, 1999). Equivalency theory advises instructional designers to re-create for distance learning students a learning experience equivalent to those obtained by traditional or local students. Fostering virtual eye contact by showing the instructor in a high-definition learning environment should reinforce the students' perceptions of the instructor's social presence, immediacy, and ability to communicate with students.

Nonverbal Communication

Nonverbal communication is a critical aspect of social interaction and is comprised of a number of physical and vocal expressions. A wide range of research studies have explored the role that nonverbal language plays in human interaction. Research has suggested that 94% of business professionals perceived nonverbal communication, and the ability to decode nonverbal cues, as vitally important aspects of interaction in their office settings (Graham, Unruh, & Jennings, 1991). Another study indicated that individuals focus more on nonverbal cues given by eye and facial expressions than hand and arm gestures. Thus, facial expressions may communicate more information (Gullberg & Holmqvist, 2006). From an anthropological perspective, it has been widely accepted that nonverbal aspects of communication in virtually all cultures are more significant than spoken words (Hall, 1959). These findings could potentially be generalized and applied to online learning environments.

Research suggests that eye contact, timing, movement, posture, gesture, facial expressions, touch, dress, classroom environment, and vocal expressions all play a role in classroom and student dynamics (Knapp, 1971; Thomas-Maddox, 2003). Other research has found that facial expressions, even in the form of black and white photographs, rather than vocalization, better communicate emotion (Mehrabian & Ferris, 1967). The encoding and decoding of nonverbal cues happen largely unconsciously, and many teachers may not recognize

the positive or negative feedback they show students (Koch, 1971). The eyes may be the most crucial aspect of nonverbal communication, especially given their ability to both encode and decode information (Hess & Polt, 1960). Instructors and learners in classroom settings communicate via nonverbal actions, understanding these actions and learning how to foster this immediacy should improve learning environment designs.

The relation of eye contact to overall nonverbal communication yields a deeper understanding of human interaction. Researchers presenting five patterns of gaze to students in several trials found that the student's positive perceptions of the researchers increased as those researchers increased eye contact in each trial (Argyle et al., 1974). These researchers had assumed that the trials of almost 100% eye contact would make learners uncomfortable; however, they found that the opposite was true. These findings are similar to studies of audiences of broadcast events that appeared to better connect with those on camera, and appreciate increased levels of eye contact (Davis, 1978). In general, someone who consistently moves their head and eyes to engage in eye contact can be perceived as better liked and more attractive by audience participants (Frischen et al., 2007). Researchers have found in face-to-face trials that not only does eye contact improve participants' perception of a presenter, but learning effectiveness using contrived materials improved measurably over control groups (Jones & Cooper, 1971; Fry & Smith, 1975). Moreover, eye contact and decreased distance also increased the persuasiveness of a presenter with research participants (Mehrabian & Williams, 1969). The common thread through these studies was the general use of nonverbal communication, and, specifically, how eye contact enhances this interaction. This affective sense of immediacy could enhance motivation to learn, and so students able to see the instructor in an online course could potentially learn more effectively than students who cannot.

Similar findings have been documented in classrooms. For example, communication motivated by goals and objectives, such as the teaching-learning process, benefit from eye contact (Kleinke, 1986). In a study of preschool children, girls responded more favorably during 5-minute word games to increased eye contact with experimenters (Kleinke, Desautels, & Knapp, 1977). The preschool boys in this study responded less favorably to the increased eye contact; however, this result could potentially be explained by undeveloped social skills. In an analysis of a seminar class of both female and male college students, presumably with more developed social skills, eye contact increased the discussion participation of all students (Caproni, Levine, O'Neal, McDonald, & Garwood, 1977). Interpersonal connections and individualized instruction in a group can be established by connecting with each and every student during a lesson (Hodge, 1971). While social presence and immediacy research have been conducted in live classrooms, more research is needed to determine how video and multimedia technology can be used to best apply these findings in online environments.

Nonverbal Communications in Distance Learning

Adult distance learners do not want to be isolated; they want contact with the instructor. The technology's ability to encode, transmit, and decode verbal and nonverbal communications from the instructor define that instructor's social presence. Social presence is the extent to which a person, in this case a distance learning student, perceives another person, the instructor, as real (Baker & Woods, 2004; Gunawardena & Zittle, 1997). Thus, the immediacy or social presence of the instructor is the student's perception of communicating with a live person. This awareness of an instructor's immediacy decreases the learner's sense of distance from the instructor and increases feelings of being a member of the class, despite actual geographic separation (Baker, 2010; Baker & Woods, 2004; Hackman & Walker, 1990). These studies found a positive

correlation between student perceived satisfaction and virtual classroom design. Specifically, classroom design aspects such as high quality audio and video and the ability to interact increased the social presence of the instructor. The more genuine the reproduction and inclusion of the instructor's nonverbal communication, the more positive will be the effect on the distance learning program's equivalency to traditional live classroom courses.

These studies highlight research, applications, and practices used to foster social presence in virtual classroom environments. Based on these research threads, treatment groups who are able to see the instructor could potentially feel a greater sense of social presence and immediacy with their instructor. Students could prefer multimedia designs for online courses that include video of the instructor and this preference should lead to learning effectiveness.

Applied Multimedia Learning and Immediacy

This research study used multimedia learning examples to guide the design of five treatment groups in a quantitative experiment that extended the findings and applications of the media and delivery systems knowledge base. For instance, five variations of a multimedia presentation were compared to each other to inform the use of audio and video in online courses delivered to online devices. A version of the presentation with narrated slides was compared to versions with the instructor's video in a window with the narrated slides in a larger window, the narration and just the instructor video, and a narrated version where visuals switch between instructor video and slides. Mayer's multimedia learning theory would predict that narrated visual groups would perform better on recall and comprehension post-tests, but which of the versions will perform best? The results of this study can now be used to guide and inform instructional design techniques intended for online and mobile applications.

Implications for this Experiment

The previous research from the Media and Delivery Systems domain of knowledge will direct and inform this study's proposed experimental design. The present study focused on a more diverse population of distance learning students, from a wide range of study majors, a broad range of age groups, and who would have more varied backgrounds. In general, this rapidly growing online population has not only not been studied by the original multimedia learning research, but has also been neglected in recent quantitative research. This study also focused on the use of high-definition video content as well as playback on a wider variety of devices.

Instructors and designers using video should be conscious of the message design impact of immediacy and also be cautious against appearing fake or too scripted. A better approach would be to employ the same presentation practices on camera as they would in a traditional classroom setting. Eye-contact, smiling, humor, gesturing, encouragement, and communicating genuine concern for their students as they would in a classroom, should also work in a video. While specific student achievement results may be in question, the relationship between perceived learning effectiveness and immediacy appears more established. Students are more satisfied with their learning experience when they feel their instructors are credible, authentic, and genuinely care about teaching and learning. Successful instructional designers can nurture this immediacy by creating learning environments and systems that foster engagement, eye-contact, and communication. Thus, using video should effectively enhance the connection between instructors and learners.

Chapter 3

Research Focus and Research Questions

There are many ways to design and capture video though simply recording a classroom lecture, while efficient, may not be the most effective or affective design strategy. However, a studio production with pre-production meetings, scripts, teleprompters, multiple cameras, special virtual background effects, and video editing, may not be the most efficient online presentation design. The present research experiment begins to inform stakeholders of optimal resource investments that balance learning effectiveness and cost. The treatments in this study explored the learning outcomes and student preferences associated with five variations of a multimedia design. The identical instructor audio, video, and slides from a recorded lecture were used to create an instructor-only, slides-only, video-switching, dual-windows, and a superimposed-slides version of the presentation. This study addressed the following research questions among online, distance learning students enrolled at a mid-sized, public, metropolitan university.

1. What is the effect of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs on learning effectiveness in terms of recall and comprehension?
2. How do the use of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perception of instructor credibility?
3. How do the use of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perception of instructor nonverbal immediacy?

4. How do the use of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perception of instructor general immediacy?
5. How do the use of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perceptions of learning environment design?
6. How do the use of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perceptions of cognitive load?

Chapter 4

Methods

This chapter presents the research methods employed during the experiment. These research methods include a description of the participants, instruments and dependent measures, the instructional message design, participant procedures, how participants were protected during the study, as well as how data was analyzed.

This study employed a between-group true experimental approach using five treatment groups, with consistency maintained during all groups, and only the independent instructional message design variable being different. Participants were randomly assigned into one of the five treatments. The independent variable being manipulated was the design of the multimedia presentation viewed by each treatment group (instructor-only, slides-only, video-switching, dual-windows, or superimposed-slides multimedia presentation designs). The dependent variables were learning effectiveness, perceived instructor credibility, nonverbal immediacy, general immediacy, instructional environment design, and perceived cognitive load. As expected from previous reports, the types of online devices used in this study fell into mobile phone, tablet, laptop/notebook, and desktop/workstation categories (Old Dominion University, 2015). However, as described by the literature review, the device type used by participants should have minimal impacts on affective or objective learning outcomes (Clark, 1994; Morrison, 1994). A preliminary pilot test was used to confirm treatment logistics, the simplified cognitive load instrument, and the equivalency of the pre-test and post-test.

Participants

The goal of the study was to randomly assign at least 30 university student volunteers into each of five treatment groups. The participants were solicited with a message posted in the

University Student Announcements daily email sent to all students. The university announcements are read by both traditional and online students, and should yield a representative sample of the university population. Ads were also placed in the printed university newspaper and the university newspaper's website. The posts ran until a minimum of 30 participants were assigned into each of the five trials (approximately five weeks). All participants were offered their choice of an optional \$5 Starbucks or \$5 Amazon.com electronic gift card for their participation. All students were also entered into a drawing for a \$79 Amazon Kindle e-reader (or equivalent Amazon.com gift card). A similar procedure was used in a previous study and resulted in a sample that was representative of the population of interest, or all students who would take online classes (Morrison et al., 2013). This related previous experiment included a diverse variety of distance learning experience, gender, ages, majors, undergraduate, and graduate students, all eligible to take or have taken an online class. Participants were allowed to use their personal device of choice to view the multimedia presentation in their assigned treatment group. It was anticipated that on average each participant would have at least one laptop or workstation and one, possibly two, other mobile devices capable of viewing the presentation and accessing the survey and assessment instruments (Dahlstrom & Bichsel, 2014). All participants had a compatible and familiar device to use in the study, and the experiment was able to technically accommodate the expected device types.

Instruments and Dependent Measures

Six instruments were used to measure and compare each multimedia design. Student achievement and learning effectiveness were measured using a 20-item pre-test and a 20-item comprehension post-test. Five-item Likert scales were used for participants to gauge their perceptions of instructor credibility, nonverbal immediacy, the general immediacy or perception

of psychological distance, and their opinion of the instructor and learning environment. A six-item, 11-option, task load index was used to measure each participant's sense of cognitive load and task effort during the presentation. Each instrument was presented online using a scalable, secure cloud-based survey service.

A seventh insularly data collection process running in parallel was the login record of the online questionnaire and video playback service, which recorded the types of devices employed by the participants. This system was also used to confirm that participants were registered at the host university and did not attempt to participate more than once. Thus, reported device types can be confirmed and compared to learner achievement, credibility, nonverbal immediacy, general immediacy, sensitivity to the learning environment design, and cognitive load. Of particular interest was if or how the measures of the dependent variables changed when participants used their personal smartphones, tablets, laptops/notebooks, or workstations. It is expected that device type would result in no significant differences between presentation versions and learning effectiveness.

Pilot study. A pilot study, with two pilot treatment groups, was conducted to create and confirm the reliability of the random assignment process, video player interfaces, and the learning assessment instruments (see Appendix A). The pilot participants in both groups were first assigned into one of two treatments, viewed either the instructor-only or the superimposed-slides version of the presentation, and then took the cognitive load measurement. After the cognitive load measure, each participant in both groups next took the same 51-item assessment. Item analysis of these 51 items confirmed which 20 items were used in the experimental pre-test and which 20-items were used in the experimental post-test. Thus, the pilot study participants confirmed and determined which items were used in the experiment to create a pre-test and a

post-test that were as identical as possible. All items were presented online in a random order for each participant, the order of answer options within each item was also randomized for each participant.

Cognitive load. The United States' National Aeronautics and Space Administration's (NASA) Task Load Index (TLX) is the first instrument used in this study and was used to measure cognitive load during each treatment. The NASA TLX was originally created to consolidate and standardize how the cognitive efficiency of aviation flight crews are measured as their psychomotor tasks are revised (Hart & Staveland, 1988). The instrument has since been used in a wide variety of experimental applications including automotive operations, medical procedures, computer system design, combat simulations, and cell phone usage (Hart, 2008). These many applications also include a reliable means to measure cognitive load in instructional design (Morrison, 2013; Reid, 2013). The instrument uses a 0 to 100 scale for participants to indicate their perception of mental demand, physical demand, temporal demand, performance, effort, and frustration level experienced during a task (see Appendix B). A simplified, online version of the treatment was used in this study to allow for the efficient integration of the instrument with the other online survey measures in this experiment. The simplified version will also use a horizontal scale from 0 (low) to 10 (high). The test-retest reliability correlation of the instrument as used in this experiment measured .83 (Hart & Staveland, 1988). Additionally, the raw Task Load Index, without weighted pairwise comparisons, has resulted in a Cronbach's alpha reliability factor of 0.74 in previous research (Wang, L., Wang, G., Haung, Jiang, & Xu, 2014).

Instructor credibility. The second instrument to be used was the McCroskey's Source Credibility Measure (McCroskey & Teven, 1999). This tool measures how participants perceive

the credibility of a communication source, or the instructor in the video in this case (see Appendix C). This instrument is based on earlier instruments such as the Semantic Differential Scale for Dimensions of Source Credibility for Spouses and Peers used in previous research studies that focused on the use of cameras or mass media to communicate the credibility of presenters (Jayasinghe et al., 1997; McCain, Chilberg, & Wakshlag, 1977; McCroskey, Holdridge, & Toomb, 1974; McCroskey & Jenson, 1975). The revised version recommends how to present and score 18 indicators such as the learner's description of the instructor's competence (e.g., intelligent/unintelligent, inexpert/expert), goodwill (e.g., self-centered/not self-centered, concerned/unconcerned) and trustworthiness (e.g., untrustworthy/trustworthy, and unethical/ethical). These three dimensions in the Source Credibility Measure roughly consolidate and correspond to the five dimensions of the items of the previous Semantic Differential Scale for Dimensions of Source Credibility for Spouses and Peers used in Jayasinghe et al. (1997). In the 1999 study, the internal reliability alphas of the three dimensions of the Source Credibility Measure resulted in 0.78 for competence, 0.92 for trustworthiness, and 0.89 for goodwill (McCroskey & Teven, 1999). A Cronbach's alpha above 0.60 is an acceptable value, however, a value closer to or above 0.90 is generally considered a preferred internal reliability value (Aron, A., Aron, E., & Coups, 2009). McCroskey and Teven (1999) found that the overall source credibility measured a reliable 0.94 when measuring all three dimensions together in another study.

Nonverbal immediacy. The third instrument used was a section of the survey based on the Nonverbal Immediacy Behaviors Index (Richmond, Gorham, & McCroskey, 1987). This research suggests that teachers that rate high on this set of immediacy items communicate more effectively with their students (see Appendix D). The instrument uses 14 items to measure

immediacy aspects such as how teachers gesture, how they smile, if they appear relaxed, and if they use a variety of vocal expressions during class. Richmond, Gorham, and McCroskey (1987) found when using the instrument that its internal reliability alpha ranged between 0.80 and 0.87. An earlier version of this measurement, Anderson's Behavioral Indicators of Immediacy Scale, resulted in a split-half internal reliability of 0.91 and 0.93 during two trials (Anderson, 1979). Anderson's Behavioral Indicators of Immediacy Scale also led to an internal reliability of 0.74 when using Nunnally's internal reliability formula (Richmond et al., 1987). In psychology studies an internal reliability calculation greater than 0.70 is considered generally reliable (Nunnally & Bernstein, 1994). Nunnally's internal reliability coefficient focuses on the comparison of word pairs and is a variation of the split-half reliability techniques also used by Cronbach's alpha and Kuder-Richardson's Formula 20 (Nunnally & Koplin, 1967).

General immediacy. The fourth instrument included as part of the survey was the Anderson Perceived General Immediacy Scale that measures the learner's assessment of the immediacy of their instructor based on the learner's perceived reduction of psychological distance (Anderson, 1979). A higher value of perceived general immediacy would indicate a reduction of psychological distance from the instructor and increased social presence with the subject matter expert. The specific items used to assess the teacher include the participants' agreement or disagreement of the immediacy of the instructor's teaching style, and their rating of the teacher as cold or warm, friendly or unfriendly, and close or distant (see Appendix E). The internal reliability of this scale using Nunnally's internal reliability formula was measured at 0.96 (Anderson, 1979).

Instructional environment. The fifth instrument investigated the learner's perception of the instructional environment with the final section of the survey based on the Instructor

Evaluation Measure. This instrument was developed and used by Jayasinghe, Morrison, and Ross (1997) in their study of student perceptions and distance learning classroom and environment design. This assessment sought to collect feedback on the overall layout and design of the instructional environment where the learning sessions took place (see Appendix F). Questions included thoughts on the size and location of monitors, room comfort, view of the instructor, and audio and/or video preferences. The internal reliability of this instrument resulted in a Cronbach's alpha of 0.73. An additional question was added at the end of the questionnaire after the Instructor Evaluation Measure items to gauge each participant's perspective of their learning (Morrison et al., 2013).

