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An analysis of students' perceptions of online multimedia tutorials to assist classroom instruction

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AN ANALYSIS OF STUDENTS' PERCEPTIONS OF ONLINE MULTIMEDIA TUTORIALS TO ASSIST CLASSROOM INSTRUCTION

An Abstract of a Thesis

Submitted

In Partial Fulfillment

of the Requirements for the Degree

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ABSTRACT

Multimedia has become the new learning environment. As technology advances and becomes more prominent, traditional education needs to adapt and utilize all the benefits that can be achieved with computer-assisted instruction. Awareness of students' attitudes toward multimedia-based education is critical in the evaluation of multimedia courses and development of multimedia-based curriculum. The purpose of this study was to examine students' perceptions of multimedia-based instruction. Educational institutions are faced with the challenges of delivering valuable training options to meet the varying needs of students and staff; computer technology has become and will continually be integrated into the classroom to make learning easier, more successful and efficient. For this reason, the promotion and monitoring of positive attitudes towards multimedia-based instruction is critical.

Four courses were selected by the researcher for analysis because of their use of a multimedia learning environment. A 29-item questionnaire was administered to 123 students to measure their attitudes towards online learning with multimedia tutorials. Students were segregated into groups based on their prior experience and analyzed using descriptive statistics (mean, median, mode, standard deviation and frequency) and an independent *t* test. The data collected from the survey answered questions pertaining to the benefit of additional online tutorials, learner independence, classroom autonomy, effect on their learning, and anxiety.

Based on the results of this study, the statistical analysis indicated there were significant differences at the $<.05$ level between the two groups of students for each of

the five hypotheses. Additionally, students' attitudes on average were nearly half a point higher ($M = 0.46$) for those who had prior experience with multimedia in the classroom than students with no experience based on a Likert five-point scale. However, students' attitudes were lower for students with prior experience ($M = 2.76$, $SD = 0.77$) over students without experience ($M = 2.81$, $SD = 1.00$) for the research question about whether students prefer online multimedia learning tutorials over traditional class handouts.

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INTRODUCTION

Multimedia has become the new learning environment. Awareness of students' attitudes toward multimedia-based education is critical to the evaluation of multimedia courses and development of multimedia based curriculum. For this reason, the promotion and monitoring of positive attitudes towards multimedia-based instruction is critical (Garcia, 2001). Instructors as well as universities have devoted many valuable resources to make learning more efficient, affordable and to enhance students' knowledge. Technology in education can be highly effective in improving student learning, but if not used correctly, could easily cost students valuable time. It is essential for students to receive the highest quality of education that can be provided to them. Students need to have hands-on experience in the classroom in order to transfer that knowledge to their future professional setting. In order for this to be achieved, it is important to understand the benefits of computer-assisted instruction in education.

When talking about computer-assisted instruction with hypermedia it is important to understand that the term is the combination of multimedia and hypertext. Hypermedia is defined as "a classification of software programs which consist of networks of related text, graphics, audio files and video clips where users navigate through browsing" (Liaw, 2001, p. 43). Hypermedia is beneficial in education because it is user-driven; meaning the student decides when he/she wants to learn. The lessons can be integrated into current projects to help the user solve a problem, or as a stand alone application if necessary. Due to its accessibility, learning can take place no matter where students are.

Additionally, self-paced-learning is beneficial to the user because the speed of the course is a variable dependent on the user. The user can start a lesson at anytime and return when best able (Konradt, 2004).

The concluding research will detail the benefits computer-assisted instruction with multimedia has on students and effective ways to introduce this type of learning environment. As technology becomes more integrated with education, it is becoming equally important to monitor students' attitudes towards this type of learning environment.

Statement of the Problem

The problem addressed in this study is to discuss and analyze the valuable use of computer-assisted instruction as an educational tool to assist learning. This study will examine students' perceptions of an interactive learning environment where multimedia tutorials complement traditional instruction. As technology and education become more integrated in the classroom, instructors as well as departments are continually interested in more efficient delivery methods.

Statement of Need

As technology advances and becomes more interlaced, traditional education needs to adapt and utilize all the benefits that can be achieved with computer-assisted instruction. Computer-assisted learning can be extremely helpful in flattening the learning curve for students. When using technology in the classroom, it is strongly recommended that educators take time to assess students' attitudes towards technology prior to the structuring of curriculum (Garcia, 2001). Taking this approach helps to

ensure that students will welcome the use of multimedia as a tool for learning. Understanding students' attitudes can ultimately allow educational professionals to create a multimedia environment conducive to learning.

Training methods are continually evolving to cater to the diverse needs of students. It is important for educational institutions to determine if computer-assisted education is a valuable resource to student understanding in technical training. Due to the increasing use of technology in classrooms and alternatives to traditional instruction, studying the differences between computer-assisted instruction and traditional education can be a valuable resource to educators.

Purpose of the Study

The purpose of this study was to examine students' perceptions of multimedia-based instruction. Educational institutions are faced with the challenges of delivering valuable training options to meet the varying needs of students and staff. Computer technology has become and will continually be integrated into the classroom to make learning easier, more successful and efficient. Traditional hands-on technical training is the preferred and most effective training method, but due to limitations in education and the diversity of students, traditional education does not allow every student the same benefits to training (Peterson, 1997). One of the main purposes of this study is to look at students' perceptions towards supplemental multimedia tutorials to compliment traditional instructional practices.

Significance of the Study

The following research may have practical implementations in understanding students' perceptions towards multimedia-based instruction and allow educators to modify the learning environment to guarantee more positive outcomes on the part of the learner. Also, this study could help to investigate educational methods in order to understand the benefits technology has on education. However, replication of this study would have to be based on the same circumstances comparable to those in this investigation.

Hypothesis

The researcher hypothesized that computer-assisted instruction will enhance learning as it supplements traditional instruction methods. Five null hypotheses were developed for this research. Five research questions were included for each null hypothesis to accept or negate each hypothesis.

Hypothesis One

Null hypothesis one: Students who use web-based tutorials are no more independent than students who do not use online multimedia tutorials.

1. Do students retain more information when online tutorials are available?
2. Are students who use online supplemental material more independent learners than users who learn by traditional means?
3. Is students' learning enhanced when online tutorials are available?
4. Do online tutorials allow students to work at their own pace?
5. Do students ask fewer questions when online multimedia tutorials are available?

Hypothesis Two

Null hypothesis two: There is no relationship between computer-assisted instruction and learning autonomy.

1. Is there a relationship between online learning with supplemental tutorials and self-efficacy?
2. Are students more autonomous learners when online tutorials are available to assist classroom activities?
3. Are students more open-minded about computer software when online resources are available?
4. Do students have more learning control when online tutorials are available?
5. Do students identify less learning frustration when online multimedia tutorials are available?

Hypothesis Three

Null hypothesis three: There is no relationship between computer-assisted instruction and classroom autonomy.

1. 1. Do students spend more time on developing projects when online tutorials are available?
2. Is less time spent on instruction when online multimedia tutorials are available?
3. Do students prefer online tutorials instead of traditional handouts?
4. Is there a relationship between computer-assisted instruction with online multimedia tutorials and students' autonomy?