Learning effectiveness. The final instrument used in the five experiment treatments was a two-part learning achievement test. This recall and comprehension instrument included a 20-question multiple choice pre-test with a 20-question post-test. Participants took the pre-test, and answered the demographics questions before being assigned to view one of the five presentations. Participants took the post-test after viewing their assigned video and after taking the credibility, immediacy, and instructor/environment survey.

This pre-test and post-test strategy was successfully employed in the earlier experiment using the same instructional subject matter in an experimental study comparing video presentation resolution and camera angle (Morrison et al., 2013). However, this previous study used only 10 items; an expansion to 20 questions enhanced internal validity and extracted more apparent learning differences. In general, the reliability of a test will increase as more items are added to that test (Frisbie, 1988). The pilot test was conducted using 51 learning assessment items and an item analysis confirmed which items were used in the pre-test and post-test. The pilot test and item analysis process helped ensure that both the experimental pre-test and

experimental post-test were as equivalent as possible. Pilot test items with a discrimination index below .30 or with a difficulty outside of a .50 to .70 range were not used or were further revised for the experimental pre-test and experimental post-test (See Appendix A). This item strategy resulted in 20-item pre-test with a KR-20 alpha of .75, and a 20-item post-test with a KR-20 alpha of .77, indicating an acceptable level of internal consistency and reliability. The 20 items in the experiment's pre-test and post-test were presented online in a random order for each participant, the order of answer options in each question were also randomized for each participant. Each multiple-choice item in the pilot test and the experimental tests had five answer options. The table of specifications for each item that comprised the pilot-test and the experiment's pre-test and post-test is listed in Appendix G.

Instructional Message Design

An experienced female classroom instructor and professional seminar presenter was used to help create, script, and test the realistic teaching materials. Research has suggested that students prefer female narrations during multimedia presentations, though the gender of the narrator had no impact on learning effectiveness (Linek, Gerjets, & Scheiter, 2010). A female presenter was also used in other similar cognitive multimedia learning experiments (Jayasinghe et al., 1997; Mayer & Johnson, 2008; Morrison et al., 2013). A female instructor was used in the present experiment to maintain consistency with this precedent.

The instructional material consists of a single video session, recorded in one of the university's professional studio and sound stages. The presenter was allowed several practice sessions, enabling them to focus comfortably on the eye-level camera while giving the instruction. The trainer presented an authentic instructional 20-minute module on social media, specifically the historical background and impact of social networking technology and trends in

interpersonal communication. The five variations of the presentation were hosted and played back for participants on the same content management system as the one used for the host university's online course archives. Using the same system created an authentic learning environment for the experiment groups. The instructor video was recorded with a Sony PMW-EX3 camcorder in 1080p, high-definition resolution. The presentation slides have been created in Microsoft PowerPoint and saved as 1920x1080 resolution JPEG images. Slides were created with black text in a 28-point sans serif Calibri font, with white backgrounds, and realistic static images; no animations, unnecessary clip-art, or sound effects were included. Instructor audio was recorded using a Sony ECM-77B lavalier microphone. The instructor video, presentation slides, and instructor audio were integrated together in each presentation version using Apple's Final Cut X video editing software suite. Each of the five presentations was created in 1080 resolution, uploaded to the content distribution system, and played back in 720 or 360 resolution based on the participant's available bandwidth to accommodate different Internet connections. The change in resolution did not appear to impact video playback quality.

Each treatment group will view a single variation of five different multimedia presentations. One version of the presentation will be the instructor's audio as captured by the studio microphone and visually showed just the instructor. This visual was recorded from the eye-level, high-definition studio camera. Participants in this instructor-only treatment group only saw the instructor and were not be able to see the presentation slides (see Appendix H). A second presentation treatment only included the slides with the instructor's audio, viewers in this slides-only treatment did not see the instructor (see Appendix I). The third variation visually switched between the instructor camera and the instructor's slides. The image the students saw during this video-switching treatment alternated between the instructor video and the

presentation slides (see Appendix J). Two treatments included simultaneous views of both the instructor camera and the slides. The fourth treatment group viewed a dual-windows presentation that included the instructor in a smaller window in the upper left of the screen and the presentation slides as a larger window on the right side of the screen (see Appendix K). The final superimposed-slides treatment type used several video layers to include the instructor in the lower left and superimposed the slides in the upper right, both over a black background layer (see Appendix L). The black background was the first layer, the second layer was the superimposed-slides, and the third layer was the instructor video. The same audio narration was used with all treatments, the same eye-level video was used when the instructor was visible (four out of five groups), and the same presentation was used when slides are visible (also in four out of five groups). The complete transcript of the 19:56 minute presentation is included in Appendix M.

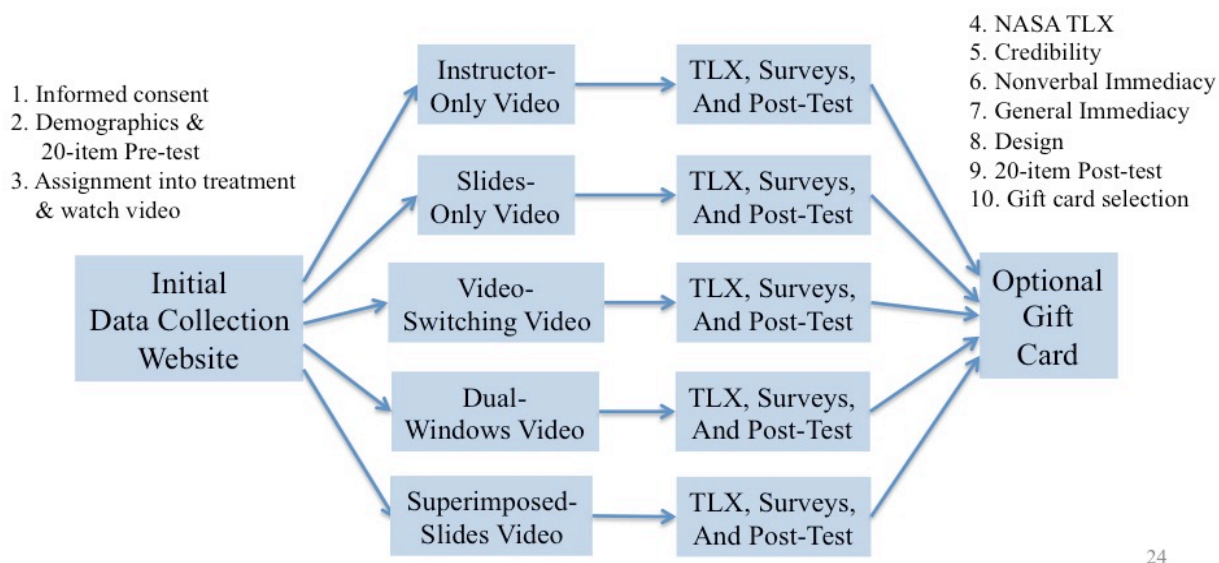
A number of best practices exist for the use of text in audiovisual presentations, and these design principles are applied in the presentation slides used in these treatments. This research included best practices dating back to the early 1960s that guide text size as a function of screen size and distance from the video display (Kemp, 1963; Kemp & Smellie, 1994). Font sizes for motion picture and video should range between one-fourth of an inch to three-eighths of an inch, or 18 to 30-point fonts. These guidelines and best practices are echoed by fundamental instructional design methods for television productions. One of these seminal works describes that the smallest usable font sizes must be greater than one twenty-fifth the height of the screen, or larger than about 14 point font, with ideally three to four words per line and four to five lines per screen (Diamond, 1964). Additionally, text density in presentations should be reduced in slides used for lectures, when the audience can be distracted, or when the slides will not need to

serve as reference material (Gabrielle, 2010). This guidance equates to three to four points to communicate per slide. The reduction of text density on slides is a specific recommendation for online classes (Bozarth, 2008). Related guidance suggests using no more than six bullets per slide, light backgrounds and dark text, the use of sans serif fonts, and the use of graphics to enhance or clarify text (Center for Learning and Teaching, 2015). Slides can effectively include minor clip art and graphics to enhance cognitive situational interest, or visual elements that are subject matter related and included to support and cue learners to content (Clark & Lyons, 2004). These attention focusing graphics are especially helpful when students have a low personal interest in the content. Other video production industry guidelines suggest keeping text on a screen for three times the time it takes an average viewer to read that text (Mecca, 2012; Taylor, 2011). For instance, if it takes an average viewer five seconds to read text on a slide, then the slide should remain on screen for approximately 15 seconds. This recommended onscreen text duration will be specifically used in the video and slide alternating video-switching treatment group of this experiment.

Participant Procedures

Interested participants first visited a link to a website where they read the details of the experiment, reviewed the host university's informed consent statement, and agreed to participate. Student volunteers were recruited via a series of advertisements in the university's daily Student Announcements email sent to all students, full-page ads placed in the university newspaper, and online ads on the university newspaper's website. This electronic newsletter, hardcopy newspaper, and website informs students of campus news and events including research opportunities.

When students approved, they clicked on an “I agree” icon on the survey website and proceeded to next give basic demographic information and took the pre-test. Collected information included age, gender, academic status (e.g. freshman, sophomore, junior, senior, master’s, doctoral, or other), device type, experience taking a distance-learning or online course, and experience watching online video. Sensitive and identifying information such as names were not collected. Participants were then randomly assigned to view one of the five 20-minute multimedia presentations. After viewing their assigned presentation, each student took the NASA Task Load Index instrument, the 5-point Likert scale perception survey, and the 20-item post-test. The survey included the credibility, nonverbal immediacy, general immediacy, and instructor evaluation instruments. The entire process was accomplished online and took participants 45 to 50 minutes to complete. The participant procedure is illustrated in Figure 1.



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Figure 1. Participants procedures during the experiment. Each participant in this experiment experienced a 10-step process from informed consent to the selection of the optional gift card. Included in the process was a random assignment into a treatment, viewing of the treatment video, then the NASA TLX, survey, and post-test instruments.

Protection of Participants

After the post-tests, participants only volunteered their email addresses to receive their \$5 e-gift cards (via email), and email addresses were collected independently from other collected data. Student email address records were deleted from the university secured online email system after respondents had been emailed their electronic gift cards. No other personal student identification information was collected, and all test and questionnaire data were encrypted and password protected on a university approved laptop and secured cloud storage integration.

Data Analysis

The analysis of research questions was completed using one-way Analyses of Variance (ANOVA) or Analyses of Covariance (ANCOVA) to determine potential statistically significant differences among the treatment groups (using a 0.05 significance level). A Tukey HSD post hoc analysis was conducted on these data sets (using a 0.05 significance level) to look for the specific significant differences among the treatment groups. Multivariate Analyses of Variance (MANOVA) were conducted using each of the five treatments and the six subscales of the NASA TLX workload treatment, with follow-up ANOVAs conducted on any significant differences (also using a 0.05 significance level). Figure 2 summarizes the independent and dependent variables, the measurement instrument, and the analysis procedure to be used for each research question. A t-test was also conducted to confirm a statistically significant difference between overall pre-test and post-test scores, to minimally indicate that learning had occurred as a result of watching the lecture.

Research Questions	Independent Variables	Dependent Variables	Data Analysis Procedures
1. What is the effect of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs on learning effectiveness?	Presentation Design: <ol style="list-style-type: none"> 1. Instructor-only 2. Slides-only 3. Video-switching 4. Dual-windows 5. Superimposed-slides 	Learning effectiveness (recall and comprehension) (measured with a pre-test before instruction and an equivalent post-test after instruction)	A 5x1 Analysis of Covariance (ANCOVA), with the differences between pre-test and post-test scores, with a Tukey HSD post hoc analysis A t-test between overall pre-test and post-test results to confirm recall and comprehension
2. How do the uses of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perception of instructor credibility?	Presentation Design: <ol style="list-style-type: none"> 1. Instructor-only 2. Slides-only 3. Video-switching 4. Dual-windows 5. Superimposed-slides 	Learner perception of instructor credibility (measured with McCroskey's Source Credibility Measure)	A 5x1 Analysis of Variance (ANOVA) with the mean score of the Source Credibility Measure, with a Tukey HSD post hoc analysis
3. How do the uses of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perception of instructor nonverbal immediacy?	Presentation Design: <ol style="list-style-type: none"> 1. Instructor-only 2. Slides-only 3. Video-switching 4. Dual-windows 5. Superimposed-slides 	Learner perception of instructor nonverbal immediacy (measured with McCroskey's Nonverbal Immediacy Behaviors Index)	A 5x1 Analysis of Variance (ANOVA) with the mean score of the Nonverbal Immediacy Behaviors index, with a Tukey HSD post hoc analysis
4. How do the uses of instructor-only, slides-only, video-switching,	Presentation Design: <ol style="list-style-type: none"> 1. Instructor-only 2. Slides-only 	Learner perception of general immediacy (or the	A 5x1 Analysis of Variance (ANOVA) with

dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perception of instructor general immediacy?	3. Video-switching 4. Dual-windows 5. Superimposed-slides	reduction of psychological instructor distance) (measured with Anderson's Perceived General Immediacy Scale)	the mean score of the Perceived General Immediacy Scale, with a Tukey HSD post hoc analysis
5. How do the uses of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perceptions of learning environment design?	Presentation Design: 1. Instructor-only 2. Slides-only 3. Video-switching 4. Dual-windows 5. Superimposed-slides	Learner perceptions of learning environment design (measured with Morrison's Instructor Evaluation Measure)	A 5x1 Analysis of Variance (ANOVA) with the mean score of the Instructor Evaluation Measure, with a Tukey HSD post hoc analysis
6. How do the uses of instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides multimedia presentation designs compare in terms of learner perceptions of cognitive load?	Presentation Design: 1. Instructor-only 2. Slides-only 3. Video-switching 4. Dual-windows 5. Superimposed-slides	Learner perceptions of cognitive load (measured with NASA's Task Load Index 6 subscales)	A 5x1 Analysis of Variance (ANOVA), with a Tukey HSD post hoc analysis on the mean score of the NASA TLX A 5x6 (5 treatments x 6 TLX subscales) Multivariate Analysis of Variance (MANOVA), with an Analysis of Variance (ANOVA) follow-up analysis

Figure 2. A summary of the analysis procedure, the independent and dependent variables, and the measurement instrument for each research question.

Chapter 5

Results

This chapter describes the results of the analyses conducted on each data set, including the results of each test, survey, and demographic collection instruments. A one-way univariate Analysis of Covariance (ANCOVA) was used to answer the first learning effectiveness research question. A one-way univariate Analysis of Variance (ANOVA) was conducted on the mean total of each instrument used to answer survey research questions 2, 3, 4, and 5, as well as the cognitive load research question 6. A one-way Multivariate Analysis of Variance (MANOVA) was also conducted where appropriate to determine how individual instrument items helped address the research questions. This application of ANOVA analysis on instrument totals, and MANOVA analysis on instrument items, was effectively used with these instruments in a similar research study (Jayasinghe, 1995). A .05 level of significance was used during each analysis. Outliers were defined as those participants who finished each instrument in or below the lower 10th percentile of overall response durations. This practice removed responses from participants who were quickly finishing the instruments to simply progress to the gift card request page.

Participants had three tasks to complete after watching their assigned video; the NASA TLX, survey, and post-test instruments. The McCroskey Source Credibility Measure instrument, Nonverbal Immediacy Behaviors Index, the Anderson Perceived General Immediacy Scale, and the Instructor Evaluation Measure were all presented to participants as a single survey instrument. Only participants who completed the pre-test, watched the video in one of the five treatments, and completed the NASA TLX and survey were used in the cognitive load and perception analysis. Only participants who completed the pre-test, watched the video in one of

the five treatments, completed the NASA TLX, survey, as well as the post-test were included in the post-test analysis. It also appeared that some students grew tired, bored, or frustrated during the experiment; many may not have completed their assigned video, and many did not complete all three instruments.

Participants

Participants in this research study first filled out several basic demographic questions and the 20-item pre-test before being assigned one of the five video modules and then completing the NASA TLX, survey, and post-test instruments. Overall, 450 volunteers started the study, 226 of these were unique participants who completed one of the five treatments and the NASA TLX, 211 continued to complete the survey, and 171 of these participants also completed the post-test.

Gender. The gender of each participant was asked to confirm that learning effectiveness or perception results would or would not be a function of gender differences. The gender demographics collected by this study generally reflects the demographics of the host university.

Gender and NASA TLX instrument. Of the 226 participants who responded, 139 reported themselves as female, 69 reported themselves as male, or a 61.5% female and 30.5% male distribution. An additional 18 students either did not report their age or moved between wireless networks during the experiment and thus, their ages could not be associated with their NASA TLX responses.

Gender and survey instrument. Of the 211 participants who responded, 134 reported themselves as female, 61 reported themselves as male, or a 63.5% female and 28.9% male distribution. An additional 16 students either did not report their age or moved between wireless networks during the experiment and thus, their ages could not be associated with their NASA TLX and survey responses.

Gender and post-test instrument. Of the 171 participants who completed the post-test, 115 reported themselves as female, 44 reported themselves as male, or a 65.0% female and 24.9% male distribution. An additional 12 students either did not report their age or moved between wireless networks during the experiment and thus, their ages could not be associated with their NASA TLX, survey, and post-test responses.