5. Do students control the pace of their learning when online multimedia tutorials are available?

Hypothesis Four

Null hypothesis four: Computer-assisted instruction has no effect on students' learning.

1. Do students retain more information when supplemental online tutorials are available?
2. Do students like their classes more when online tutorials are available?
3. Are students more motivated when online tutorials are available?
4. Are lessons learned more efficiently when online tutorials are utilized?
5. Do online tutorials have positive effects on students' learning?

Hypothesis Five

Null hypothesis five: The level of anxiety of students who use online multimedia tutorials is not different from the anxiety level of students who do not use online tutorials.

1. Do students feel learning is easier with online tutorials?
2. Are students more engaged in their coursework when online tutorials are available?
3. Do students have more positive attitudes about learning new software when additional online tutorials are available?
4. Do students feel less anxiety when online tutorials are available?
5. Does human voice diminish learning anxiety when added to online multimedia tutorials?

An additional twenty-sixth question added by the researcher as an indicator for a future recommendation "Do students feel that classes introducing new application software should provide supplemental online multimedia tutorials?"

Assumptions

This study assumed that the participants responded truthfully and accurately to the questionnaire.

Delimitations

The following delimitations were made with this study of computer-assisted instruction.

1. This study was limited to students at a Midwestern university.
2. The study was limited to students in four courses during the summer 2007 semester.
3. This study was limited to students who participated in the survey and questionnaire truthfully.

Results and Expected Benefits

Taking into account the use of technology as it assists education; it is desirable to investigate the impacts computer-assisted instruction has on students' perceptions in the classroom. It is also important to predict future trends and identify facilitating factors that could hinder the implementation of further use of computer-assisted instruction in higher education.

Definition of Terms

For the purposes of clarity, this study utilized specific definitions that are related to technology and education. The definitions of this investigation are:

Asynchronous – "Essentially a measurement process of the learning that has either taken place or can take place. Usually measured against stated learning outcomes" (Kirkpatrick, 1998, p. vx).

Computer-assisted instruction – "Instruction delivered directly to learners by allowing them to interact with lessons programmed into the computer system" (Heinich, Molenda, Russell, & Smaldino, 1999, p. 402).

Hypermedia – "A classification of software programs which consist of networks of related text, graphics, audio files and video clips where users navigate through browsing" (Liaw, 2001, p. 43).

Internet – "An electronic data network that enables infinite numbers of computers to send text and graphics to one another over phone lines" (Schreiber & Berge, 1998, p. 414).

Multimedia – A combination of three forms of content: abstract, iconic and concrete. An example of an abstract form would be verbal – either text or audio. Iconic content would be the actual program and the concrete would include the actual physical technology available like the personal computer (Yin, 2001, p. 276).

Synchronous – "Data communication in which transmissions are sent at a fixed rate, with the sending and receiving devices synchronized" (Schreiber & Berge, 1998, p. 417).

Training - "Learning that is provided in order to improve performance on the present job" (Fuller & Farington, 1999, p. 4).

Summary of Projected Components

The succeeding chapters to this investigation were developed to give a review of literature from leading researchers in technology and education. This study will look at the types of computer-assisted instruction and the benefits it has on students and their educators. It will also discuss the unique needs of the adult learner, action learning, hypermedia advantages and disadvantages, types of computer-based instruction and self-paced learning.

The methodology of the investigation will include the standards of adequacy of the research, procedures, identification of the population, development of the instrument, data collection and analysis of the data. A questionnaire was developed as the primary data collection tool and administered to four courses in the summer 2007 semester at a Midwestern university.

The data analysis will present the finding for this research using a 29-item questionnaire to measure students' perceptions towards online multimedia as a supplemental resource for traditional education. The information obtained from the questionnaire will be analyzed by the researcher to answer the five null hypotheses.

The final chapter of the investigation will study the findings and make recommendations to future studies on computer-assisted instruction through the use of hypermedia. An Appendix was compiled to house other necessary information such as the survey instrument, questionnaires, tables and graphs as well as student data that was collected during the experiment.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this study was to examine students' perceptions of multimedia-based instruction. This study examined student uses and benefits of multimedia as a supplement to traditional education as well as assessing the perceived importance of the resource. This chapter will present types of computer-assisted instruction and the benefits it has on students and their educators. It will also discuss the unique needs of the adult learner, action learning, hypermedia advantages and disadvantages, types of computer-based instruction and self-paced learning. This study analyzed students' perceived value with consideration of the student's baseline skills and concepts as well as demographic and attitudinal perceptions.

Learning is a process that requires time. Students vary in the amount of time they need to process information in order to acquire knowledge. Their knowledge is attained through a series of temporal sequencing and meaningful interactions between the individual and information (Yin, 2001). Knowing this, it is important to move the learning styles away from an instructor-centered delivery setting to a learner-centered instructional environment. A learner-centered environment allows students to actively engage in the thought process which makes knowledge comprehension more effective. In his research, Yin (2001) suggests when students spend more time engaging in a particular activity, they are more likely to achieve academically. In order for instructional systems to become more adaptive to the student, there needs to be more

emphasis put on the learner-demonstrated learning styles where the relationships between sequencing, time and nature of the instructional methods are examined (Yin, 2001).

It is important for instructors to re-evaluate their teaching strategies in order to design new instructional approaches that are more practicable and useful to their students. Subsequently, students' learning is continually modified by the educational and social environment. In recent years, multimedia has become a useful tool for educators to utilize in the learning environment. For this reason, it is equally important to monitor students' perceptions towards their new learning medium.

The Adult Learner

Adult education has undergone a transformation in the last 20 years as new technologies cater to adult learners needs. Bogue (1989) states "adults learn better, retain information longer, and integrate it with their skills and knowledge when they interact actively with the material in a self-directed mode" (p. 447). If information is distributed passively through traditional educational channels like lectures and demonstrations; adult learners' comprehension is less than if they used an applied approach (Bogue, 1989). By moving the responsibility from the educator to the student, naturally it becomes the student's responsibility to learn the information. Transferring the control from educator to student can be very difficult when adopting a self-directed teaching process. Self-directed learning means the student collects the information and gradually processes this information in order to learn. Initially, the process may seem slow as students tend to make mistakes while trying to master the learning curve of the multimedia itself.

A great deal of adult education relies on traditional teaching methods, especially when relating to technical computer training. Instructors believe that due to the complex nature of the technical software the most effective method of instruction is through careful and detailed presentations. However, this traditional approach means there is too much time spent on precision and clarity of the presentation instead of allowing students to engage in the software themselves. Moving from a traditional approach of instruction to an andragogy environment maintains that the responsibility of learning comes from the students (Bogue, 1989).

The term andragogy has been adopted when referring to delivering instructional material to adults. An andragogy learning environment is developed around the learners' needs, which include facilitating problem-solving skills. It is important to remember that in this type of environment the learner is self-directed. Their education needs to be designed around guiding the learner and providing them with sufficient resources. Conversely, with traditional education, the learning environment is centered around a pedagogy approach - developed around the instructor instead of the student. In this method, the learner is more dependent on the instructor for obtaining information, and this information is distributed primarily through traditional education channels like demonstrations and lectures.