Age. The age distribution of participants in this study ranged from 17 to 66, representing a wide diversity of background and experience. The average age of all research participants was 27.1, with a median age of 22 years. These findings suggest a positive skew towards younger students though with a long tail indicating the noteworthy presence of older students. For the purposes of analysis, the participants were grouped into three categories, or a group of “17-23” year olds, a second group of “24-30” year olds, and a third “30+” group. These groups would generally correspond to students seeking bachelor, masters, and doctoral degrees and the blended traditional and adult learner demographic of the host university. This strategy also allowed for sufficiently large sample sizes in each category for statistical analysis.

Age and NASA TLX instrument. A total of 226 participants completed the NASA TLX instrument. There were 110 participants who reported their age between 17 and 23, 56 participants reported their age were between 24 and 30 years old, and 36 students reported being older than 30. An additional 24 students either did not report their age or moved between wireless networks during the experiment and thus, their ages could not be associated with their NASA TLX responses.

Age and survey instrument. A total of 208 participants completed the survey. There were 104 participants who reported their age between 17 and 23, 52 participants reported their age between 24 and 30 years old, and 34 students reported being older than 30. An additional 18

students either did not report their age or moved between wireless networks during the experiment and thus, their ages could not be associated with their NASA TLX and survey responses.

Age and post-test instrument. A total of 171 participants completed the post-test. There were 77 participants who reported their age between 17 and 23, 45 participants reported their age between 24 and 30 years old, and 34 students reported being older than 30. An additional 15 students either did not report their age or moved between wireless networks during the experiment and thus, their ages could not be associated with their NASA TLX, survey, and post-test responses.

Academic Experience. The academic experience of participants in this study ranged from entering freshmen to Ph.D. doctoral candidates, representing the population of the host university and the desired experimental sample. The small sample size of freshmen and doctoral students and the impact on the study's validity and reliability was a concern. For instance, after removing outliers, there were only 11 freshmen participants who completed the post-test. More appropriate groups sizes were obtained when combining similar groups. The freshmen and sophomores were combined into a single group, the juniors and seniors were combined into a single group, and the masters degree seeking and doctoral students were combined into a single group. The result was three categories with at least 30 participants in each category.

Academic experience and NASA TLX instrument. Of the 226 participants who responded to the NASA TLX, 49 participants were in the freshmen/sophomore group, 116 participants were in the junior/senior group, and 43 masters and doctoral participants in the graduate students group. An additional 18 students either did not report their academic status or

moved between wireless networks during the experiment and thus, their academic status could not be associated with their NASA TLX responses.

Academic experience and survey instrument. Of the 211 participants who responded to the survey, 42 participants were in the freshmen/sophomore group, 113 participants were in the junior/senior group, and there were 40 masters and doctoral participants in the graduate students group. An additional 16 students either did not report their academic status or moved between wireless networks during the experiment and thus, their academic status could not be associated with their NASA TLX and survey responses.

Academic experience and post-test instrument. Of the 211 participants who responded to the survey, 27 participants were in the freshmen/sophomore group, 97 participants were in the junior/senior group, and there were 36 masters and doctoral participants in the graduate students group. An additional 11 students either did not report their academic status or moved between wireless networks during the experiment and thus, their academic status could not be associated with their NASA TLX, survey, and post-test responses.

Online Course Experience. Participant experience in online courses ranged from having never taken an online class before to having taken seven or more online courses. This wide range of previous experience also approximates the student population of the host university and the desired experimental sample.

Online course experience and NASA TLX instrument. Of the 226 participants who responded to the NASA TLX, 60 participants had never taken on online class, 57 participants had taken 1 to 2 classes, 35 participants had taken 3 to 4 classes, 19 participants had taken 5 to 6 classes, and 34 participants who have taken more than 7 online classes. An additional 21 students either did not report their experience taking online classes or had moved between

wireless networks during the experiment and thus, their experience could not be associated with their NASA TLX responses.

Online course experience and survey instrument. Of the 211 participants who responded to the survey, 56 participants had never taken on online class, 53 participants had taken 1 to 2 classes, 32 participants had taken 3 to 4 classes, 19 participants had taken 5 to 6 classes, and 33 participants who have taken more than 7 online classes. An additional 18 students either did not report their experience taking online classes or had moved between wireless networks during the experiment and thus, their experience could not be associated with their NASA TLX and survey responses.

Online course experience and post-test instrument. Of the 171 participants who responded to the post-test, 38 participants had never taken on online class, 47 participants had taken 1 to 2 classes, 25 participants had taken 3 to 4 classes, 16 participants had taken 5 to 6 classes, and 29 participants who have taken more than 7 online classes. An additional 16 students either did not report their experience taking online classes or had moved between wireless networks during the experiment and thus, their experience could not be associated with their NASA TLX, survey, and post-test responses.

Online Video Watching Experience. Participants were also asked for their experience watching general online video. This previous familiarity could allow them to better adapt to online classes that utilize online video. This experience could impact their perception of cognitive load, immediacy, and learning effectiveness.

Online Video Watching Experience and NASA TLX instrument. Of the 226 participants who responded to the NASA TLX, there were 18 participants who reported that they do not regularly watch video online, 43 who view 1 to 2 hours per week, 56 who viewed 3 to 4

hours per week, 48 who viewed 5 to 6 hours per week, and 43 who reported that they viewed more than 7 hours of video online per week. An additional 18 students either did not report their experience watching video online or had moved between wireless networks during the experiment and thus, their experience could not be associated with their NASA TLX responses.

Online Video Watching Experience and survey instrument. Of the 211 participants who responded to the survey, there were 19 participants who reported that they do not regularly watch video online, 41 who viewed 1 to 2 hours per week, 49 who viewed 3 to 4 hours per week, 47 who viewed 5 to 6 hours per week, and 40 who reported that they viewed more than 7 hours of video online per week. An additional 15 students either did not report their experience watching video online or had moved between wireless networks during the experiment and thus, their experience could not be associated with their NASA TLX and survey responses.

Online Video Watching Experience and post-test instrument. Of the 171 participants who responded to the survey, there were 14 participants who reported that they do not regularly watch video online, 33 who viewed 1 to 2 hours per week, 45 who viewed 3 to 4 hours per week, 33 who viewed 5 to 6 hours per week, and 33 who reported that they viewed more than 7 hours of video online per week. An additional 13 students either did not report their experience watching video online or had moved between wireless networks during the experiment and thus, their experience could not be associated with their NASA TLX, survey, and post-test responses.

Device Type. Participants were asked just after viewing their assigned video what type of device they had used during the experiment. This data would be used to confirm what impact, if any, device type and screen size would have on task load, student perception, and learning effectiveness. Of the 242 participants who had reported the type of device they used during the experiment, 120 participants reporting using laptops, 62 participants used workstations or

desktops, 39 participants used phones, and 21 participants used tablets. The tablet group includes both “tablets” as well as “mini-tablets”. The question asking for device type was included as part of the NASA TLX questionnaire. Device usage responses were recorded and tied to the participants’ IP address at the time of the experiment even if the participants had moved between networks during the experiment.

Pre-test. A 20-item pretest was administered after the demographics questions and before the treatment. Participants were scored on the pre-test based on the number of items answered correctly out of 20 total items. Outliers were defined as those participants who did not take adequate time to complete the post-test. Best practices for instructors and instructional designers require allocating enough time for at least 90% of students to finish an achievement instrument (Ebel, 1970). Adequate time was determined based on the top 90th percentile of pilot test responses that took longer than 2 minutes and 18 seconds to complete the post-test based on this best practice. For each experimental treatment, outliers in the bottom 10th percentile and took less than 2 minutes and 18 seconds to complete their responses, were removed from each analysis. After the outliers were removed, 335 of the original 450 participants had submitted valid responses to the pre-test.

The results of the pre-test instrument appear to be generally valid and reliable. The KR-20 of the pre-test measured .65 indicating a fairly reliable construct from the perspective of classroom instruction (Ebel, 1970). The pre-test instrument’s discrimination between high performers (upper 27% of correct responses) and lower performers (lower 27% of correct responses), ranged between .03 and .73 with an overall average discrimination index of .45. A test item’s discrimination describes how effective that item is at discerning high achieving students from low achieving students. This discrimination index is above .30 and is considered

best practice for an achievement instrument (Ebel, 1970). The difficulty of each item ranged from .11 to .73, with an overall average instrument difficulty index of .43. This difficulty index is below the expected .50 to .70 range of a multiple choice achievement instrument, indicating that most participants were very unfamiliar with the subject matter. The overall standard deviation on the pre-test was 3.60. The chance score, or theoretical score a participant could achieve by guessing on 20, 5-option multiple-choice items, was 4. The range between a perfect score of 20 and the chance score of 4 is 16, and 1/6th of this range of 16 is 2.67. The standard deviation of 3.60 is greater 2.67 (greater than 1/6th the range between the highest possible score and the chance score). This result indicates that the instrument exhibits an acceptable ability to distinguish between participants with different levels of ability (Ebel, 1970).

NASA Task Load Index. Similar to the learning effectiveness, survey research questions, and associated analysis, outliers were defined as those participants who did not take adequate time to complete the overall NASA Task Load Index (TLX) instrument. Adequate time was determined based on the 90th percentile of responders who took longer than 21 seconds to complete the six items in the NASA TLX. For each experimental treatment, outliers below 21 seconds were removed from the ANOVA analysis. After removing outliers, there were 43 participants in the dual-windows treatment, 46 participants in the instructor-only treatment, 49 participants in the slides-only treatment, 43 participants in the superimposed-slides treatment, and 45 participants in the video-switching treatment for a total of 226 valid participant responses.

Perception Surveys. Similar to the learning effectiveness instruments and associated analysis, outliers were defined as those participants who did not take adequate time to complete the overall survey. Adequate time was determined based on the 90th percentile of responders who took longer than 2 minutes and 1 second to complete the survey. For each experimental

treatment, outliers below 2 minutes and 1 second were removed from the ANOVA analysis. After removing outliers, there were 38 participants in the dual-windows treatment, 39 participants in the instructor-only treatment, 48 participants in the slides-only treatment, 40 participants in the superimposed-slides treatment, and 43 participants in the video-switching treatment for a total of 208 valid participant responses.

Post-test. A 20-item post-test was administered after the treatment, NASA TLX instrument, and survey instruments. As with the pre-test, participants were scored based on the number of items answered correctly out of 20 total items. Also similar to the pre-test, outliers were defined as those participants who did not take adequate time to complete the post-test. Adequate time was determined based on the 90th percentile of post-test responses that took longer than 2 minutes and 18 seconds to complete the post-test. For each experimental treatment, outliers below 2 minutes and 18 seconds were removed from each analysis. After removing outliers, there were 33 participants in the dual-windows treatment, 32 participants in the instructor-only treatment, 38 participants in the slides-only treatment, 36 participants in the superimposed-slides treatment, and 31 participants in the video-switching treatment for a total of 171 valid participant responses.

The results of the post-test instrument also appear to be generally valid and reliable. The KR-20 of the post-test measured .58 indicating somewhat of a validity deviation between the pre-test and the post-test. The post-test instrument's discrimination between high performers (upper 27% of correct responses) and lower performers (lower 27% of correct responses), ranged between .20 and .63 with an overall average discrimination index of .39. This discrimination index is above .30 and is considered best practice for an achievement instrument (Ebel, 1970). The difficulty of each item ranged from .49 to .81, with an overall average instrument difficulty

index of .65. This difficulty index is in between the expected .50 to .70 range of a multiple choice achievement instrument (Ebel, 1970). The overall standard deviation on the post-test was 3.25. The chance score, or theoretical score a participant could achieve by guessing on 20, 5-option multiple-choice items, was 4 (a 20% chance of guessing the correct answer of all 20 items). The range between a perfect score of 20 and the chance score of 4 is 16, and 1/6th the range between this range of 16 is 2.67. The standard deviation of 3.25 is greater than 1/6th the range between the highest possible score and the chance score, or greater than 2.67. This result indicates that the instrument exhibits an acceptable ability to distinguish between participants with different levels of ability.

Research Question 1: Learning Effectiveness

A one-way univariate Analysis of Covariance (ANCOVA) was conducted to determine the effect of the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) on the total score of each participant on the post-test. The covariate was pre-test scores. An ANOVA was first used to confirm that there were no significant differences between pre-tests scores and treatment groups, $F(4,151) = 1.04$, $p = .39$, indicating that an ANCOVA could be performed on the post-tests and treatments. This step was included to confirm that all participants in all five treatments had all performed similarly on the pre-test and had the same level of previous knowledge about the subject matter. If a group had scored higher than the others on the pre-test, then an ANCOVA would be much less effective analysis. Next, the ANCOVA analysis was conducted to control for any variance introduced by the common pre-test, the results indicated no significant difference between treatment groups and post-test scores, $F(4,151) = .56$, $p = .7$. These results indicate that participants in all five treatment groups performed similarly on the post-test.

A paired-samples t-test was conducted on the pre-test and post-test scores of each participant to confirm that content recall and comprehension had occurred. The analysis indicated a significant difference between the mean pre-test scores ($M = 10.02$, $SD = 3.50$), and post-test scores ($M = 13.00$, $SD = 3.25$), $t(156) = 11.53$, $p < .01$. These results indicate that all participants appeared to learn equally well from the instructional treatments, at least in terms of recall and comprehension. However, no one treatment group outperformed the other groups.

Research Question 2: Instructor Credibility

A one-way Analysis of Variance (ANOVA) was conducted to evaluate the relationship between the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) and the average score of each participant on the McCroskey Source Credibility Measure items in the survey. The ANOVA was significant, $F(4,203) = 2.47$, $p < .05$, indicating a difference among the treatment groups. A follow-up Tukey HSD test was conducted to evaluate the difference among the means. The dual-windows group ($M = 5.58$, $SD = .88$) perceived the instructor as more credible than the instructor-only group ($M = 4.99$, $SD = .7$), possibly indicating that inclusion of slides impacted perceived credibility, see Table 1.

Table 1

Source Credibility Measure of each Treatment Group

Treatment	<i>n</i>	Mean (SD)	95% Confidence Interval
Dual-Windows*	38	5.75 (.99)	[5.45, 6.1]
Superimposed-Slides	40	5.53 (.98)	[5.23, 5.83]
Video-Switching	43	5.51 (1)	[5.22, 5.79]
Slides-Only	48	5.49 (.97)	[5.22, 5.76]
Instructor-Only*	39	5.1 (.75)	[4.8, 5.4]

Note. Source credibility measured on a 1 to 7 scale, with 7 being the most credible.

* Significant difference found between these treatments, $p < .05$.

Research Question 3: Nonverbal Immediacy

A one-way univariate Analysis of Variance (ANOVA) was conducted to determine the effect of the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) on the mean score of participants on the Nonverbal Immediacy Behaviors Index section of the survey. The ANOVA indicated a significant difference between treatment groups, $F(4,206) = 4.68$, $p < .01$. A follow-up Tukey HSD test was conducted to evaluate the difference among the treatment groups. The nonverbal immediacy of the instructor was rated lowest by the slides-only group ($M = 3.83$, $SD = 1.12$) as compared to the other four groups; superimposed slides ($M = 4.37$, $SD = .46$), video-switching ($M = 4.29$, $SD = .44$), instructor slides ($M = 4.27$, $SD = .43$), and dual windows ($M = 4.24$, $SD = .46$), see Table 2. These results could indicate that the exclusion of the instructor from the multimedia design negatively impacts perceived nonverbal immediacy.

Table 2

Nonverbal Immediacy Behaviors Index Measure of each Treatment Group

Treatment	<i>n</i>	Mean (SD)	95% Confidence Interval
Superimposed-Slides	40	4.37 (.46)	[4.17, 4.58]
Video-Switching	44	4.29 (.44)	[4.1, 4.49]
Instructor-Only	40	4.27 (.43)	[4.06, 4.48]
Dual-Windows	39	4.24 (.46)	[4.03, 4.45]
Slides-Only *	48	3.83 (1.12)	[3.65, 4.02]

Note. Nonverbal immediacy measured on a 1 to 7 scale, with 7 being the highest level of perceived nonverbal immediacy.

*Significant difference found between this treatment and the other four treatments, $p < .05$.

Research Question 4: General Immediacy

A one-way univariate Analysis of Variance (ANOVA) was conducted to determine the effect of the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) on the mean total scores of participants on the Anderson Perceived General Immediacy Scale. The superimposed-slides group perceived the general immediacy of the instructor highest, though the results were not statistically significant, $F(4,205) = .82$, $p = .51$. A MANOVA was also conducted on the nine individual items, though this analysis did not indicate significant differences between specific items in the construct, Wilks' Lambda = .81, $F(36,728) = 1.2$, $p = .2$.

Research Question 5: Instructor Evaluation Measure

A one-way Analysis of Variance (ANOVA) was conducted to determine the effect of the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) on the average score for each of the ten items of the Instructor Evaluation Measure. The only significant difference was found during the analysis of general student satisfaction, or desire to continue or drop the course.

Item 9 on the Instructor Evaluation Measure asked participants their willingness to continue the course in the treatment presented. An ANOVA analysis indicated that there was a significant difference between treatments on this instrument, $F(4,206) = 4.03$, $p < .01$. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the instructor-only treatment ($M = 4.35$, $SD = 2.04$) was significantly different than the dual-windows treatment ($M = 2.97$, $SD = 1.66$), the superimposed-slides treatment ($M = 3.0$, $SD = 1.55$), and the video-switching treatment ($M = 3.27$, $SD = 1.55$), see Table 3. These results indicate the participants in the instructor-only treatment group were the most unsatisfied with the presentation format and were the most willing to drop the course.

Table 3

Participant Desire to Continue the Course as Presented

Treatment	<i>n</i>	Mean (SD)	95% Confidence Interval
Instructor-Only *	40	4.35 (2.04)	[3.8, 4.9]
Slides-Only	48	3.44 (1.95)	[2.94, 3.94]
Video-Switching	44	3.27 (1.55)	[2.75, 3.8]
Superimposed-Slides	40	3.0 (1.55)	[2.45, 3.55]
Dual-Windows	39	2.97 (1.66)	[2.42, 3.53]

Note. Desire to continue the course on a 1 to 7 scale, with 7 being the highest desire to drop the course.

*Significant difference found between this treatment and the video-switching, superimposed-slides, and dual-windows, $p < .05$.

Research Question 6: Cognitive Load

A one-way Analysis of Variance (ANOVA) was conducted to determine the effect of the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) on the average score of each participant on the NASA Task Load Index (TLX). The analysis found no significant differences between treatment type and average TLX scores, $F(4,221) = .56$, $p = .69$.

A one-way Multivariate Analysis of Variance (MANOVA) was also conducted to determine the effect of the five types of multimedia designs (instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides) on the six items of the NASA TLX (mental demand, physical demand, pace, success, work, and stress). The analysis did not find significant differences between treatments and the NASA TLX items, Wilks' Lambda = .92, $F(24,810) = .82$, $p = .72$. The different treatment designs did not appear to have an impact on the participants' perception of task or cognitive load.

Demographic Findings

All participants were asked basic demographic information at the beginning of the experiment. This data was used to better understand the characteristics of the sample and the impact of these characteristics on the types of devices used, task and cognitive load, perceptions of credibility and immediacy, and learning effectiveness.

Device Type. Participants were able to self-select the Internet and video enabled device that they would use during the experiment; devices types were categorized as desktops or workstations, laptops, tablets, and phones. Of particular interest, device type did not impact perception of screen size, or Item 3 of the Instructor Evaluation Measure, $F(3, 207) = .919, p = .42$, mental effort, $F(3, 238) = 1.34, p = .26$, or the post-test, $F(3, 167) = 1.19, p = .32$. No significant differences were found when comparing device type in terms of this study's constructs.

Age. A series of one-way Analysis of Variances (ANOVA) was conducted to determine the effect of the three age categories (12-23, 24-30, and 30+) on the average score of each participant on the NASA TLX, survey results, and post-test results. A significant difference was found on the ANOVA conducted to compare age and post-test performance, $F(3, 167) = 3.87, p < .01$. A Tukey HSD follow-up analysis indicated that experienced students in the 24 to 30 year-old category ($M = 13.98, SD = 2.72$) outperformed the younger 17 to 23 year-old demographic ($M = 12.13, SD = 3.31$), see Table 4. This result could indicate that more experienced students with more developed study habits and internal motivations, would perform better in online classes than more traditional students with less developed study habits. No other significant differences were found when comparing age groups in terms of this study's other constructs.

Table 4

Participants Age Compared to Post-test Scores

Treatment	<i>n</i>	Mean (SD)	95% Confidence Interval
24 – 30 year olds *	45	13.98 (2.7)	[13.04, 14.91]
30+ year olds	34	13.59 (3.6)	[12.51, 14.66]
Unknown age	15	12.47 (2.62)	[10.85, 14.08]
17-23 year olds *	77	12.13 (3.31)	[11.42, 12.84]

Note. Post-test scores reflect the number of right answer out of 20 items.

* Significant difference found between these treatments, $p < .05$.

Gender. A series of one-way Analysis of Variances (ANOVA) was conducted to determine the effect of gender (female, male, and unknown) on the average score of each participant on the NASA TLX, survey results, and post-test results. No statistically significant differences were found when comparing the three gender categories in terms of this study's constructs.

Academic Experience. A series of one-way Analysis of Variances (ANOVA) were conducted to determine the effect of academic experience (freshmen/sophomore, junior/senior, and graduate students) on the average score of each participant on the NASA TLX, survey results, and post-test results. A significant difference was found when conducting the ANOVA comparing academic experience with post-test scores, $F(3,167) = 3.72, p < .05$. A Tukey HSD analysis further indicated that the group of graduate students ($M = 14.5, SD = 3.14$) performed better on the post-test than the junior/senior group ($M = 12.57, SD = 3.33$) and almost statistically higher than the freshman/sophomore group ($M = 12.44, SD = 2.72$), see Table 5.

These results could also indicate that more experienced students would perform better in online, video-based classes than less experienced students. No other significant differences were found when comparing academic experience in terms of this study's other constructs.

Table 5

Academic Experience Compared to Post-test Scores

Treatment	<i>n</i>	Mean (SD)	95% Confidence Interval
Graduate Students *	36	14.5 (3.14)	[13.46, 15.55]
Juniors & Seniors *	97	12.57 (3.33)	[11.93, 13.2]
Freshmen & Sophomores	27	12.44 (2.72)	[11.24, 13.65]
Unknown	11	12.27 (2.83)	[10.38, 14.16]

Note. Post-test scores reflect the number of right answer out of 20 items.

* Significant difference found between these treatments, $p < .05$.

Online Course Experience. A series of one-way Analysis of Variances (ANOVA) were conducted to determine the effect of experience taking an online course (no experience, 1 or 2 classes, 3 or 4 classes, 5 or 6 classes, and haven taken more than 7 classes) on the average score of each participant on the NASA TLX, survey results, and post-test results. Several patterns were possibly visible between experienced and inexperienced students. However, no statistically significant differences were found when using an ANOVA analysis to compare experience taking online courses to any of the measured constructs.

Online Video Watching Experience. A series of one-way Analysis of Variances (ANOVA) were conducted to determine the effect of experience watching online video (not

regularly watching video online, 1 or 2 hours per week, 3 or 4 hours per week, 5 or 6 hours per week, and viewing more than 7 hours of video online a week) on the average score of each participant on the NASA TLX, survey results, and post-test results. No statistically significant differences were found when using an ANOVA analysis to compare experience viewing online video to any of the measured constructs.

Chapter 6

Discussion

This chapter discusses the results of this experiment in terms a learner's perception of their online instructor and the courser's multimedia message design. The results of the data analysis are examined in the context of each research question. Guidelines for the use of multimedia design can be derived from the significant findings related to credibility, immediacy, student satisfaction, and student experience. The research questions whose analyses resulted in no significant differences are also valuable and will help inform future variations of this experiment.

Learning Effectiveness

While participants did appear to learn the subject matter when the post-test scores are compared to the pre-test scores, the learning achievements appeared similar across the five treatment groups. In terms of recall and comprehension, none of the multimedia presentations in this experiment improved learning as compared to the other presentations. The five treatments may have been too similar to result in learning effectiveness differences. Each treatment used the same high-definition 1080p resolution video of the instructor recorded in a broadcast quality production studio. The instructor's audio narration was recorded during the studio session with a professional microphone and mixer system. Presentation slides were also captured at a high-definition 1080p resolution, created using common best practices for the creation of slides, and the same slides were used in each of the four treatments that included slides. This ensured that the original source files were as high quality as possible. The result was five treatments that were identical aside from the use and arrangement of the instructional video and slide elements.

No significant differences in terms of learning effectiveness is a common finding in many previous research studies that investigated different media types (Joy & Garcia, 2000). These researchers conducted a thorough investigation of previous media comparison studies and revealed many instances where variables were not controlled or inconsistent during earlier studies. The current study differed from the classic media comparison studies in that the media, or what Gagne, Briggs, and Wager (1992) would describe as the vehicle for communication, is Internet streamed video and was a constant during the experiment. This experiment was a multimedia design or instructional methods experiment not a media or technology comparison.

This experiment also employed a thorough process to ensure that the pre-test and post-tests were as nearly identical as possible and as valid and reliable as possible. However, while the no significant difference finding was similar to the classic media comparison studies, this finding was instead possibly caused by the similarities in the multimedia presentations designs. One way to confirm this conclusion would be to conduct a future research project that would keep all the variables the same. However, this new study could include a new audio-only treatment, text-only treatment, and a treatment where there is more text on the slides and that text is more condensed. These new treatments should be different enough from the original five groups used in this study to register a learning effectiveness difference, and potentially confirm the equivalence of the original treatments.

Varying the multimedia designs further should better inform best practices. This conclusion is supported by previous research that found a multimedia design based on video performed better in terms of learning effectiveness when compared to an animated version and a static image version (Chen & Sun, 2012). The content (middle school earth science and physics) was kept the same in three treatments and each treatment was designed to minimize cognitive

load. Multiple choice pre-test and post-test scores found significant differences between these three designs, a strategy that can be replicated in future versions of this project.

The subject matter of the 20-minute history lecture used in this study does not lend itself well to learning assessment items beyond Bloom's original levels of knowledge, comprehension, and application (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Learning effectiveness differences in future, similar multimedia research studies could instead include items assessing higher order levels in Bloom's taxonomy such as analysis, synthesis, and evaluation questions in the pre-test and post-test. Mayer's research successfully used this approach by including a series of short problem-solving items at the end of the instruction (Mayer & Moreno, 1998, 1999, 2000, 2003; Sung & Mayer, 2013). Future research projects could use instructional content beyond historical subject matter to better foster the creation of problem-solving post-test items.

Instructors, instructional designers, and university administrators could take comfort knowing that classes that use the five different presentation styles in this experiment can each help instruct equally well if care is taken to focus on quality audio, video, and slide production. However, these findings are in the context of a 20-minute lecture and on recall and comprehension. Other results, and differences among the five designs, could occur if the length of the video lecture is varied and if the content better lends itself to problem-solving, content analysis, and subject matter synthesis.

Instructor Credibility

The second research question in this study used the McCroskey Source Credibility Measure to gauge each participant's perception of instructor credibility during the five treatments. This study found that participants in the dual-windows group perceived the instructor as more credible than the instructor-only group. While not quite statistically

significant, the other treatments that included slides also outperformed the instructor-only group in terms of perceived instructor credibility.

The use of presentation slides in general, and Microsoft's PowerPoint in particular, have become an essential communication tool in government, military, corporate, and academic environments (Knoblauch, 2013; Kosslyn, Kievit, Russell, & Shephard, 2012; Park & Feigenson, 2012). Students appear to want and expect some form of presented content during their classes (Levasseur & Sawyer, 2006). These researchers found that the type of content, PowerPoint slides, chalk and chalkboard, or overhead projector and transparencies, was less relevant than the presence of content in classroom environments. The use of graphics has also helped students connect with instructors (Cook, 2012). This author also found that students wanted additional slides, screen captures, and visual aids in their online classes. Students are accustomed to seeing slides, or some form of visual content, besides the instructor's 'talking head' in their classes.

A particularly interesting study found that more complex presentation slides were perceived as more credible than less complex text-based slides (Guadagno, Muscanell, Sundie, Hardison, & Cialdini, 2013). In this study complex animated slides and charts influenced sports analytics subject matter novices as well as experts. Participants perceived the presenter in the complex slide treatment as more credible as compared to presenters using hardcopy handouts or text-based slides. This finding could be counterintuitive when considering cognitive load theory, but would make sense if a certain level of intrinsic cognitive load is needed to maximize the commitment of germane resources and learning effectiveness. Similar results were found in a judicial context. Viewers of law arguments found the lawyers who used slides more credible and more persuasive than lawyers who made similar arguments without the aid of presentational content (Park & Feigenson, 2012). An analysis of technical conference presentations also

supports the view that well designed presentation slides will enhance the perceived credibility of presenters (Garrett, 2012). This author found that audiences generally prefer simpler slides, with authentic pictures as opposed to complex slides with clip-art. Presentation slides are most effective when they present a clear message, when they are uncluttered, with appropriate font sizes and colors, and with the appropriate use of color (Kosslyn et al., 2012).

The common thread throughout these studies is the expectation students have for visual content in classes, and the positive impact on perceived credibility that well designed slides could have on an audience. The results of the instructor-only treatment group support these findings, especially as compared to the versions with slides such as the dual-windows design. Participants expected slides; without slides the learners felt that something was missing, and that missing component of the video appeared to lower the perceived credibility of the instructor.

Nonverbal Immediacy

An important conclusion of this five-treatment experiment is the need to include and show the instructor in video created for online students to create immediacy and motivate learners. The third research question in this study used the Nonverbal Immediacy Behaviors Index to measure participants' perception of the instructor's nonverbal immediacy during the five treatments. This study found that participants in the slides-only group perceived the instructor as the least immediate as compared to the other groups. The students in the slides-only group could hear but could not see the instructor and so did not benefit from nonverbal communication cues.

Enhanced immediacy and motivation should lead to learning effectiveness. McCroskey's research helped establish the positive correlation between the immediacy perceived by learners and learning effectiveness (Thomas, Richmond, & McCroskey, 1994). Students respond better

in learning situations when they have a positive perception of their teacher. These results are consistent with other research findings that found that the design of online courses could foster immediacy and lead to enhanced motivation and learning effectiveness (Frisby, Limperos, Racord, Downs, & Kersmar, 2013). The findings of immediacy studies based in classroom environments should also apply in online environments. Video in online courses can potentially communicate nonverbal immediacy just as face-to-face environments (Borup, West, & Graham, 2012). This study found that facial expressions communicated in online environments lead to perceptions of energy and happiness, and too little social presence negatively impacts communication. Students have a strong desire for social presence, interaction, feedback, audio, and immediacy (Murphey, Arnold, Foster, & Degenhart, 2012). The inclusion of the instructor in online video should lead to enhanced immediacy and ultimately improve learning effectiveness.

Recent research on best practices for the use of video in Massive Open Online Courses (MOOCs) suggests that immediacy is enhanced by short videos that typically show the instructor for 80% of that video (da Silva, Santos, Costa, & Viana, 2016). Interestingly, these same best practices suggest that the most effective MOOCs show slide content for 90% of the duration of a video module used in that MOOC, necessitating a blend of both instructor video and content as seen in the present study. MOOCs with video, especially videos that show the instructor, are viewed as more engaging by students (Diwanji, Simon, Marki, Korkut, & Dornberger, 2014). Production quality and the instructor's use of wit and humor also help communicate humanistic immediacy in online classes. These are important factors to consider as social interaction and presence may have a significant role in enhancing the motivation to learn (Gergenfurtner & Vauras, 2012). Video can also provide instructional support for different learning preferences

(Tait, 2014). Visual and auditory preferring students should find the inclusion of video engaging in a way text only online content would not.

Online video can extend the perception of immediacy from instructor to students, as well as from students to instructors. Using asynchronous online video feedback helps establish relationships and motivate students (Griffiths & Graham, 2010). These researchers also found that instructors were more able to accurately observe the learning and motivation of their students when the students provided video feedback to the instructor. Nonverbal communication cues can lead to a learner's positive or negative perception of the instructor and a positive relation should increase motivation and enhance learning. This finding is echoed in another large research review that found production quality, and including not just slides but the instructor as well, should positively impact student engagement in the course (Guo, Kim, & Rubin, 2014). Online students want to make a connection with a human and immediacy is created when they can put a face on their instructor.

General Immediacy

The fourth research question in this study used the Anderson Perceived General Immediacy Scale to gauge each participant's perception of the instructor's overall immediacy during the five treatments. This study did not find a statistically significant difference between the groups; it appeared that the participants in each treatment similarly perceived the general immediacy of the instructor. Though as brought up by several participant comments, students may be better able to gauge the general immediacy of the instructor if they spend more than 20-minutes in the course. The more time spent with the instructor, the more students may be able to distinguish or determine the immediacy of the instructor (Hart, 2012). Longer studies are needed to better understand the impact of immediacy in online environments and links to learning

effectiveness (Frisby et al., 2013). Replicating this study with a much longer instructional video presentation, or a series of short presentations as part of a longer treatment, could better show general immediacy differences between the treatments.

Both instruments are designed to measure the construct of teacher or instructor immediacy, however, one takes a more direct approach. The Nonverbal Immediacy Behaviors Index used in the third research question includes items that specifically ask for the learner's perception of the instructor's gestures, tone of voice, and eye-contact. The Anderson Perceived General Immediacy Scale used in the fourth research question includes multiple items that more indirectly asks the learner for their opinion of the instructor's immediacy. The instrument first asks the participant to read a short definition of immediacy. Specifically, immediacy is defined as the idea that a person is friendly or warm based on eye-contact, smiling, body movement and gestures, how relaxed they are, and their vocal expressions.

Both instruments are similar, though the items in the Nonverbal Immediacy are more direct, while the items in the General Immediacy instrument are more indirect and require the participant to first read the presented definition of immediacy. This more indirect approach of the General Immediacy scale could have lead to the lack of variation in the treatment results. Participants may have had a hard time interpreting the items, or may not have had enough visual or auditory information from the videos to make conclusions. This lack of clear direction could be especially true if participants did not take the time to read the given instructions for this portion of the survey and skipped over the given definition of immediacy. Not having a baseline definition of immediacy could lead to the middle of the Likert scale responses, and thus no statistically significant differences between treatments on this instrument. It may be beneficial to

shorten the overall survey and only use the more direct items of the Nonverbal Immediacy Behaviors Index in future research studies.