Moving from a pedagogy environment to an andragogical approach in the classroom takes additional steps which require additional effort. Instructors need a different set of skills in order to adopt this style. In the andragogical approach, there is significantly less time spent providing information directly to the classroom and much

more time spent assisting the class. The instructor's role becomes more of a facilitator than a teacher and they become a primary resource to the students' learning. Students are given the chance to learn what they want at a pace that is comfortable for them, and have the flexibility to use additional resources they find desirable to enhance their learning.

Action Learning

As the learning environment continually evolves, it is important to understand that students learn differently depending on the information provided. Knowing this, there are a number of specific techniques which educators can include in their presentations to increase action learning in the classroom. Action learning is a process where participants study their own actions and reflect on them in order to improve performance. The following derived from research by Bogue (1989) will provide short descriptions and examples of several types.

Learning Contracts

Students taking technical training classes can usually identify their need for taking the course, many times for a specific task that they need to accomplish. Integrating a learning contract for students helps to identify the process to obtain this knowledge. The learning contract starts with setting an initial goal that each student wants to reach upon completion of the course and subsequently identifying the steps to reach that goal. The students master the relevant skills in the classroom, and then transfer this knowledge to the professional setting. Students are able to keep a link to the educational setting for advice or to report success. According to Bogue (1989), when participants identify these

goals at the beginning of the session, their ability to select the techniques they need from those presented is increased.

Learning to Use Manuals

Gaining technical program literacy is often difficult. It is nearly impossible, even with intensive training, to teach the entire technical application to a student. At some point, students will need answers to their own questions that were not included with the instruction. Students need to know where they can find additional information and apply it to the problem at hand. Providing a users manual can be extremely beneficial to students' self-efficacy. Also, instructors should cater instruction to their students' future needs and develop exercises that require students to access their own information from a manual. Doing so will help reinforce the students ability to become more independent.

Problem-solving Exercises

An action learning approach gives the student access to any essential information they would need to complete the activity, allowing the student to complete the necessary steps to finish the task. These problem-solving activities allow the students to think for themselves instead of being directed by the instructor. If the instruction is too guided, it is difficult for learning to take place because the students become too involved in the process instead of understanding how the task was completed. In this technique, the instructor needs to be a facilitator rather than a teacher and become a resource to the students instead of the answer to the problem.

Modularized Training Sessions

Modularized training sessions offer training for students to accomplish a particular task without asking the students to learn the rest of the program. In this event, students have the chance to learn relevant skills of the program to accomplish a particular task instead of having to first learn insignificant features of the program. Students can diagnose their own learning needs and use the appropriate module to accomplish the task.

Multiple Presentation Methods

Students have different needs and learning styles so it is important for the instructor to adapt to these. The multiple presentation method offers a variety of learning formats for students whether it is traditional instruction combined with learning manuals or interactive tutorials. This technique allows the students to learn in whatever style they feel most comfortable with. Multiple presentation methods can also assist in students' knowledge retention by providing additional resources.

Focusing on Learning to Learn

Focusing on learning to learn helps maintain a student-centered focus. It is up to the instructor to provide the right environment for their students to learn. Students need to be actively engaged in the exercises in order to get the most out of their education. Opening the class up for discussion helps students to think for themselves and link information together. Also, repeating a question to the class and allowing others in the class to answer it helps promote self-efficacy. Utilizing a constructivist approach makes the student responsible for their learning. Instructors need to develop interpersonal skills to facilitate learning and support self-directed education.

It is important for educators to implement action learning techniques in their presentations to confront the unique learning styles of their students. Each student has a unique set of needs and educators need to be responsible for creating a learning environment conducive to their learning. It is up to the educators to become more proactive in the creation of their presentations.

Hypermedia

Hypermedia utilizes a combination of multimedia and hypertext which enables users to navigate using related text and graphics to access information. With hypermedia, the role of the active learner is emphasized. Learning is self-regulated, meaning students can have full control over their speed, time and location (Liaw, 2001).

Hypermedia is now widely used and available in professional and educational settings for creating instructional lessons. An assortment of texts, graphics, animation and sound are combined to produce dynamic and interactive hypermedia lessons. The information is organized into 'nodes' and through hypermedia these 'nodes' can be further linked into an informational network (Lee, 1998).

Hypermedia is fairly easy for educators to implement because it does not require line-by-line computing to develop an interactive lesson which was the case with most traditional programming languages. Many popular hypermedia products offer built-in programming languages and are often very user friendly using icon based developmental tools.

Hypermedia allows the user the ability to structure the learning approach, cross-reference and restructure traditional instruction practices such as textbooks and lectures

(Liaw, 2001). Lee (1998) notes that students' level of self-control and intrinsic motivation increased as the result of using hypermedia as a tool for learning. Students also favor the use of hypermedia as a means of delivery due to its practicality. "Studies have consistently shown that computer-based instruction has positive effects on students' learning" (Kondrat, p. 177). On average, students using computer-based instruction typically learn more, in less time, and like their classes more. Hypermedia is effective on the technical instruction because it is highly transferable to real problems. Students who are using video tutorials are using it to gain insight on relevant competencies that will be transferred to the workplace (Kondrat, 2004).

Hypermedia learning is beneficial to students' information retention. It can contribute to the four different learning theories. These include Bruner's three-form theory, dual coding theory, the theory of multiple representations and cognitive flexibility theory. Using Bruner's three-form theory, learners portray reality through actions, icons and symbols. Learning is based on a stimulus-response theory where the role of doing is effective in learning. Using icons, students learn through a combination of images or mental pictures where symbolic form is connected to language (Liaw, 2001).

One important benefit to hypermedia its utilization of a dual coding environment which encourages reflection and raises questions. Not only are the students learning the course work but they are also reflecting on what they learned (Palloff & Pratt, 1999). Hypermedia gives students the ability to learn and experience in one training session and expand upon what they have learned from there. Students can take the knowledge they gained from one training session and transfer the acquired knowledge to future

endeavors. Hypermedia can integrate these environments together to intrigue the active learner. Likewise, it is important that the students are actively engaged in the project.

Hypermedia is highly beneficial for instructors and students alike in professional education. Computer-assisted instruction makes it easier and more cost effective to introduce interactive tutorials into the classroom. Students enrolled in technical education courses can be trained with technical expertise and interactive tutorials help give these students an avenue to learn. There still needs to be structure to the class and an instructor that is willing to help, but effectively introducing hypermedia to the classroom can be a valuable learning avenue.

Hypermedia applications are viewed in the educational environment as a next generation instructional method that offers the learner more control over their learning experience. Cognitive flexibility theory conveys that the nature of learning is complex. A significant part of learning comes from the configuration of the program, the control, and the motivational effect it has on the student. Hypermedia is a structured environment similar to the human memory. Like a human brain, hypermedia applications are composed of nodes and ordered relationships linking information together. This network provides the foundation for learning as a result of the interactive process between the nodes of information (Liaw, 2001). According to Yildirim, Ozden and Aksu (2001) students prefer learner-controlled instructional methods. In supporting research, Crane and Mylonas (1988) stated that this type of a learning environment improved creative, individualized and active learning.