Instructor Evaluation Measure

The fifth research question in this study used the ten items of the Instructor Evaluation Measure to gauge the participant's perception of the learning environment design during the five treatments. This study did not find a statistically significant difference between the treatment groups on nine out of ten independent items. However, the study did find a difference when participants were asked if they would continue in the course as it was presented in their treatment. The participants in the instructor-only group reported that they would be the most likely to drop the course, possibly indicating the desire for other visual content in the course other than the instructor. This finding is similar to the credibility findings of the treatment groups. The instructor-only group was the only treatment without slides, and was viewed as the least credible. Students are accustomed to seeing presentation content during class (Levasseur & Sawyer, 2006). Online students not seeing content could have a negative impact on their willingness to continue the course as presented.

Student satisfaction is an important critical pillar of a quality distance learning program (Moore, 2002). This Instructor Evaluation Measure item asks the learners for their satisfaction with the design of the course, which would have an influence on retention; a course design that negatively impacts retention should be avoided. This student satisfaction finding also suggests that students prefer slides to be part of the video presentation.

Cognitive Load

The sixth research question in this study used the NASA Task Load Index (TLX) to measure participants' perception of task and cognitive load during the five treatments. The study

did not find a statistically significant difference among the treatments groups when measuring cognitive load. The five different multimedia designs appeared to be equivalent in terms of low overall cognitive, physical, and emotional demand. The inclusion of the instructor video in various ways and the simplistic design of the presentation slides appeared to minimize cognitive load as measured by the NASA TLX. However, these results are in terms of a 20-minute, well-produced video and audio, with high quality post-production, and possibly a subject matter with inherently low intrinsic cognitive load.

Another constant variable in this study was the design of the video player interface, which is designed to be simple, uncluttered, and reduce extraneous cognitive load. This is the same video player interface used by distance learning students at the host university to play video archives and recordings of web conference classes, events, and seminars. Other research has also shown that the simplest video interface designs tend to be the most effective in terms of reducing cognitive load (Reiss, 2007). The results of these five treatments lend support to the design effectiveness of the video player interface used by the host university. The current player does not appear to add substantial extraneous cognitive load in the context of this experiment.

Using different subject matter and increasing the intrinsic cognitive load during the presentation may confirm the results of this study. For instance, previous research teaching mathematics problem solving with text and animation treatments and the NASA TLX resulted in significant differences (Rey & Buchwald, 2011). These researchers found that cognitive load during treatments measured significant differences, to the point that some expert learners experienced cognitive overload. The problem-solving content appeared to be higher in intrinsic cognitive load than the fact-based history subject matter used in this study.

The extraneous and intrinsic cognitive load experienced by participants in this experiment may have been too low to be distinguished by the NASA TLX and lead to the no significant differences result. Previous research has shown that providing more relevant, intrinsic information using color photographs compared to drawings and black and white variations resulted in greater content recall (Berry, 1991). Other researchers have found that lowering overall cognitive load may not improve learning performance, rather finding an efficient balance between intrinsic load and applied germane resources may be more effective (Reid, 2013; Sliva, 2013). These studies suggest that lowering cognitive load as much as possible, or over simplifying the presentation designs, could leave cognitive resources idle and negatively impact learning. Similar results were encountered in a recent study in a multifaceted business analysis context. Researchers found during an experiment with three versions of a business strategies presentation, that the version with the most graphics was viewed as the most popular (Kernbach, Eppler, & Bresciani, 2015). Learners not only preferred the more complex version, but also recalled more about the presentation. Increasing relevant intrinsic cognitive load by varying the multimedia design or using different, more complex subject matter may also show learning effectiveness results in future studies.

Previous researchers have used biometrics to measure anxiety, emotion, and stress (Chen & Sun, 2012). This study used a more objective and direct heart rate sensor system to measure stress, rather than the more subjective and indirect NASA TLX that is based on self-reporting. In addition to non-obtrusive heart-rate monitors, future research can also employ brainwave or eye-motion sensors to also measure stress and cognitive load (Haapalainen, Kim, Forlizzi, & Dey, 2010; Johnson & Mayer, 2012). A future direction for another follow-up research study could be

to repeat this project using the same content and procedures and use psychophysical instruments in addition to the NASA TLX.

Device Type

A concern during this study was whether the device chosen and used by each participant during the experiment would introduce a new, confounding variable. However, the results of each research question were consistent and appeared to be independent of the device used by students during the treatments. The learning effectiveness pre-test and post-test, surveys, and NASA TLX responses were indistinguishable when participants used workstation or desktop computers, laptop computers, tablets, or smart phones.

Device type, and screen size, did not appear to impact recall, comprehension, credibility, immediacy, or cognitive load. These findings are consistent with the philosophy that the design of instruction is more important than the media, medium, or technology used to transmit or receive that instruction (Clark & Felton, 2005, 2014; Sung & Mayer, 2013). Media and technology are the vehicles for instructional methods, and as technology advances different delivery methods can become possible or more efficient (Brannan & Baker, 2013). Rather than compare one technology to another, a more productive endeavor would be to look for the most effective combination of pedagogical practices, and confirm in what environments, and for what learners, those practices will produce the best results (Joy & Garcia, 2000). Future research should continue to expand the combinations of visual presentations and video window arrangements to find the best applications for the most appropriate contexts.

Age and Academic Experience

An objective of this study was to include a representative sample of the host university's student population by including both traditional as well as adult learners. An authentic sample

set would help maintain the generalizability of any experimental findings. Previous studies focused on younger, traditional college students (Mayer & Anderson, 1991, 1992; Mayer & Moreno, 1998, 1999, 2000, 2003; Sung & Mayer, 2013). The present multimedia study and experiment found that older students in the 23 to 30 year-old demographic performed better on the post-test than the younger students in the 17 to 23 year-old demographic. A pattern was also visible when comparing the 30+ age group to the younger participants where the experience of students appeared to impact learning effectiveness.

Similar to the age comparison, academic experience also appeared to impact learning effectiveness. The graduate students in the study appeared to statistically outperform the undergraduate junior and senior participants, and almost statistically outperformed the freshmen and sophomore participants. This result could further support a conclusion that students with more developed study habits and internal motivations could perform better in video-based online classes. This result could also support the need to enhance student support systems for younger or less experienced students who take video-based online classes to help them be successful.

These two constructs from the demographics data collection provided similar insight; mature students bring their experience to their online classes. Older students, or adult learners, tend to have a different inherent level of perseverance and drive to obtain their learning objectives. In a large study with a very diverse sample, ‘perseverance and passion for long-term goals’, or grit, increases nearly linearly with age and experience (Duckworth, Peterson, Matthews, & Kelly, 2007; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). The older and more experienced an adult learner, the more determined they are to accomplish their learning goals. This linear relationship is also supported when the Duckworth, Peterson, Matthews, and Kelly (2007) study compared undergraduate and graduate learners. The more experienced

graduate students responded with higher levels of determination than the undergraduate students. More experienced students will have more developed study habits, academic expectations, motivations, could have taken the experiment more seriously, and could have extended their study habits to the learning activity in this experiment.

Self-motivation is especially important for isolated, online students (Mandernach, Donnelly, & Dailey-Herbert, 2006). Younger students may not yet have this inherent self-motivation. Newer students, or students without academic experience, may need additional supports (Cochran, Campbell, Baker, & Leeds, 2013). Freshman and sophomore students, in particular, would benefit from additional institution supports and learner support policies to help them gain academic experience and increase retention. Younger and less experienced students are the most likely to drop out of online programs (Hart, 2012). The author of this literature review also acknowledges the need to provide technology support for online learners as they continue to gain experience. These results support the findings that older and more experienced students may tend to outperform younger less experienced, possibly less motivated students.

Student support is a critical aspect of online learning systems. Students with less experience are more likely to drop out of online programs (Hart, 2012). The more classes a student takes, the more probable they are to continue on to graduation. One way to foster this familiarity for learners early in their academic careers could be to build prerequisite tutorials or online introduction seminars that the students experience first before they take their online classes. Future multimedia learning research studies should continue to include a diverse age and experience sample to better learn how to support all students.

Other Findings

Potential data collection errors were averted by the use of completion times to define valid NASA TLX, survey, and post-test responses. For instance, one means for an unethical participant to attempt to receive multiple gift card incentives would be to clear the history of their web browser, or use a different web browser application on their device. The previous participant can then retake the post-test and request another gift card with a different email address. Students rapidly completing the pre-test, survey, and post-test multiple times to get to the gift card request at the end would bias the research with purposeful erroneous entries. The researchers witnessed several of these attempts.

Research data were collected separately from email addresses. Email addresses were only requested to send students their gift card incentives, as such there was no way to tie duplicate gift card requests to duplicate pre-test, survey, and post-test entries. Also, multiple roommates sharing a residential Internet connection could have different internal IP addresses on their different devices internal to their residential network. However, they all could be sharing the common IP address assigned to their residence by their Internet Service Provider. The online survey service used in this study would record the same Internet Service Provider IP address multiple times as multiple participants sharing the same residential network legitimately participated in the study. As such, using only data collected from unique IP addresses would filter out participants biasing the study with multiple responses, but would also filter out legitimate entries from participants sharing a residential Internet Service Provider. Instead of filtering by IP address, this study filtered data by completion times. Legitimate NASA TLX, survey, and post-test entries would show completion times much longer than participants who quickly answered the instruments to skip to the gift card request page. Using data collected only

from students who spent more time on each instrument than the lowest 10th percentile of responses should have eliminated entries from participants who responded more than once.

Another possible data entry error could have occurred when the online survey service stopped taking survey entries beyond the 200th response. The error was found and corrected only after several students attempting to participate contacted the researcher. The research study collected data for approximately three weeks; the primary data collection system was down for only several hours during this collection period. However, some data collection opportunities could have been missed during this brief outage.

The researchers had configured a backup data collection system and this system was used as the error in the primary data collection process was being resolved. The backup system did not use the host university's student authentication process and was compromised by an external entity. The unknown external entity also wanted the researchers to send them multiple gift cards. This security compromise occurred after the error in the primary system was resolved and the primary system brought back online. Data entries on the secondary system collected after the security breach were discarded and are not part of the data analysis.

There are many ways to design an online course, with many ways to integrate video. There are also numerous online course designs that use very little beyond text and slides. As such, asking participants for their experience taking online classes may not have been specific enough to create an independent variable that could be statistically compared to the dependent variables in the research questions. A more relevant demographic question would have asked about experience taking online classes that included a substantial use of video.

The over-all length of the experiment and the relative value of the gift card incentive may have negatively impacted the response rate in this study. Of the 450 participants who started,

226 completed the NASA TLX, 211 completed the survey, and only 171 completed the post-test. The length or number of instruments included after the video could be reduced to potentially increase the completion rate during future experiments. Decreasing the number of items in the pre-test and post-test would negatively impact validity and reliability of the achievement instruments. The NASA TLX can be successfully completed in a short amount of time. A more effective option to reduce the time spent in the experiment could be to only use the NASA TLX, Source Credibility instrument, Nonverbal Immediacy Behaviors Index, and the post-test. The more indirect Perceived General Immediacy Scale and the more traditional classroom based Instructor Evaluation Measure could be excluded in favor of reducing the time commitment needed to be made by participants. This would reduce the number of items in the survey from 49 to 30 and could positively influence or at least maintain the enthusiasm to continue and complete the post-test. Reducing the number of instruments used in future studies would be a compromise, though the result could be an increased response rate. Another option could be to increase the incentive, and increase the budgets of future research projects.

Keeping participants' email addresses temporarily associated with their responses could better prevent participants from trying to submit multiple responses to receive multiple gift-cards. This concern was not an issue when the research was confined to a physical classroom or conference room environment, though the anonymous nature of the Internet appears to increase the likelihood of unethical behavior. This unethical behavior was especially apparent when the experiment's backup website was compromised by someone seeking many multiple gift cards. Extreme care would have to be taken in future studies to encrypt participant data and delete collected email addresses after the completion of those projects. Assigning a unique identifier for each participant would also resolve situations where the participants move between different

wireless networks. A unique participant identifier would provide a means to re-associate demographics, pre-test, TLX, survey, and post-test responses back to a user even when that user changes IP addresses when they transition between networks.

Chapter 7

Conclusions

There are several conclusions and best practice guidelines that can be proposed from this experimental research study. The first is that instructional designers should plan to show both the instructor and presentation content to online learners to maximize both instructor credibility and instructor immediacy. Secondly, by investing in quality audio, video, and content production, all five multimedia design types can be effective in terms of content recall and comprehension in 20-minute segments. A third best practice consideration is for institutions and distance learning programs to focus on the continued development of support strategies for inexperienced online learners. The results of this experiment can also serve as the baseline and foundation for a variety of future derivative research studies in applied multimedia learning theory. Finally, the design of the instruction and of the multimedia presentation is more important than the devices used to receive that presentation.

This project was not a media comparison study; the media or the delivery of video via the Internet to mobile devices was a constant. Also, specific devices were not being directly compared to each other, and an online version of the instruction was not being compared to a face-to-face traditional version. Rather, the goal of this project was to look for and create evidence-based, best practices when designing multimedia presentations for online courses. This study compared instructional message design practices using audio, video, and presentation slides. Students appeared to learn equally and successfully well in all five treatments, leading to no significant statistical differences in this study. However, a number of modifications can be made to this study's research design to guide future studies. For instance, several potential future experiments could build upon the initial findings established by this study and vary the

text density on the slides, vary the presence of audio, vary the inclusion of text and graphics, use different subject matter, increase the duration of the instruction, and redesign the pre-test and post-test. However, instructional designers can take some degree of comfort knowing that choosing one of the five designs in this study should not negatively impact learners. As long as the audio and video quality are maximized and the slides are not designed to be overly complex, instructor-only, slides-only, video-switching, dual-windows, and superimposed-slides designs can all be effective design layouts.

Another best practice illustrated by this research is the need to show and balance both presentation slides and the video of the instructor. Well designed presentation slides may enhance the perceived credibility of the instructor, and students may pay better attention to an instructor they perceive as being credible. However, not being able to see the instructor appears to negatively impact the student's sense of immediacy with the instructor. A multimedia design that includes both slide content and instructor video could also balance the perception of credibility with perceptions of instructor immediacy. A complementary blend of the human instructor and the graphics, animation, or textual visual content with quality narration can create an online learning environment that engages the learners. Investments in production quality also help communicate and replicate the immediacy of face-to-face classrooms in online video environments. Online learning can be very impersonal, though well-crafted video can foster both instructor credibility and immediacy, adding a personal touch to what would otherwise be an impersonal environment.

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Appendix A

Pilot Study and Assessment Items

A pilot study with two treatment groups was used to confirm the reliability of the recall and comprehension learning effectiveness assessment items before using a subset of those items in the experiment's pre-test and post-test. The pilot test volunteers were invited to participate with a message sent to staff in two large university administrative departments and several classes of Communications 101. Before taking the pilot post-test, volunteers in these two groups first viewed one of two multimedia designs. One pilot group viewed the instructor-only version of the multimedia design and the second pilot group viewed the superimposed-slides version. This strategy tested the design that was most effective in the previous Morrison et al. (2013) research study, as well as tested the newest of the five designs. Both pilot treatments occurred simultaneously, and so the pilot process also tested the survey website's technical ability to randomly assign participants into each of the two groups. All participants were offered their choice of an optional \$5 Starbucks or \$5 Amazon electronic gift card for their participation. Figure A1 illustrates the participant procedures during the pilot test.

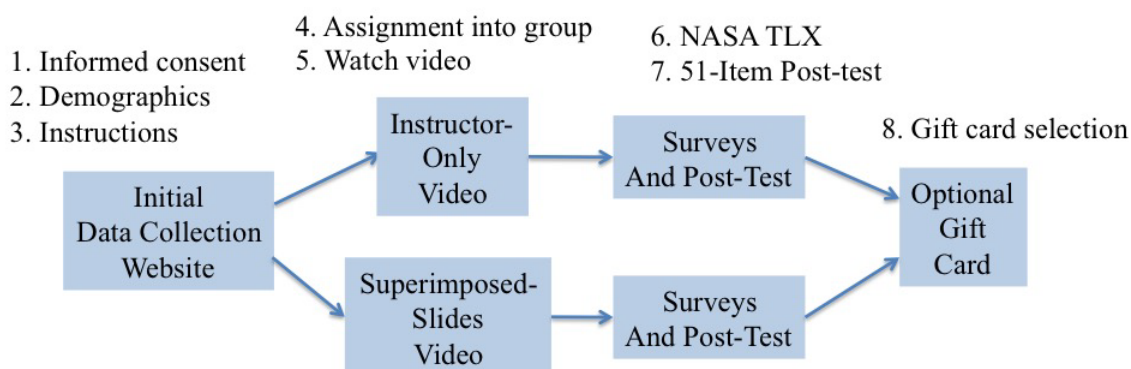


Figure A1. Pilot test procedures. Pilot test participants were randomly assigned into one of two

treatments, viewed their assigned video, took the NASA TLX and post-test, then selected their gift card option.