Learner-control is linked to numerous positive outcomes including motivation, increased level of engagement, positive student attitudes as well as decreased anxiety. This type of learner-centered control can also be connected to the student's sense of competence and self-efficacy. These positive attitudes can then enhance students' continuous motivation and increase their desire to learn (Yildirim et al., 2001).

Development of Hypermedia Presentations

When constructing hypermedia instructional materials, three phases should be considered:

Phase 1: Preparation. Determining the type of hypermedia presentation to develop is one of the most significant factors in the preparation phase. To do this, it is important to examine the student's baseline knowledge of the subject and plan accordingly. Students demographic like age, maturity and technology literacy should be considered during the preparation stage. Instructors should conduct a content analysis and needs assessment to determine the objectives the interactive lesson should be constructed around. Furthermore, instructors should determine the learning strategies of their students while keeping in mind that effective learning couples new knowledge to existing knowledge. Finally, instructors should identify what organizational approaches best suit the learning strategies of the individuals. During the preparation phase, utilizing a hierarchical approach can be effective in this process to connect nodes to one another (Yildirim et al., 2001).

Phase 2: Development. Building upon the objectives from the preparation phase, the development phase structures the information through content mapping and

programming. The creation of the content map is determined by the relationship of concepts with the content analysis. During the development stage, storyboarding can help to organize information and illustrate the linking of informational nodes in the application. Storyboarding shows the relationship of information and links each unit with the lesson. Once the information is organized, the application development and programming of the learning environment can begin. It is important to keep in mind that the hypermedia application should be constructed to meet the needs of the students while taking into account the information gained from the previous phases of development (Yildirim et al., 2001).

Phase 3: Evaluation. After the development of the hypermedia lesson, it is important for others to evaluate its content. The lesson should be assessed, revised and improved (Yildirim et al., 2001). Understanding students' perceptions while utilizing the application is very important to their academic achievement. By evaluating the learning environment and continually revising the experience, it can lead to a greater acceptance of the application.

Hypermedia: Advantages and Disadvantages

Hypermedia learning environments incorporate a number of different learning devices developed to enhance learning. Hypermedia typically uses a navigational structure to combine text, images, diagrams, video clips, and sound. A common approach to the design of hypermedia instructional materials is to have a main navigation for students to follow. In addition to the main navigation, hypermedia allows alternate information to be displayed for users. These additional features are intended to increase

students' comprehension by providing supplementary information on the topic as the student requests it. Other features commonly associated with hypermedia are links to objectives, site-maps and self-check questions which are essential for comprehension (Hartley, 2001).

Students are continually being asked to learn more using hypermedia content, however it must be well examined to make it most beneficial. There are several characteristics of hypermedia that can impede the learner's ability to comprehend the material from the activity. Novelty, multiple representative modes of presentation, nonlinear paths and increased learning control can frustrate the learners if they are not accustomed to this type of learning environment. Many of these characteristics have also been cited as reasons to encourage hypermedia as a means for instruction maintaining how vital it is to acquire feedback from the students about their experience with the interactive environment (Hartley, 2001).

Several characteristics that make learning with hypermedia effective can also hinder students' learning. It is noted that the environment should be conducive to the students' learning. Simply having self check questions or objectives for the students to complete does not mean students will use them effectively or even at all. It is important to consider the student's desire to succeed when developing course material around hypermedia. Students need to couple their skills with their desire to succeed in an interactive educational system (Hartley, 2001).

There are three factors that can contribute to ineffective hypermedia presentation: (a) cognitive load, (b) metacognitive development and (c) Gardner's theory of settings.

Cognitive load is the mental requirements to complete a particular task (Sweller, 1989). The increase in cognitive load could potentially hinder students' understanding and acceptance due to the increased amount of information. Any new material, especially highly technical information, requires a great deal of concentration and understanding. Asking a student to learn the desired information as well as the hypermedia program itself can be a potential inhibitor to learning (Hartley, 2001).

The hypermedia learning environment may even hinder the students' metacognitive (knowledge and regulation) development skills. If students can navigate through the interactive environment too simply, the application could be deficient in teaching the students effective learning strategies. These learning strategies prove vital in their metacognitive development and understanding of the information presented. Kuhn (1999) suggests that students are more likely to make gains in their 'metaknowing skills' by increasing their control over the learning process.

Gardner (1990) proposed the theory of settings to explain why hypermedia may be used ineffectively. Poor monitoring, primitive (ineffective) routines, limited knowledge base and attributions that are not conductive to use and minimal transfer of strategic activity can lead to poor implementation. If the educational setting is not favorable to students understanding of the activity, then implementing a hypermedia program is highly inadequate no matter the quality of the program (Hartley, 2001).

Understanding the advantages and limitation of hypermedia education while assessing students' attitudes throughout their education will allow educators to effectively construct an environment conducive to learning. Implementation of the application is not

enough; dedicated maintenance of the environment and evaluation of students' attitudes are essential to successful implementation of hypermedia in education.

Types of Computer-Based and Online Instruction

As the educational environment shifts away from a traditional style, computer technology is becoming the accepted medium for delivery. Students have the ability to learn when they want and at a pace adequate to their needs.

Computer-Assisted Instruction

There are many distinct advantages computer-assisted instruction (CAI) has in education. The most notable involves the individual actively participating in the learning process. Reinforcement of the learning objective is immediate and systematic and makes it virtually impossible for the students to be completely passive throughout the lesson.

Coupling computer-assisted education with hypermedia offers several advantages over traditional forms of training. First, the training is user-driven, meaning the student decides when they want to learn. Students have the ability to proceed at their own pace throughout the lesson, providing a learning environment adequate for students at all levels. Self regulated learning not only transfers the responsibility of learning to the students, but also frees up time for the instructor to devote to meeting students' needs. This type of learning environment allows students to learn more, while developing more innovative and creative work (Chambers & Sprecher, 1980). Second, with just-in-time learning, the education is integrated with current working processes. This is highly beneficial to the students because the information is developed by an expert in the field to meet the needs of the students. Third, computer-assisted instruction promotes just-in-

place learning. Students are able to participate in the training course no matter where they are whether at home, work or school making this type of instruction highly cost effective. Learning is not dependent on the place and time that is convenient for the instructor, but available as a convenience to the student (Kondradt, 2004).

Computer-Mediated Communication

Students today have very different needs than those of the past. Their schedules need to be flexible so they can have access to instructors and facilities. Providing off-site resources where students can access these learning opportunities where they work and live can help open the educational door to students that otherwise would not be able to participate.