The pilot studies used the below 51 items to confirm which 20 items were used in the experiment trials as the pre-test and as the post-test. The bolded answer options indicate the best answer for each item. While only 40 items were needed, additional questions were included to create enough items for the pre-test and post-test. Several of these items were revised versions of the pre-test and post-test items used in Morrison et al. (2013). However, all items now included five plausible answer options as opposed to three to add variance and increase the standard deviation of each item.

The pilot study included 39 volunteers, 51% female and 41% male, with average age of 37.9. Half of the participants reported having experience with an online class (50.85%), and almost half (47.46%) reported having above average or expert level experience with information technology. The 51 items in the pilot post-test were analyzed and items with a difficulty between .50 and .70 and with a discrimination above .30 were identified. Items with a difficulty above .70 and below .50, and items with a discrimination below .30, were revised in an effort to remove ambiguity and bias.

Twenty items from this item pool were used in the experimental pre-test and another 20 were used items in the experimental post-test. Items were arranged to equally distribute item types and content areas (see Appendix G). This item distribution strategy resulted in a 20-item pre-test with a KR-20 alpha of .75, and a 20-item post-test with a KR-20 alpha of .77, indicating an acceptable level of internal consistency and reliability. There was also no significant difference between the pilot test scores of the derived experimental pre-test ($M = .67$, $SD = .12$)

and the pilot test derived post-test ($M = .65$, $SD = .12$), with $t(38) = .35$, $p = .72$. The Kuder-Richardson Formula 20 calculations as well as the t-test helped confirm that the experimental pre-test and post-test were made to be as equivalent as possible.

The following pool of items were used in the pilot post-test, a subset of these items were used in the experimental pre-test and post-test, bold item options indicate the acceptable correct response. Each item when presented online also included a write-in text field for comments, participants could use this area to comment on items, options, and answers that they disagreed with. The 51 items were presented online in a random order for each participant, the order of answer options in each question was also randomized for each participant. In items that included “none of the above” or “all of the above” as answer options, these options always appeared as option “e”.

- 1) Which of these is *not* a social networking technology or system?
 - a) The radio
 - b) Facebook
 - c) **Google**
 - d) The television
 - e) Cell phones
- 2) What previous network did the Internet *directly* develop from?
 - a) America Online or AOL
 - b) **The ARPANET**
 - c) AT&T's Long Distance Telephone Network
 - d) Telephone networks
 - e) Telegraph networks
- 3) What is a many to many communication model? When many people can:
 - a) send messages to others on the Internet
 - b) **send and receive messages from each other**
 - c) receive electronic messages from others
 - d) transmit electronic messages from others
 - e) play an uploaded video file
- 4) The completion of a global network was first implemented for use by what system?

- a) The Internet
 - b) Analog Telephone
 - c) Telegraph**
 - d) Satellites
 - e) Digital Telephone
- 5) What was one of the first real time social networking technologies?
- a) The radio
 - b) The television**
 - c) The Pony Express
 - d) Telegram deliveries
 - e) **The telephone**
- 6) The launch of Sputnik would lead to what major networking development?
- a) The telephone
 - b) The ARPANET**
 - c) The television
 - d) The telegraph
 - e) CELLULAR telephones
- 7) The development of affordable personal computers directly lead to what networking system?
- a) The Internet**
 - b) The ARPANET
 - c) High speed mainframes
 - d) The original electronic bulletin boards
 - e) Supercomputers
- 8) Which of these was the earliest form of one-to-many mass communication?
- a) The radio
 - b) The printing press**
 - c) The television
 - d) Email
 - e) Electronic bulletin boards
- 9) Which of these was the first modern social networking Internet site?
- a) Facebook.com
 - b) Friendster.com
 - c) TheFacebook.com
 - d) SixDegrees.com**
 - e) The Harvard Dorm Bulletin Board
- 10) The launch of the Soviet Union's Sputnik satellite would eventually lead to what major modern social media and networking development?
- a) The Internet
 - b) The ARPANET**
 - c) The digital telephone network

- d) The NSFNET
 - e) The DARPA NET
- 11) The telephone for the first time allowed for what type of communication between callers?
- a) Communication over great distance
 - b) Satellite communication
 - c) Wireless communication
 - d) Two-way communication**
 - e) Transcontinental communication
- 12) Advances in telegraph technology directly lead to what modern technology?
- a) The television
 - b) The cell phone
 - c) Satellite broadcasts
 - d) The Internet**
 - e) **The telephone**
- 13) What aspects of electronic bulletin boards were integrated into modern social networking sites?
- a) Posting of audio and video
 - b) Creating personal profiles
 - c) Reading messages from other users**
 - d) Real-time communications with text messages
 - e) Real-time communication with threaded discussions
- 14) The completion of a global network was first implemented for use by what social networking technology?
- a) The Internet
 - b) The telegraph**
 - c) The telephone
 - d) Satellites
 - e) The radio
- 15) The development of affordable personal computers in the 1990's lead to the rapid growth of what networking system?
- a) The Internet**
 - b) Electronic Bulletin Boards
 - c) The NSFNET
 - d) The ARPANET
 - e) Myspace.com
- 16) Which of these is not specifically a social networking technology?
- a) The telegraph
 - b) Mobile cell and smart phones
 - c) Amazon**
 - d) The printing press

- e) The Pony Express
- 17) The first electronic bulletin boards used what technology to connect users?
- a) **Telephone networks**
 - b) The Internet
 - c) The ARPANET
 - d) Telegraph networks
 - e) Wall mounted touchscreens
- 18) Telephone technology added two-way communication to what earlier network?
- a) The Internet
 - b) The ARPANET
 - c) **The Telegraph**
 - d) The NSFNET
 - e) Wireless radio
- 19) Modern social networking sites evolved in part from what previous service?
- a) Smart phones
 - b) Cell phones
 - c) **Electronic bulletin boards**
 - d) The United States Postal Service
 - e) Email
- 20) What is *not* an example of a many-to-many communication model?
- a) Web conferencing in teams
 - b) Telephone conference calls
 - c) Classroom video conferencing
 - d) Online threaded discussions
 - e) **An email sent to a group list**
- 21) What is an example of a one-to-many communications model?
- a) Web conferencing in small groups
 - b) Virtual office hours
 - c) **A posted YouTube video**
 - d) A telephone call
 - e) Online threaded discussions
- 22) What is an example of a one-to-one communications model?
- a) Newspapers
 - b) The television
 - c) The radio
 - d) The printing press
 - e) **The telegraph**
- 23) What was the first one-to-many communications technology to be widely adopted by most families in the United States?

- a) The telegraph
 - b) The telephone
 - c) The television
 - d) The radio**
 - e) The personal computer
- 24) What was the purpose of The U.S. Advanced Research Projects Agency
- a) To design social networking media and technology
 - b) To create, promote, and plan research and development projects**
 - c) To research social networking media and technology
 - d) To create reliable network designs
 - e) To reduce the costs of personal computers and bandwidth
- 25) The network that would evolve into the Internet was designed to...
- a) replace the telephone as the primary social networking technology
 - b) connect and share computer processing resources**
 - c) reduce the costs of mobile communications and bandwidth
 - d) create a platform for social media applications
 - e) utilize telephone lines for the transmission of digital signals
- 26) The ARPANET was first used to...
- a) connect computers at research institutions.**
 - b) connect U.S. department of defense agencies.
 - c) establish large pools of data storage.
 - d) connect large bulletin board systems.
 - e) replace Telenet as a public data sharing network.
- 27) Email was first used...
- a) by research institutions to contact and communication with graduate students.
 - b) by lead research scientist to communicate with government agencies.
 - c) by students creating social networking email groups in their dorms.
 - d) by marketing agencies as they first began to adopt the Internet.**
 - e) by mainframe programmers to leave messages for each other.**
- 28) What was one of the first applications to run on the ARPANET?
- a) An inventory database
 - b) Electronic mail**
 - c) Electronic bulletin boards
 - d) An Internet search engine
 - e) The World Wide Web
- 29) What was one of the first uses of email as a one-to-one communication method?
- a) Families could communicate with each other over long distances
 - b) Project managers could communicate with their entire mainframe staff
 - c) Programmers working different shifts could communicate with each other**
 - d) Early social media sites could offer communication services to its subscribers

- e) Social networking providers could establish early email groups
- 30) Early electronic bulletin boards allowed a user to post messages for others, this is an example of what kind of communication model?
- a) One-to-one
 - b) Many-to-one
 - c) Many-to-many
 - d) One-to-many**
 - e) none of the above
- 31) The first bulletin boards used what kind which technology to connect users?
- a) Internet Protocols
 - b) Telephone lines and modems**
 - c) Satellite downlinks
 - d) Wireless radio
 - e) Cable television modems
- 32) The first electronic bulletin boards represent what major point in social networking history?
- a) Mobile devices were not bale to connect to social media sites
 - b) Mainframe users were now able to post messages for each other
 - c) General computer users were able to interact with each other**
 - d) Threaded discussion were now possible on the World Wide Web
 - e) Discussions were now available on the Internet
- 33) Sixdegrees.com represents what major point in social networking history?
- a) It still holds the official record as the largest social media website
 - b) It used a client and mainframe model to allow users to post messages
 - c) It used a client and server model to allow users to post messages
 - d) It was the first social media website developed without investor funding**
 - e) It used the Internet to provide many function of bulletin boards**
- 34) Sixdegrees.com introduced what characteristics of modern social media and networking sites
- a) The creation and searching of user profiles**
 - b) The encryption of user profiles
 - c) The user's ability to upload and post video
 - d) The user's ability to connect from cell phones
 - e) World-wide access to user messages
- 35) In the history of social networking, which was the earliest online social networking site?
- a) TheFacebook
 - b) MySpace
 - c) SixDegrees**
 - d) Friendster
 - e) America Online
- 36) MySpace's initial rapid growth can be attributed to what strategies?

- a) **Flexibility and good marketing**
 - b) Very strong external investor support
 - c) Low prices
 - d) A one-to-one social networking design
 - e) Good technical support
- 37) What was some of the reasons for MySpace's eventual decline?
- a) Not providing enough technical support
 - b) Loosing its corporate funding sources
 - c) **Too much reliance on advertising income and lack of flexibility**
 - d) No longer focusing on marketing and public relations
 - e) Not becoming accessible on mobile devices
- 38) Today's version of MySpace had been redesigned to focus on what?
- a) **Music and entertainment**
 - b) Users selling items and services
 - c) Social gaming
 - d) Video content upload and playback
 - e) Support for mobile devices and apps
- 39) At first Facebook's membership was restricted to what audience?
- a) **Colleges students**
 - b) Computer science majors
 - c) Only members over 18 years old
 - d) Stanford and Yale students in dorms
 - e) IT graduate students
- 40) Facebook's rapid growth was initiated by?
- a) Corporate sponsors
 - b) **College and high school student membership**
 - c) Marketing campaigns and party promoters
 - d) Google advertising income
 - e) Musicians and entertainers
- 41) Which social networking site was the first to add a "like" and "dislike" option?
- a) SixDegrees
 - b) Friendster
 - c) MySpace
 - d) **Facebook**
 - e) Twitter
- 42) Today's Internet connected smartphones allow for what model of communication?
- a) One-to-one
 - b) One-to-many
 - c) Many-to-one
 - d) **Many-to-many**

e) **All of the above**

43) Today's workstations, laptops, and tablets allow for what model of communication?

- a) Many-to-many
- b) Many-to-one
- c) One-to-many
- d) One-to-one
- e) **All of the above**

44) Twitter uses what blended communication models?

- a) One-to-one email
- b) Many-to-one voicemail
- c) An electronic version of one-to-one telegraphs
- d) **One-to-many text messages**
- e) None of the above

45) What is Twitter's specific contribution to the history of social networking?

- a) **It focused on real-time, one-to-many communication with mobile devices**
- b) It focused on a faster approach to send very long emails
- c) It was the first social networking site to allow for the creating of profiles
- d) It created a digital version of one-to-one telegraphs
- e) None of the above

46) Which of these are *not* a specific example of a social networking technology?

- a) Email
- b) Electronic Bulletin Boards
- c) The Telegraph
- d) The Telephone
- e) **The Internet**

47) Which is an early example of one-to-many communication models?

- a) Analog cell phones
- b) **The printing press**
- c) Analog telephones
- d) Digital telegraphs
- e) None of the above

48) YouTube allows individuals to upload or post online videos that can be viewed by numerous other users, this is an example of what communication model?

- a) Many-to-one
- b) Many-to-many
- c) **One-to-many**
- d) One-to-one
- e) All of the above

- 49) Many news websites allow readers to post and comment on news stories or articles, any other registered visitor can read and reply back to these comments, other visitors can then reply back to this reply, this is an example of what communication model?
- a) One-to-many
 - b) Many-to-one
 - c) **Many-to-many**
 - d) One-to-one
 - e) All of the above
- 50) Newspaper companies allowed a single agency to consolidate news and information and then reach many readers with an early morning and a later afternoon edition of their newspaper, this was an example of what communication model?
- a) Many-to-one
 - b) Many-to-many
 - c) One-to-one
 - d) **One-to-many**
 - e) None of the above
- 51) A Teleprinter or Teletype used telegraph lines to connect operators who could type, transmit, and receive messages from each other, an early application was the connection of an operator station in Philadelphia connected to another operator station in New York, this was an example of what communication model?
- a) One-to-many
 - b) Many-to-one
 - c) Many-to-many
 - d) **One-to-one**
 - e) None of the above

Appendix B

The Simplified NASA Task Load Index (TLX)

This instrument uses six items on a 0 = low to 10 = high scale, subscales include mental effort, mental demand, temporal demand, performance, effort, and frustration in 11 gradations on these scales. The scale has been simplified from 0 through 100 to 0 through 10 to meet the logistic needs of the study and capabilities of the online survey service.

“Instructions: On a scale from 0 (low) to 10 (high), how much effort do you think was required to learn from this video presentation? Please select a response between 0 and 10.”

1) How mentally demanding was the task?

Low = 0 1 2 3 4 5 6 7 8 9 10 = High

2) How physically demanding was the task?

Low = 0 1 2 3 4 5 6 7 8 9 10 = High

3) How hurried or rushed was the pace of the task?

Low = 0 1 2 3 4 5 6 7 8 9 10 = High

4)* How successful were you in accomplishing what you were asked to do?

Low = 0 1 2 3 4 5 6 7 8 9 10 = High

5) How hard did you have to work to accomplish your level of performance?

Low = 0 1 2 3 4 5 6 7 8 9 10 = High

6) How insecure, discouraged, irritated, stressed, and annoyed were you?

Low = 0 1 2 3 4 5 6 7 8 9 10 = High

7) Other comments?

(* Note: this item is reversed during calculation of the overall mean score)

Appendix C

The McCroskey Source Credibility Measure

This tool measures how study participants evaluate the general credibility of a presenter, in this case the learners' perception of the credibility of a communication source, or the instructor in the video.

“Instructions: How would you evaluate the instructor for the course on the following items? Please circle the appropriate number for each item to indicate your agreement of what best describes the video you just watched.”

1)* Intelligent 1 2 3 4 5 6 7 Unintelligent

comments?

2) Untrained 1 2 3 4 5 6 7 Trained

comments?

3)* Cares about me 1 2 3 4 5 6 7 Doesn't care about me

comments?

4)* Honest 1 2 3 4 5 6 7 Dishonest

comments?

5)* Has my interests at heart 1 2 3 4 5 6 7 Doesn't have my interests at heart

comments?

6) Untrustworthy 1 2 3 4 5 6 7 Trustworthy

comments?

7) Inexpert 1 2 3 4 5 6 7 Expert

comments?

8) Self-centered 1 2 3 4 5 6 7 Not self-centered

comments?

9)* Concerned with me 1 2 3 4 5 6 7 Not concerned with me

comments?

10)* Honorable 1 2 3 4 5 6 7 Dishonorable

comments?

11)* Informed 1 2 3 4 5 6 7 Uninformed

comments?

12)* Moral 1 2 3 4 5 6 7 Immoral

comments?

13) Incompetent 1 2 3 4 5 6 7 Competent

comments?

14) Unethical 1 2 3 4 5 6 7 Ethical

comments?

15) Insensitive 1 2 3 4 5 6 7 Sensitive

comments?

16)* Bright 1 2 3 4 5 6 7 Stupid

comments?

17) Phony 1 2 3 4 5 6 7 Genuine

comments?

18) Not understanding 1 2 3 4 5 6 7 Understanding

19) Other comments?

(* Note: these items are reversed during calculation of the overall mean score)

Appendix D

The Nonverbal Immediacy Behaviors Index

This instrument uses 14 indicators such as instructor gestures during the class, they smile, they appear relaxed, and they use a variety of vocal expressions.

“Instructions: How would you evaluate the instructor for the course on the following items? Please circle the appropriate number for each item to indicate your agreement of what best describes the video you just watched.”

1)* Stays behind desk while teaching.

Never 1 2 3 4 5 6 7 Always

comments?

2) Gestures while talking to class.

Never 1 2 3 4 5 6 7 Always

comments?

3)* Uses monotone/dull voice when talking to class.

Never 1 2 3 4 5 6 7 Always

comments?

4) Looks at class while talking.

Never 1 2 3 4 5 6 7 Always

comments?

5) Smiles at the class as a whole, not just at individual students.

Never 1 2 3 4 5 6 7 Always

comments?