Computer-mediated communication (CMC) in education provides a low-cost, accessible delivery system. Students use personal computers, internet and networks to communicate using synchronous and asynchronous modes. Research by Card and Horton (2000) imply that distance education can provide instruction to students whose location, personal agenda or other professional obligations would not allow them to otherwise take courses (p. 235). Also, with economic and demographic changes, education needs to adapt and become more productive and efficient. Educators will be asked to serve more students without an increase in funding (Card & Horton, 2000).

For effective CMC in education, Card and Horton (2000) cited research from Chickering and Gamson (1987) about the "seven principles of good practice for undergraduate education." The seven principles were developed to maintain implementation of effective CMC in education and to provide quality instruction

efficiently. Good teaching should include: (1) interaction between instructor and students, (2) opportunity to develop collaboration and cooperation among students, (3) active learning, (4) timely feedback, (5) an emphasis on time management, (6) high expectations and (7) different ways of learning.

In their research, students using computer-mediated communication while following the seven principles allowed for more student interaction, easier access to the instructor, more involvement in the course and a better overall learning experience than traditional education. Students reported that they communicated with instructors more via CMC than they did in traditional face-to-face classes. Following the seven principles can enhance students' engagement and offset the demand faced by institutions in today's changing economic and demographic society (Card & Horton, 2000).

Principle 1: Interaction between instructor and students. Technologies have increased the opportunities for students to communicate with their instructors. Students are able to converse with their instructors through e-mail, instant messaging and real-time video conferencing at each others convenience. Even at different locations, this provides increased interaction between the students and educator.

Principle 2: Opportunity to develop collaboration and cooperation among students. Students have the ability to post their knowledge to online forums making it possible for remote users to work together on a particular project. Students can collaborate on topics and leave feedback for others to build the knowledge base together.

Principle 3: Active learning. Students can actively participate and interact with technology, such as researching on the internet, in order to gain additional understanding

of the concepts. With computer-mediated communication, it is vital for all members to actively engage together. Each student is responsible for their participation in the collective learning environment.

Principle 4: Timely feedback. Technology enhances feedback between student and instructor. Instructors do not have to be physically accessible to answer questions and provide feedback. Technologies such as e-mail allow students to receive feedback almost instantaneously.

Principle 5: An emphasis on time management. Computer-mediated communication can make learning more efficient by creating an environment that is convenient for each student. Students become responsible for managing their schedules and completing their assignments on time while using technology as the medium for their learning.

Principle 6: High expectations. Higher expectations are placed on students in this type of learning medium. Students are no longer just responsible for the learning that takes place in the classroom. They have access to an unbelievable amount of information and resources at their fingertips which raises the expectations of their instructors.

Principle 7: Different ways of learning. Technology offers an assortment of delivery methods which can complement students' diverse learning styles. Students have a unique set of needs and providing a variety of presentation methods can capitalize on these needs.

Card and Horton (2000) modeled their computer-mediated communication study after traditional teaching principles. By understanding the seven principles of good

practice for undergraduate education and maintaining that the seven principles are equally present using computer-mediated communication allowed students to receive the same type of education students typically receive in traditional education while noting that they had more interaction with their instructor.

Computerized-interactive Learning

Computerized interactive learning (CIL) is composed of three major characteristics, which include individuality, interactivity and guidance. CIL systems are the basis for self-paced instruction where a learner determines the speed of the lesson. It offers students an individualized two-way learning experience between the student and the activity on the computer. This interaction guides the user through the instructional activity at an individualized speed. CIL systems often improve student comprehension by actively involving the students instead of passive instruction via traditional instruction (Kokol, Kokol & Dinevski, 2005).

Students using simulation technologies often spend much of their time overcoming the technical complexity of the simulation. Many times, the simulation is limited by availability, time and resources. Asynchronous learning can help to reduce the workload of traditional classroom teaching. Educators do not have to spend additional time to allow student to use the simulation. Whitehouse and Pellegrin (1995) estimate that students can save up to 70% of training time by utilizing their personal computer in education. Computer-based training can be an after-hours assistant to traditional classroom learning. Students have the ability to access the information any day, at any time (Tao & Guo, 2001).

Self-paced Learning

The impact of how different learning styles have affected student learning has concerned educators for years (Yin, 2001). It is important to understand these different learning styles in order to identify which instructional method would be most effective for students' retention of information. However, it is often difficult to identify the relationships between learning styles and the most effective instructional method since each student learns differently.

Ideally, with a self-paced learning environment there should be no time constraints, allowing the user as much time and resources as they need to be successful in the classroom. Self-paced learning allows students the flexibility to choose when, where, and how to learn new topics or applications. However, when implementing a self-paced learning environment into a traditional classroom setting, time constraints are usually a factor. In this case, accommodations should be made for students who may have time limitations (Yin, 2001).

Learners take different amounts of time to process information to acquire knowledge. "This knowledge is constructed through temporal sequencing of meaningful interactions between the individuals and their learning context" (Yin, p. 274). It is important for instructors to shift from a traditional instructor-centered design that asks, "how one should learn" to a learner-centered design that asks, "how does one learn?" A more adaptive learning environment puts the emphasis on the student to be responsible for sequencing and time. When the instructional experience is effectively self-managed,

this may add to the learners' sense of competence and self-efficacy, which, in turn, can enhance continuous motivation (Yildirim et al., 2001).

Throughout education, it is apparent that students have diverse learning styles. In the study by Yin (2001) many participants suggested having more "hints or notes" available to them on the material to help them through difficult or "problematic spots" during the lesson (p. 281). These hints helped some students to recover or accurately perform without getting frustrated. Therefore, it is important for instructors to monitor and observe where learners tend to have problems and design the instructional tool accordingly. For those that like to try new things and are more autonomous, providing flexible lessons would be more effective. However, for those who do not like to explore and have a more structured sense of direction (most notably in adult education); a more linear lesson will be more beneficial to them.

Educators are continually faced with the challenges of delivering quality technology training to meet the diverse needs of the students. Traditional, hands-on classroom training tends to be preferred for personal training, but due to an assortment of constraints, not everyone has equal access to the training. Supplemental self-paced tutorials offer an excellent addition to traditional education. There are many benefits that come with a self-paced classroom: increased training options, supplemental traditional training and promoting self-efficacy (Peterson, 1997).

Self-paced learning can be used as a supplemental learning tool for hands-on classes. When exposed to traditional hands-on training, Peterson (1997) notes students will retain 15-30% of the material they are exposed to. This is not enough retention to

master the skills that were covered in the training course. Many times, students do not have the resources to repeat the training over and must rely on documentation from the class. Self-paced tutorials can be used as class refreshers to gain a better understanding of topic and improve knowledge retention for future use (Peterson, 1997).

Self-paced training is important in building self-reliance. Students can access self-paced tutorials to answer the questions themselves instead of spending time tracking someone else down for information. Peterson (1997) noted if students had a question about software that was used in a hands-on classroom; their first option was to call the help desk. Their second option was to contact the instructor of the course to try and resolve their question and third, ask a fellow coworker if they had any additional information. The fourth option was to recall documentation to help find the answer. Self-paced tutorials add another option for students to utilize. Oftentimes, the questions asked by students are fairly basic and can be answered more effectively through an interactive tutorial instead of tracking down others for help (Peterson, 1997).