6)* Has a very tense body position while talking to the class.

Never 1 2 3 4 5 6 7 Always

comments?

7) Moves around while teaching.

Never 1 2 3 4 5 6 7 Always

comments?

8)* Looks at the board or notes while talking to the class.

Never 1 2 3 4 5 6 7 Always

comments?

9)* Stands behind podium or desk while teaching.

Never 1 2 3 4 5 6 7 Always

comments?

10) Has a very relaxed body position while talking to the class.

Never 1 2 3 4 5 6 7 Always

comments?

11)* Smiles at individual students in the class.

Never 1 2 3 4 5 6 7 Always

comments?

12) Uses a variety of vocal expressions while talking to the class.

Never 1 2 3 4 5 6 7 Always

comments?

(* Note: these items are reversed during calculation of the overall mean score)

Appendix E

The Anderson Perceived General Immediacy Scale

The specific items used to assess the teacher included the participants' agreement or disagreement of the immediacy of the instructor's teaching style, and their rating of the teacher as cold or warm, friendly or unfriendly, and close or distant. The original layout of the instrument was modified to fit the format of the online survey tool. Participants are required to read a definition of "immediacy" before they begin to answer the survey items.

"Immediate behaviors are those communication behaviors that reduce distance between people. Immediate behaviors may actually decrease the physical distance, or they may decrease the psychological distance. The more immediate a person is, the more likely he/she is to communicate at close distances, smile, engage in eye contact, use direct body orientations, use overall body movement and gestures, touch others, relax, and be vocally expressive. In other words, we might say that an immediate person is perceived as overtly friendly and warm.

Please circle the appropriate number for each item to indicate your agreement of what best describes the video you just watched."

1)* In your opinion, the teaching style of the instructor you just watched on video is immediate.

agree 1 2 3 4 5 6 7 disagree

comments?

2) In your opinion, the teaching style of the instructor you just watched on video is immediate.

false 1 2 3 4 5 6 7 true

comments?

3) In your opinion, the teaching style of the instructor you just watched on video is immediate.

incorrect 1 2 3 4 5 6 7 correct

comments?

4) In your opinion, the teaching style of the instructor you just watched on video is immediate.

wrong 1 2 3 4 5 6 7 right

comments?

5)* In your opinion, the teaching style of the instructor you just watched on video is immediate.

yes 1 2 3 4 5 6 7 no

comments?

6)* In your opinion, the teaching style of the instructor you just watched on video is immediate.

immediate 1 2 3 4 5 6 7 not immediate

comments?

7). In your opinion, the teaching style of the instructor you just watched on video is immediate.

cold 1 2 3 4 5 6 7 warm

comments?

8) In your opinion, the teaching style of the instructor you just watched on video is immediate.

unfriendly 1 2 3 4 5 6 7 friendly

comments?

9)* In your opinion, the teaching style of the instructor you just watched on video is immediate.

close 1 2 3 4 5 6 7 distant

comments?

(* Note: these items are reversed during calculation of the overall mean score)

Appendix F

The Instructor Evaluation Measure

This assessment seeks to collect feedback on the overall layout and design of the instructional environment where the learning sessions take place. Questions include attitudes on the size and location of monitors, room comfort, view of the instructor, and audio and video preferences.

“Instructions: how would you evaluate the instructor for the course on the following items? Please circle the appropriate number for each item to indicate your agreement of what best describes the video you just watched.”

1) I was comfortable with the location of the monitor(s) for viewing the video I just watched:

Very comfortable 1 2 3 4 5 6 7 Very uncomfortable
comments?

2) I felt comfortable with the way this lecture was presented:

Very comfortable 1 2 3 4 5 6 7 Very uncomfortable
comments?

3) The monitor was too small for watching a video lecture:

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

comments?

4) The monitor was too large for watching a video lecture:

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

comments?

5) It was hard to keep my attention on what the instructor was saying:

Very hard 1 2 3 4 5 6 7 Very easy

comments?

6) I felt that the instructor cared that the student learned the material:

Strongly agree 1 2 3 4 5 6 7 Strongly disagree

comments?

7) How would you rate the amount of eye contact with the instructor?

Too much 1 2 3 4 5 6 7 Too little

comments?

8) I would prefer to have listened to an audio file:

Strongly agree 1 2 3 4 5 6 7 Strongly disagree
comments?

9) Given an option, I would continue taking the course presented:

Definitely continue 1 2 3 4 5 6 7 Definitely drop
comments?

10) How much did you learn from this presentation?

I learned something new 1 2 3 4 5 6 7 I did not learn much
comments?

Appendix G

Table of Specifications

Items arranged in a table of specification indicate the content areas covered by the multiple-choice items and the four levels of Bloom's taxonomy that each item tested. The table also indicates how the items from the pilot post-test were distributed into the experiment's pre-test and post-test.

Pre-test and Post-test Table of Specifications				
Principle	Knowledge	Comprehension	Application	Analysis
	Remembers previously learned information	Demonstrates an understanding of the facts	Apply knowledge to actual situations	Break ideas into simpler parts and support generalizations
Historical Milestones				
Telegraph Systems		Post#6 (pilot#18) Pre#4 (pilot#12)		
Telephone Systems		Post#4 (pilot#11) Pre#6 (pilot#17)		
Electronic bulletin boards		Post#12 (pilot#31) Pre#7 (pilot#19)		
The ARPANET	Pre#1 (pilot#1) Post#2 (pilot#6) Pre#5 (pilot#26)	Pre#11 (pilot#22) Post#10 (pilot#27)		
The Internet		Post#5 (pilot#15) Pre#9 (pilot#24)		
Applied social networking			Pre#2 (pilot#2) Post#9 (pilot#16)	

Communication Models				
One to One			Post#11 (pilot#29) Pre#20 (pilot#52)	
One to Many (& Many to One)		Post#8 (pilot#30) Pre#18 (pilot#47)	Pre#3 (pilot#8) Post#7 (pilot#21) Pre#10 (pilot#25) Post#20 (pilot#50)	
Many to Many			Pre#8 (pilot#20) Post#1 (pilot#3)	
Model generalization				Post#3 (pilot#42) Pre#16 (pilot#43)
Social Networking Applications				
SixDegrees	Post#13 (pilot#33) Pre#12 (pilot#35)	Pre#15 (pilot#9) Post#14 (pilot#34)		
MySpace	Post#15 (pilot#36) Pre#13 (pilot#37) Post#16 (pilot#38) Pre#19 (pilot#51)			

Facebook	Post#17 (pilot#40) Pre#14 (pilot#39) Post#18 (pilot#41)			
Twitter			Pre#17 (pilot#44) Post#19 (pilot#45)	

Figure G1. Pre-test and Post-test Table of Specifications.

Appendix H

The “Instructor-Only” Video Treatment



Figure H1. The “Instructor-Only” Video Treatment. Participants in this “instructor-only” treatment group viewed a version of the presentation that only contained the instructor eye-level camera video as the visual source. The instructor’s narration remained the same for all five presentation versions. As an example, approximately 90 seconds of the 20-minute instructional module can be viewed at <https://www.youtube.com/watch?v=ccz07giZsMU>. Actual treatment materials were not uploaded to YouTube, but were instead uploaded to a secured server for use during the experiment, YouTube is only used here for illustrative purposes.

Appendix I

The “Slides-Only” Video Treatment



Figure II. Participants in this “slides-only” treatment group viewed a version of the presentation that only contained the instructor’s presentation slides as the visual source; the instructor’s narration remained the same. The slides were designed to reduce extraneous load, served as a guide for the presenter, and graphics are used as instructional cues. As an example, approximately 90 seconds of the 20-minute instructional module can be viewed at <https://www.youtube.com/watch?v=urg8QIRfzBE>. Actual treatment materials were not uploaded to YouTube, but were instead uploaded to a secured server for use during the experiment, YouTube is only used here for illustrative purposes.

Appendix J

The “Video-Switching” Video Treatment



Figure J1. Participants in this “video-switching” treatment group viewed a version of the presentation that visually switched and alternated between the instructor camera video and the presentation slides. The slides were generally left on screen long enough for a viewer to read the text before it switched back to the camera video. As an example, approximately 90 seconds of the 20-minute instructional module can be viewed at <https://www.youtube.com/watch?v=5A46HQ9fXIQ>. Actual treatment materials were not uploaded to YouTube, but were instead uploaded to a secured server for use during the experiment, YouTube is only used here for illustrative purposes.

Appendix K

The “Dual-Windows” Video Treatment

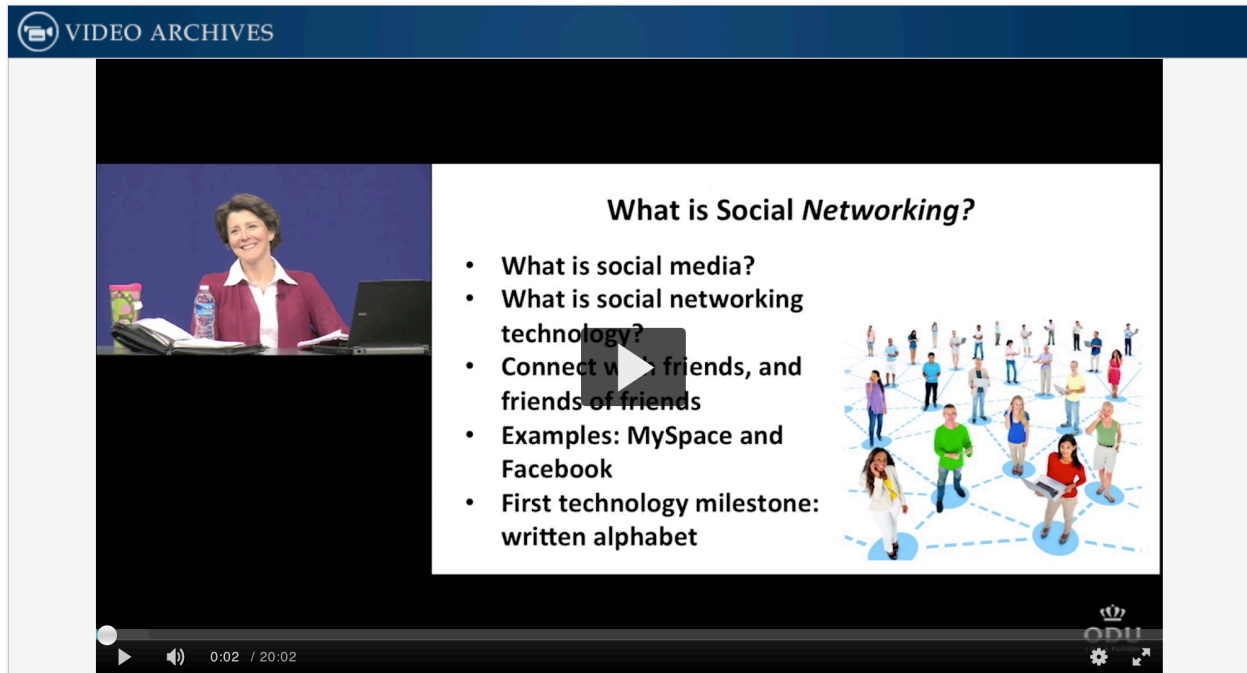


Figure K1. Participants in this “dual-windows” treatment group viewed a version of the presentation that included both visual sources at the same time. The instructor camera appeared as a smaller window in the upper left of the screen, and the slides appeared as a larger window on the right. The instructor’s narration and slides remained the same for all five presentation versions. As an example, approximately 90 seconds of the 20-minute instructional module can be viewed at <https://www.youtube.com/watch?v=piMu3p6PSJw>. Actual treatment materials were not uploaded to YouTube, but were instead uploaded to a secured server for use during the experiment, YouTube is only used here for illustrative purposes.

Appendix L

The “Superimposed-Slides” Video Treatment

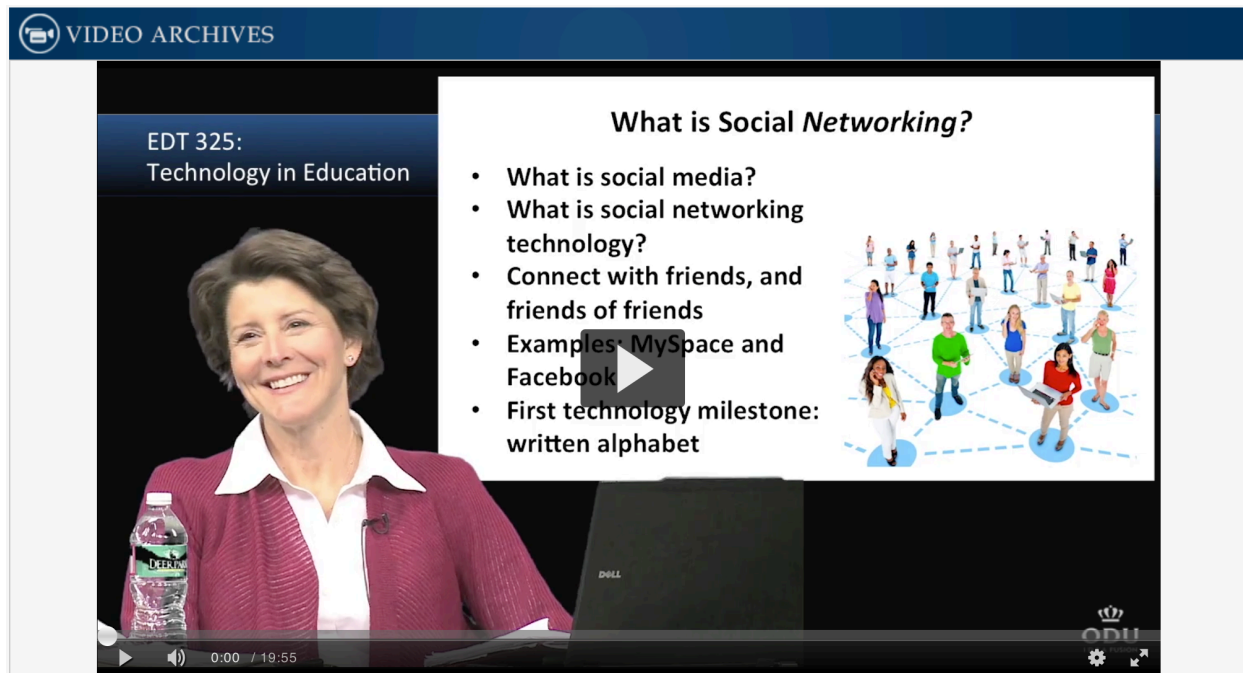


Figure L1. Participants in the “superimposed-slides” treatment group also viewed a version of the presentation that included both visual sources at the same time. However, in this case the instructor camera appeared as a large window in the lower left of the screen, the slides appeared superimposed as a large window in the upper right of the screen. Both video sources appeared in front of a black background layer. As an example, approximately 90 seconds of the 20-minute instructional module can be viewed at <https://www.youtube.com/watch?v=VhCVy9YkYMA>. Actual treatment materials were not uploaded to YouTube, but were instead uploaded to a secured server for use during the experiment, YouTube is only used here for illustrative purposes.

Appendix M

The Audio Transcript of the Instructional Lecture Segment

1

00:00:00,76 --> 00:00:05,335

Great question. So, what is social media?

2

00:00:05,35 --> 00:00:13,338

For today's discussion let's define social media as the use of technology to foster interaction and communication.

3

00:00:13,38 --> 00:00:22,779

The Internet is just one medium or way to transport communication so. What's is a social networking?

4

00:00:22,79 --> 00:00:26,997

Simply put, it's expanding the number of people you know by meeting your friends' friends

5

00:00:27,53 --> 00:00:30,554

and then your friends' friends' friends, and so on and so forth.

6

00:00:31,89 --> 00:00:39,111

Websites such as Myspace and Facebook have simply taken the social networking concept online.

7

00:00:39,11 --> 00:00:45,005

But technology has been used for a very long time to create new ways to communicate.

8

00:00:45,05 --> 00:00:50,772

And if technology is the knowledge and the use of tools and techniques,

9

00:00:50,72 --> 00:00:58,775

then the first milestone in social media was the development of the first written alphabet some time around 4,000 BCBCE

110

00:01:00,72 --> 00:01:01,551

in Mesopotamia and then Egypt.

111

00:01:02,54 --> 00:01:04,335

But it wasn't until 1440,

112

00:01:04,35 --> 00:01:12,337

when the Germans invented a mechanized printing press that a medium for mass communications was established.

113

00:01:12,37 --> 00:01:14,884

For the first time in human history.

114

00:01:14,84 --> 00:01:18,666

Printed books would become available to the general public,

115

00:01:18,66 --> 00:01:23,991

and this represented a significant milestone in social communication,

116

00:01:23,91 --> 00:01:31,111

because the printing press established a scalable one-to-many model of communication,

117

00:01:31,11 --> 00:01:34,009

specifically From the author to the people reading the books.

118

00:01:36,03 --> 00:01:47,113

Now the development of the telegraph in the mid 1850s allowed people to communicate in real time across great distances.

119

00:01:47,13 --> 00:01:56,8

Before the telegraph, people would try to send messages using smoke and fire, mirrors, or the ever famous Pony Express.

220

00:01:56,8 --> 00:02:01,774

Electricity simply expanded their range of signaling .