Self-paced tutorials allow students flexibility in learning new applications. Students can dramatically increase their knowledge retention of skills learned in a traditional hands-on training course with supplemental self-paced instruction and become more confident in learning a new application. The tutorials should be used to reinforce learning, not substitute traditional instruction. Self-paced lessons should be used as a resource for individuals who may use the materials to review specific topics or to learn new ones. The software titles should be flexible enough to keep pace with any new releases or increased demands by students and educators (Peterson, 1997).

Conclusion

As education moves from a traditional instructor-centered delivery approach to a learner-centered setting, it is imperative for educational institutions to also monitor students' attitudes towards this type of environment. The preliminary research itemized a number of benefits computer-assisted instruction with hypermedia had on students, however attitudes of the students towards this type of learning environment is rarely noted.

If the utilization of multimedia learning environments is to be maximized in education, attitudes towards these learning settings must be continuously monitored. Fast, effective instruments to assess attitudes toward multimedia instruction are crucial to this process. Awareness of students' attitudes toward multimedia-based education is critical in the evaluation of multimedia courses and development of multimedia based curriculum. For this reason, the promotion and monitoring of positive attitudes towards multimedia-based instruction is critical (Garcia, 2001).

CHAPTER III

METHODOLOGY

This study used survey methods and descriptive statistics to identify perceptions of students' attitudes towards online multimedia in education. The methodology of this study includes: (a) standards of adequacy, (b) research procedures, (c) identification of the population, (d) an instrument, (e) data collection and (f) analysis of the data. A questionnaire was administered to measure students' attitudes towards online learning with multimedia tutorials and administered to participants to gauge their response (see Appendix B). Each question on the survey pertaining to online multimedia was aligned with the research questions developed by the researcher. A final question was included on the survey as an indicator for future research.

Surveys are used frequently in educational research to describe respondents' attitudes, beliefs and opinions; to analyze the frequency of demographics and traits; or to delineate reasons for particular practices. The purpose of survey research in education is to study the distribution of characteristics in a given population for the purpose of educational planning and decision making (Mason & Bramble, 1997).

In order for survey research to be useful, the sample of respondents needs to be representative of the population being studied. The researcher used descriptive statistics to analyze the sample. Data derived from descriptive statistics was used to organize, display and interpret the information. Descriptive statistics investigate views of a group of subjects and reports the findings the way they are at the given time of the sample. Findings from survey research provide valuable data, particularly as an indicator for

further investigation (Mason & Bramble, 1997). The concluding research design was developed to examine students' perceptions towards online multimedia tutorials to supplement education received in a traditional classroom setting.

Standards of Adequacy

Research surveys are frequently used in educational research to measure attitudes and beliefs of the participants. McMillan and Schumacher (1997) listed seven questions to focus attention on the most important criteria for and judging the adequacy of descriptive research designs. The researcher aligned each item on the questionnaire to McMillan and Schumacher's model to ensure that the questionnaire met the objectives of the research. When developing research surveys it is important to keep the following questions in mind:

1. Are the objectives and purposes of the survey clear?

   The purpose of the questionnaire was to measure students' perceptions of online multimedia tutorials in education. Each item response was aligned with the objective and purpose of this study and created to answer the supporting research questions.

2. Is it likely that the target population and sampling procedure will provide credible answers to the research questions?

   The students sampled in this study were chosen because of their familiarity with multimedia education. They were advised to participate willingly and with anonymity to maintain their credibility.

3. Is the instrument clearly designed and well worded?

The questionnaire was developed through empirical research, reviewed by peers, and suggestions by the thesis advisory committee were welcomed in order to ensure clarity and legibility.

4. Is there assurance of confidentiality of responses?

A consent form was attached to the questionnaire that noted the confidentiality of responses as well as a verbal statement by the researcher assuring the students anonymity. No names were solicited by the researcher for the purpose of this research.

5. Does the letter of transmittal establish the credibility of the research?

In conjunction with the consent form, a brief description of the procedure and expected benefits of this study were included to establish credibility of the research.

6. What is the return rate?

The survey was distributed during class and students were given adequate time to respond to the items, limiting the number of non-respondents.

7. Do the conclusions reflect return rate and other possible limitations?

Conclusions were based on a return rate of nearly 100%, so correlations are valid.

Research Procedure

As previously noted, the research procedure for this study followed the survey development methods created by McMillan and Schumacher (1997). The first step in survey research was to define the purpose and objectives of the research. It has been previously noted that the purpose of this research is to analyze the perceptions students have on the impact of online multimedia and their learning.

The second step was to select the resources and target population. The questionnaire consisted of 29-items: three demographic items and 25 questions measuring students' attitudes towards online multimedia tutorials. A final question was included in the questionnaire as an indicator for future research. The questionnaire was produced by the researcher and distributed to students in multimedia-based courses. The target population consisted of students at a Midwestern university enrolled in four courses using multimedia learning environments.

The third step of the survey method was to choose and develop techniques for gathering data. As noted by McMillan and Schumacher (1997) and Mason and Bramble (1997), questionnaires are the most frequently used technique for collecting data in educational research; therefore the researcher developed a questionnaire as the primary data collection tool for this study. Each student would receive the same questionnaire in the same manner to maintain its accuracy. The objectives of the questionnaire are based on the research questions previously noted and each item on the questionnaire was aligned with the corresponding research question.

The fourth step of survey research design was sampling. The researcher used convenience sampling to select the desired courses during the summer 2007 semester. McMillan and Schumacher (1997) define convenience as a group of subjects selected on the basis of being accessible or expedient (p. 169). Convenience samples are often used in educational and behavioral research due to the accessibility and ease of data collection. The researcher used this type of non-probability sampling due to the availability of the respondents to the researcher. The convenience sample of 123 students at a Midwestern

university was created to tabulate their responses towards learning via an online multimedia medium.

The fifth step was a letter of transmittal. A questionnaire and a consent letter were distributed to participants in their classroom setting by the researcher (Appendix C). As advised by McMillan and Schumacher (1997) the consent letter listed the names and identifications of the researcher and thesis advisory chair; the purpose and intention of the questionnaire; the importance of the study; protection of the respondents to ensure anonymity; a brief description of the procedure; expected benefits of the study; and request for cooperation and honesty of participating in the study.

The sixth step recommended for research survey design was a follow-up questionnaire. The researcher limited the questionnaires to 29-items that could be completed before class. There was no need for a follow-up because the questionnaires were completed in class and returned to the researcher.

The seventh step was to account for non-respondents. In most research survey studies there will be a percentage of subjects who fail to return the questionnaire. There was no need to account for non-respondents for this research because all of the questionnaires were returned to the researcher upon completion in class.

Identification of the Sample Population

The sample of this study consisted of 123 students enrolled in four courses at a Midwestern university for the summer 2007 semester. Classes were recommended by University professors due to their use of multimedia in the classroom. Each course was

selected specifically by the researcher because of the use of multimedia learning in the class. A total of four courses were included in this research.

The first course was a Web Publishing class from the Graphic Communications program in the Department of Industrial Technology and selected because of the course focus on technology. Multimedia tutorials are a prevalent learning medium for students in technical training courses. Students enrolled in this course are required to develop interactive web applications and multimedia tutorials can be a helpful learning avenue.

The second course consisted of students from the Capstone class as part of a General Education requirement at the University. Students enrolled in Capstone often learn from multimedia about significant issues confronting society regarding natural and social components in the environment. Additionally, as a General Education course the researcher included this class in the research to survey students across multiple educational backgrounds.

The third course consisted of students enrolled in an Educational Media and Classroom Computing class from the Instructional Technology Division in the College of Education. Students enrolled in this course investigate the historical, social and scientific uses of technology in education. Students learn how to build multimedia lessons to use as examples for future lessons.

The participants in the final course were enrolled in the Teaching Elementary School Social Studies from the College of Education. Students enrolled in this course investigate teaching materials and appropriate instructional strategies for teaching.

A total number of 123 students were sampled (122 returned) for this research through four courses. Of the respondents, four were graduate students, 68 seniors, 44 were juniors, five sophomores and one freshman. All students observed in this study participated willingly and it was assumed they answered truthfully on the survey. Students enrolled in each program are primarily undergraduate students taking the class for credit to meet their program requirements.

Instrument

There are many computer attitude scales available to researchers that measure anxiety and other computer-related attitudes of the respondents (e.g. Computer Anxiety Index, Computer Attitude Scale, Attitudes Towards Computers Scale) but tend to fall short in analyzing students' overall perceptions toward this type of learning environment. Garcia (2001) developed eight multimedia-based dimensions in order to better gauge their perceptions. These included: (a) students' views toward computer interaction, (b) students' attitudes toward the learner's control over the instructional process, (c) students' degree of involvement in the multimedia activity, (d) students' views on individualized instruction, (e) students' perceptions toward self-paced instruction, (f) students' perceptions toward the instructional application used in terms of its user-friendliness, (g) students' levels of anxiety when working with multimedia and (h) students' general opinions towards their experience with the instructional material (Garcia, 2001).

The researcher adapted the survey questions created by Garcia from her eight multimedia-based dimensions and aligned them with the research questions included in

this study. Additionally, the researcher consulted other research about developing sample surveys. Spunts' (2003) research on customer service questionnaires was also analyzed as a comprehensive guide to determine survey objectives for organizing and writing questions correctly. The researcher followed his six essential steps for good questionnaire design. They include:

1. Setting objectives.
2. Choosing the target audience.
3. Determining the survey medium.
4. Constructing the questionnaire.
5. Conducting the survey.
6. Analyzing and reporting the results.

The researcher used the guidelines from Spunt & Garcia as the foundation for the survey development and requisite questions. The objective of this research is to analyze students' perceptions of online multimedia to support classroom instruction. The researcher developed five hypotheses to analyze their perceptions. Five supporting questions were developed to prove or disprove each of the five hypotheses. A draft of the questionnaire was sent to the thesis advisory committee welcoming their suggestions.

The questionnaire was divided into two sections: (1) demographic data and (2) learning environment evaluation. The first section included in the questionnaire detailed the respondents' demographic information. Three questions were incorporated to acquire background information from the respondents. The first question was an open-ended question asking for the students major. The second item was included to acquire the

students' classification (e.g. freshman, sophomore, junior, senior or graduate). The final question in the demographic section was incorporated to gauge each students experience with online multimedia tutorials. In order to accurately answer the subsequent questions pertaining to their perceptions on the learning environment, it is imperative that the students have an understanding of online multimedia tutorials. Sample tutorials were provided by the researcher to clarify any misconceptions students may have about online multimedia tutorials.

The second section of the questionnaire analyzed students' perceptions of the learning environment. This section consisted of 25 questions developed to answer each of the five supporting hypotheses:

1. Students who use web-based tutorials are no more independent than students who do not use online multimedia tutorials.
2. There is no relationship between computer-assisted instruction and learning autonomy.
3. There is no relationship between computer-assisted instruction and classroom autonomy.
4. Computer-assisted instruction has no effect on students' learning.
5. The level of anxiety of students who use online multimedia tutorials is not different from the anxiety level of students who do not use online tutorials.

Five questions were developed to answer each of the research questions. A final question was included as a recommendation item as to whether students feel classes teaching new applications should provide additional multimedia resources for students.

The questionnaire was developed to compare the students' perceptions of the resources provided to complete their coursework. The data collected from the survey answered questions pertaining to the benefit of additional online tutorials, learner independence, classroom autonomy, effect on learning and anxiety. To gauge students' perceptions about their experience with online multimedia tutorials the students were asked to provide answers on the questionnaire by using a Likert five-item scale to choose whether they (1) Strongly Disagree, (2) Disagree, (3) Undecided, (4) Agree, or (5) Strongly Agree with the proposed question (see Appendix A). Names were not solicited on the questionnaire to ensure confidentiality and the questionnaire was distributed anonymously to students before the start of class. The students sampled in the research were informed that completion of the survey was not mandatory.

Data Collection

Data was collected through the distribution of the questionnaire during class. Students were asked to mark the response that most closely indicated their feelings towards each statement and to choose only one response for each item. Each participant who was involved in this study was given a consent form and participated willingly and anonymously.

Questions on the survey addressed students' overall perceptions of online multimedia tutorials from their prior classroom experiences. The questionnaire indicated that in order to answer the items relating to supplemental online multimedia instruction, an understanding of online multimedia tutorials was imperative. The researcher provided samples of multimedia training tutorials relating to website development as examples for

the research participants to consult in order to clarify any misconceptions about the definition of online multimedia tutorials. Each example tutorial related to a particular lesson in website development (i.e. inserting and formatting tables, inserting images and text, etc.) which students could access in order to learn specific website development techniques.

Analysis of the Data

After the survey was completed, the respondents' information was inputted into a spreadsheet to chart the data. Basic statistical tests (e.g. mean, median, mode, standard deviation, variance and frequency) were conducted to chart the distribution of students' attitudes towards multimedia education. This study used descriptive statistical methods to analyze the data to answer the research questions. A *t* test at the 95% confidence level was also conducted to test for significance in students' perceptions.

CHAPTER IV

DATA ANALYSIS

This chapter presents an analysis of the findings for this research. The primary purpose of this study was to analyze the perceptions students had towards online multimedia tutorials to assist classroom instruction. In the context of this research, it is vital to understand students' feelings towards learning through online avenues. The findings were formulated from an analysis of data from answers to each of the five hypotheses. In order to derive the findings, 29 questions were distributed to students from various educational backgrounds.

The questionnaire was divided into two distinct sections. (1) Demographic data included (a) program of study, (b) classification and (c) experience with online multimedia tutorials. (2) Responses to 25 questions pertaining to students' perceptions of online multimedia tutorials were analyzed to answer the five hypotheses. A final question was posed by the researcher was included as an indicator for future recommendations.