221

00:02:01,74 --> 00:02:09,882

Messages in the form of electronic signals could be transported from one location, received in another,

222

00:02:09,82 --> 00:02:15,998

and then the original message could be replicated. Of course, along with progress comes a fallout .

223

00:02:15,98 --> 00:02:21,888

And with the connection of the East Coast of the United States with the West Coast in 1861,

224

00:02:21,88 --> 00:02:27,228

the Pony Express mail carrying service became obsolete.

225

00:02:27,28 --> 00:02:34,887

In 1866, communications between North American and Europe was established with the Trans-Atlantic cables.

226

00:02:34,87 --> 00:02:44,885

And in 1902 a trans pacific cable completed a global communication circuit. So what would be next?

227

00:02:44,85 --> 00:02:53,668

Well, while the worldwide telegraph system was being created, developmental methods to transmit

228

00:02:53,89 --> 00:02:59,992

or distribute voice Over this network really quickly evolved.

229

00:02:59,92 --> 00:03:05,772

Now there will always be some controversy over who invented what first.

330

00:03:05,72 --> 00:03:11,661

But Alexander Graham Bell was awarded the patent for the apparatus for transmitting voice

331

00:03:11,8 --> 00:03:21,6

or sound telegraphically in 1876. what would become the telephone revolutionized communication.

332

00:03:21,6 --> 00:03:24,000

Think about it for a second.

333

00:03:24,00 --> 00:03:33,114

The first time, real time interactive voice communication to be transmitted across great distances.

334

00:03:33,14 --> 00:03:43,332

The telegram and then the telephone created one-to-one communication. Now, what is that? That's mom, I'll be home at 7.

335

00:03:43,32 --> 00:03:45,001

I mean, people were able to create

336

00:03:45,01 --> 00:03:50,555

and maintain relationships over great distances far better than they could through the written word,

337

00:03:50,55 --> 00:03:54,442

which might have taken weeks Months, even years, to be received.

338

00:03:56,08 --> 00:04:01,559

Now many people played the role in what would become radio broadcasting.

339

00:04:01,59 --> 00:04:09,8

And as we established, the telegram and then the telephone represent one to one communication.

440

00:04:09,8 --> 00:04:17,669

Wireless radio, however, brought a whole new level of communication that of electronic mass Communication

441

00:04:17,77 --> 00:04:25,5

or one to many. The first wireless communication using radio waves was demonstrated in the late 1890s.

442

00:04:27,21 --> 00:04:34,334

And by the 1920s, radio broadcasting had become a revolutionized social media.

443

00:04:34,34 --> 00:04:40,779

Radios in homes decreased the perception of the size and distance of the world.

444

00:04:40,79 --> 00:04:48,662

And households in rural areas which previously may have only had access to a weekly newspaper could now hear real times

445

00:04:48,62 --> 00:04:59,335

news and sports' events, the latest music. Products could be sold in real time right in the family home.

446

00:04:59,35 --> 00:05:05,223

Another revolution in social media and technology was the development of the television.

447

00:05:05,23 --> 00:05:10,004

Electromechanical television sets were available in the late 1920s.

448

00:05:10,04 --> 00:05:15,771

But programming was sporadic and it was way too expensive for the average household.

449

00:05:15,71 --> 00:05:19,229

and The development of the television was waylaid by World War II.

550

00:05:20,05 --> 00:05:23,668

But by 1947 televisions had become more affordable

551

00:05:24,12 --> 00:05:30,8

and by 1954 television sets were in over half of American households.

552

00:05:30,8 --> 00:05:39,223

The family television much like the family radio of a previous generation became the focal point of the living room

553

00:05:39,88 --> 00:05:42,997

and one's source for information.

554

00:05:42,97 --> 00:05:50,995

The TV with its audio and its visual components of communication had become the massive premier social media.

555

00:05:53,15 --> 00:06:03,2

In 1957 the first experimental satellite was launched into low orbit by the Soviet Union.

556

00:06:03,2 --> 00:06:12,888

It circled the Earth for about three months. Sending out a repetitive beep, beep, beep below .

557

00:06:12,88 --> 00:06:18,663

Now I realize that repetitive beeping may not sound too impressive,

558

00:06:18,63 --> 00:06:27,887

but Sputnik not only represents a communication technology milestone But it also sparked a number of psychological

559

00:06:27,87 --> 00:06:35,1

impaired on shifts in the United States. The Cold War generation.

660

00:06:35,1 --> 00:06:43,664

One response to Sputnik was the creation of the Advance Research Projects Agency, or ARPA, by the U.S.

661

00:06:43,64 --> 00:06:53,002

Department of Defense. ARPA's purpose was to create, promote, and plan research and development projects.

662

00:06:53,02 --> 00:06:59,112

And one of ARPA's research projects was the connection and sharing of large computer processing

663

00:06:59,12 --> 00:07:08,331

and information at various research Institutes over a new network that used digital packets and not telephone circuits.

664

00:07:11,82 --> 00:07:21,222

In 1969, ARPA launched the Arpanet, which first connected computer systems at UCLA, Stanford research tech,

665

00:07:21,22 --> 00:07:24,449

UC Santa Barbera and the University of Utah.

666

00:07:24,49 --> 00:07:32,009

But by the early 1970s, it had grown to include several hundred connected computer systems. Systems.

667

00:07:32,09 --> 00:07:36,004

A public version of ARPANET, called Telenet, was created in 1974.

668

00:07:37,63 --> 00:07:44,447

It was purchased by GTE and then Sprint, and eventually would become Sprintnet .

669

00:07:44,47 --> 00:07:44,882

In 1974,

770

00:07:44,82 --> 00:07:55,995

a new network communication specification guideline called TCP/IP Or internet protocol was the first publication to

771

00:07:55,95 --> 00:08:02,4

refer to the internet as a potentially global communications platform.

772

00:08:02,4 --> 00:08:07,112

ARPANET completed its complete transition to TCPIT in 1983.

773

00:08:09,81 --> 00:08:16,003

The US National Science Foundation created an assessment in 1986.

774

00:08:16,03 --> 00:08:22,998

Its purpose was to connect research institutions, and by using nets Internet protocol,

775

00:08:22,98 --> 00:08:33,2

it allowed both networks to Intercommunicate. In 1989 began allowing commercial access to its system.

776

00:08:33,2 --> 00:08:39,666

This started with NCI's mail system but soon grew to include many other communication systems

777

00:08:39,66 --> 00:08:48,775

and networks like Sprint Net, Time Net. CompuServe, Newsnet, Bitnet, I mean just to name a few.

778

00:08:48,75 --> 00:08:57,1

In 1990, BARPA changed its name to DARPA, the Defense Advanced Research Project Agency.

779

00:08:57,1 --> 00:09:05,992

And DARPA really desired a more secure network and it discontinued its original use of the Arpanet system.

880

00:09:05,92 --> 00:09:11,223

The National Science Foundation began phasing out the NSFNET between 1993 and 1999.

881

00:09:14,39 --> 00:09:22,227

Most of the backbone services of the NSFNET provided was replaced by MCI WorldCom Network Services.

882

00:09:22,27 --> 00:09:33,995

By the mid 1990s The Internet was a growing global collection of interconnected networks.

883

00:09:33,95 --> 00:09:42,446

The Internet provides a platform for many social media applications, and one of the very first was email.

884

00:09:42,46 --> 00:09:50,115

Back in the early days of computers, various users would share mainframe computer storage.

885

00:09:50,35 --> 00:09:54,447

And they would have times for sharing the system.

886

00:09:54,47 --> 00:10:02,669

As early as 1965, MITs just found it very convenient to leave messages for other mainframe users,

887

00:10:02,69 --> 00:10:07,776

but it was over on the Arpa-Net in Ray Tomlinson,

888

00:10:07,76 --> 00:10:17,996

who is cited as having sent the first email with that ever-familiar at sign to separate a person's username from the

889

00:10:17,96 --> 00:10:19,664

person's machine.

990

00:10:20,7 --> 00:10:25,000

But much like the television, the internet would require further development

991

00:10:25,00 --> 00:10:31,993

and a lot more affordability before internet email could become popular.

992

00:10:31,93 --> 00:10:40,779

Another social media networking milestone was the development of the first electronic message board system.

993

00:10:40,79 --> 00:10:49,228

The first computerized bulletin board system was developed by Ward Christenson in 1978 during the Chicago snowstorm.

994

00:10:50,32 --> 00:10:57,665

And it's based similarly to the physical bulletin boards that we might see in stores or schools or Panera Bread.

995

00:10:57,65 --> 00:11:03,992

But in this case it was basically a place to post electronic messages.

996

00:11:03,92 --> 00:11:07,224

The Internet user would use the telephone modems

997

00:11:07,27 --> 00:11:13,005

and their home computers to dial up computers that were hosting the electronic bulletin board.

998

00:11:13,65 --> 00:11:22,557

Now, of course, long distance telephone services kind of limited the reach Of these dial up bulletin boards.

999

00:11:22,57 --> 00:11:30,228

But, for the first time, a growing number of computer users were able to interact with each other.

10100

00:11:30,28 --> 00:11:37,226

A person just entered their name and their password and they were able to read and post messages from other users.

10101

00:11:38,47 --> 00:11:43,337

In other words, It was a virtual community.

10102

00:11:43,37 --> 00:11:51,551

The basic features and usability of the first computerized bulletin boards led to online forums, threaded discussions,

10103

00:11:51,51 --> 00:12:01,1

weblogs, allowing for many-to-many communication, in other words, social networking.

10104

00:12:01,1 --> 00:12:08,557

One of the earliest online forums that kind of have a lot of similar features to what we now know as social networking

10105

00:12:08,57 --> 00:12:14,888

sites was six degree dot com. And that launched in 1997.

10106

00:12:14,88 --> 00:12:20,662

Users were able to create profiles and they could invite their friends to create profiles.

10107

00:12:20,62 --> 00:12:27,776

They could browse through other profiles and they could organize groups and send and post messages.

10108

00:12:27,76 --> 00:12:34,223

At its height, the site had over a million users.

10109

00:12:34,23 --> 00:12:41,224

In 2001, the site closed its door but SixDegrees.com had introduced the world to searchable profiles.

11110

00:12:43,79 --> 00:12:48,883

The next big social networking site was Friendster launched in 2002.

11111

00:12:48,83 --> 00:12:55,221

It grew very quickly and through its success several other niche

11112

00:12:55,24 --> 00:13:02,117

or very focused social networking sites developed like Dogster for dog owners

11113

00:13:02,62 --> 00:13:06,224

or Elfster for people who did secret Santa's.

11114

00:13:06,24 --> 00:13:14,5

Friendster was purchased by MLL Global, which was a large agent internet site provider in 2009.

11115

00:13:15,78 --> 00:13:26,115

And most of its over eight million users are located in Asia or the United States. Success breeds competition.

11116

00:13:26,15 --> 00:13:34,773

So in 2003, E Universe, the Internet marketing company that would later become Intermix Media,

11117

00:13:34,73 --> 00:13:37,669

decided to give Friendster some competition.

11118

00:13:37,69 --> 00:13:45,006

They spent about three months in development and E Universe was able to emulate many of Friendster's best features.

11119

00:13:46,16 --> 00:13:55,995

And then it launched Myspace.com. And rather than employing the traditional marketing strategies, Myspace is smart.

12120

00:13:55,95 --> 00:13:59,225

First thing they did was sign up all their employees.

12121

00:13:59,25 --> 00:14:06,881

And then they had contests to see and offer cash rewards to see which employee could get the most people to sign up.

12122

00:14:06,81 --> 00:14:09,35

Of course a lot of time that was their family and friends.

12123

00:14:10,54 --> 00:14:17,443

MySpace also sponsored sign-up parties that had bands and clubs and LA party promoters.

12124

00:14:17,43 --> 00:14:23,991

The move likely contributed heavily to its early adoption by music enthusiasts.

12125

00:14:23,91 --> 00:14:29,668

With a parent company's marketing and the financial resources and all the early buzz,

12126

00:14:29,68 --> 00:14:34,008

MySpace.com began to grow faster than any previous social networking site.

12127

00:14:35,66 --> 00:14:42,113

Part of its growth was due to MySpace's flexibility and response to consumer needs.

12128

00:14:42,13 --> 00:14:49,116

For instance, a person who had basic webpage design could easily customize their MySpace page.

12129

00:14:49,16 --> 00:14:56,778

MySpace was also very committed to adding new features based on customer needs or usage trends.

13130

00:14:56,78 --> 00:15:02,001

They were also very good at supporting users who developed their own unique ideas.

13131

00:15:03,75 --> 00:15:11,3

For instance, when Myspace noticed that musicians and bands were using Myspace to market themselves,

13132

00:15:11,3 --> 00:15:18,994

they took it upon themselves to create Myspace Music, where the user was not only able to play,

13133

00:15:18,94 --> 00:15:23,008

but they could also Purchase music.

13134

00:15:23,08 --> 00:15:30,667

While Myspace planned and designed for growth, Friendster was slow to respond to consumer wants

13135

00:15:30,67 --> 00:15:40,883

and very difficult to customize. In 2005, MySpace and its parent company was purchased by News Corporation.

13136

00:15:40,83 --> 00:15:47,449

That's the parent company at the Wall Street Journal, the 20th Century Fox, Fox Broadcasting,

13137

00:15:47,49 --> 00:15:52,226

and numerous other news and entertainment companies.

13138

00:15:52,26 --> 00:15:58,447

With the influx of Google advertising dollars, Myspace continued to grow,

13139

00:15:58,47 --> 00:16:12,111

and reaching its 100 millionth account in 2006. And at its height in 2008, Myspace had 130 million active users.

14140

00:16:12,11 --> 00:16:21,991

MySpace's reason for decline can be debated, but it's probably a result of too much reliance on advertising dollars

14141

00:16:21,96 --> 00:16:26,558

and no longer becoming flexible to new features.

14142

00:16:26,58 --> 00:16:31,5

Funny, they strayed from the very things that made them popular to begin with.

14143

00:16:33,62 --> 00:16:38,007

MySpace has since redesigned itself to focus primarily on music and entertainment,

14144

00:16:38,07 --> 00:16:48,887

thus relinquishing its title as the number one social networking site too. Facebook.

14145

00:16:48,87 --> 00:16:57,553

The ever popular and much adored, or either hated, facebook.com was designed in a Harvard dorm room.

14146

00:16:57,53 --> 00:17:04,775

It was launched in 2004 by students, as a social networking site to connect to other students.

14147

00:17:06,8 --> 00:17:12,006

In 30 days over half the undergraduate population had signed up.

14148

00:17:12,06 --> 00:17:18,447

Originally it was restricted to Harvard students, but it soon expanded to include Columbia, Stanford, Yale .

14149

00:17:18,47 --> 00:17:24,553

And eventually included most colleges and universities in the United States and Canada.

15150

00:17:24,53 --> 00:17:33,9

TheFacebook.com incorporated in 2004, and in 2005, dropped the “The“ from its name to simply become Facebook.

15151

00:17:35,59 --> 00:17:41,334

In September of '05, Facebook allowed high school students to join its network.

15152

00:17:41,34 --> 00:17:48,005

And a year later, much to my children's chagrin, it opened its doors to the general public.

15153

00:17:48,05 --> 00:17:57,7

Facebook reached its 500 millionth user in 2010 with over half of its numbers logging in on a daily basis.

15154

00:18:00,59 --> 00:18:01,446

Facebook's attraction?

15155

00:18:01,46 --> 00:18:09,224

Well, it was easier to use than MySpace and it also allowed users to take their existing email accounts

15156

00:18:09,57 --> 00:18:18,556

and instantly invite everyone on that list to join Facebook. In fairness, MySpace would eventually add this feature.

15157

00:18:18,56 --> 00:18:24,007

Now once somebody logs in they can Search for friends. They can search for people with similar interests.

15158

00:18:24,58 --> 00:18:29,112

They can read and post messages. They can put an online blog.

15159

00:18:29,12 --> 00:18:35,883

They can post videos, likes, dislikes, more things than we really have time to go over.

16160

00:18:35,83 --> 00:18:42,118

Twitter marks another milestone in the evolution of social media and social networking.

16161

00:18:42,18 --> 00:18:43,117

Basically,

16162

00:18:43,17 --> 00:18:52,661

this service allows users to send nearly real time communication to a large number of other Twitter users via a mobile

16163

00:18:52,61 --> 00:18:54,004

cell or smartphone.

16164

00:18:54,58 --> 00:18:59,773

And we have the developers of a podcasting creation, search

16165

00:18:59,76 --> 00:19:10,4

and directory company to thank for this system that envisioned and nicknamed TWTTR, a name inspired by Flickr,

16166

00:19:10,4 --> 00:19:17,779

the picture and video hosting website. And, probably also, the observation of birds.

16167

00:19:17,79 --> 00:19:21,226

Communicating to each other with short chirps or tweets.

16168

00:19:22,13 --> 00:19:26,222

Users on this system can send instant text messages

16169

00:19:26,68 --> 00:19:36,117

or a 140 character short service messages texts to other users either online or using mobile devices.

17170

00:19:36,17 --> 00:19:42,225

One message can be sent to as many people who are signed up to follow that account.

17171

00:19:42,25 --> 00:19:46,882

One might say a very effective one to many communications models.

17172

00:19:47,87 --> 00:19:54,996

Since its launch in 2006 Twitter has grown to include over 175 million users.

VITA

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