Data from the questionnaire was collected by determining the mean student responses related to the five research questions included for each hypothesis. Students' responses to the 25 research questions were tabulated on a Likert five-item scale. Options for the responses were: (1) Strongly Disagree, (2) Disagree, (3) Undecided, (4) Agree, (5) Strongly Agree.

Description of the Responses

Four courses were sampled for the findings of this research during the summer 2007 semester. A total of 123 questionnaires were distributed and returned to the researcher and included in the analysis. One questionnaire was excluded from the findings due to a lack of completeness.

Demographic Information

Three demographic items were addressed on the questionnaire. The demographic data of the participants revealed their (a) college, (b) classification and (c) experience with online multimedia tutorials.

Distribution by College

This study involved four courses from the summer 2007 semester: (1) Capstone, (2) Educational Media, (3) Web Development and (4) Teaching Elementary School Social Studies. Students identified their major on the questionnaire, from that; the researcher grouped the students by College. A majority (58%) of students that were sampled were students from the College of Education (see Table 1).

Table 1

Distribution by College

College	(*n*)	%
Business Administration	15	12.3%
Education	71	58.2%
Humanities and Fine Arts	7	5.7%
Natural Sciences	12	9.8%
Social and Behavioral Science	13	10.7%
(Graduate and Continuing Education)	4	3.3%
	122	100%

Classification

The majority of students sampled for this study were juniors and seniors (see Table 2). From the total population, 68 students sampled were seniors (55.7%) and 44 students were juniors (36.1%). There were five sophomores included in the population (4.1%), while only one freshman participated in this study. An additional four (3.3%) graduate students participated in this survey.

Table 2

Classification

Classification	(*n*)	%
Freshman	1	0.8%
Sophomore	5	4.1%
Junior	44	36.1%
Senior	68	55.7%
Graduate	4	3.3%
	122	100%

Experience with Multimedia Tutorials

Students were asked to identify if they had used online multimedia tutorials prior to completing the questions pertaining to online multimedia tutorials. A majority (101 students or 82.8%) of students noted they had utilized online multimedia tutorials as shown in the Table 3. The remaining 21 students (17.2%) noted that they had not used online multimedia tutorials prior to receiving the questionnaire.

Table 3

Experience with Multimedia Tutorials

Experience	(*n*)	%
Yes	101	82.8%
No	21	17.2%
	122	100%

Hypotheses Testing

Five null hypotheses predicted that there would be no significant difference between students' perceptions for those who have had experience with online multimedia tutorials and those who have not had prior experience. The five null hypotheses stated:

1. Students using supplemental online multimedia tutorials are no more independent learners than students who do not use online multimedia tutorials.
2. There is no relationship between supplemental computer-assisted instruction and learning autonomy.
3. There is no relationship between computer-assisted instruction and classroom autonomy.
4. Computer-assisted instruction has no effect on student learning.
5. The level of anxiety of students who use online multimedia tutorials is not different from the anxiety level of students who do not use online tutorials.

Evaluation of the Questionnaire

A questionnaire was distributed to students to gauge their perceptions towards online multimedia tutorials. For each of the five hypotheses, five research questions were aligned to the questionnaire. A Likert five-item scale was used to determine the frequency, percentage, mean, median, mode, standard deviation and variance of the responses. Of the 122 surveys returned to the researcher, 21 of the respondents noted that they had no prior knowledge of using online multimedia tutorials. The 21 students who had never used online-multimedia tutorials were added to Group 1. The remaining 101 students that had experience with online multimedia tutorials were added to Group 2. The table in Appendix D illustrates the mean (*M*), standard deviation (*SD*), and number (*n*) of students in each group.

Hypothesis One: Frequency of Students Attitudes

Hypothesis One: Students who use web-based tutorials are no more independent than students who do not use online multimedia tutorials.

Question 1. Do students retain more information when online tutorials are available?

This question was intended to gauge each student's perceived retention of information when presented with supplemental online multimedia tutorials to assist classroom instruction. Student responses to this question indicated that more than 71% of the students who have used online multimedia tutorials agreed with the statement (11.9% strongly agreed and 59.4% agreed) compared to only 33% of students from Group 1 who agreed with the question. Table 4 shows the frequency of student attitudes to Question 1 for Group 1 and Group 2.

Table 4

Hypothesis One: Question 1

Question 1	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	12	57.1%	5	23.8%	2	9.5%
Group 2	1	1.0%	6	5.9%	22	21.8%	60	59.4%	12	11.9%

May not add due to rounding.

Question 2. Are students who use online supplemental material more independent learners than users who learn by traditional classroom instructional methods?

This question was developed to measure whether students are more independent learners when online supplemental materials are available. In order for instructional systems to become more adaptive to students, it is important to place additional emphasis on learner-demonstrated learning styles. Student responses to this question indicated that more than 70% of the students from Group 2 agreed with the statement (7.9% strongly agreed and 62.4% agreed) compared to 38% from the students who reported no prior experience with online multimedia tutorials. Table 5 shows the frequency of replies to Question 2.

Table 5

Hypothesis One: Question 2

Question 2	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	4	19.1%	8	38.1%	7	33.3%	1	4.8%
Group 2	1	1.0%	10	9.9%	19	18.8%	63	62.4%	8	7.9%

May not add due to rounding.

Question 3. Is students' learning enhanced when online tutorials are available?

This question was intended to gauge whether students believe their learning was enhanced when online tutorials were available. Student responses to this question indicated that more than 85% of the students surveyed in Group 2 agreed with the statement (20.8% strongly agreed and 64.4% agreed). Of the 21 responses in Group 1, 48% of the respondents agreed with the statement. Table 6 shows the frequency of replies to Question 3.

Table 6

Hypothesis One: Question 3

Question 3	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	1	4.8%	10	47.6%	7	33.3%	3	14.3%
Group 2	0	0.0%	5	5.0%	10	9.9%	65	64.4%	21	20.8%

May not add due to rounding.

Question 4. Do online tutorials allow students to work at their own pace?

This question was included to measure whether students believe online multimedia tutorials allow them to work at their own pace. As noted by the researcher with self-paced training, it important to build self-reliance. Online tutorials allow students to answer questions themselves on their own time. Student responses from this question indicated more than 82% of the students sampled from Group 2 agreed with this statement (18.8% strongly agreed and 63.4% agreed). Only 38% of students with no prior online multimedia tutorial experience agreed with the statement. Table 7 shows the frequency of replies to Question 4.

Table 7

Hypothesis One: Question 4

Question 4	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	11	52.4%	7	33.3%	1	4.8%
Group 2	0	0.0%	5	5.0%	13	12.9%	64	63.4%	19	18.8%

May not add due to rounding.

Question 5. Do students ask fewer questions when online multimedia tutorials are available?

It is important to move student learning styles away from instructor-centered delivery to a learner-centered environment to promote self-efficacy. This question was developed to assess whether students believe that they asked fewer questions and need less assistance when online multimedia tutorials are available for reference. Student responses from Group 2 indicated that nearly 57% of these students agreed with the statement (6.9% strongly agreed and 49.5% agreed) compared to only 29% of students in Group 1. Table 8 shows the frequency of replies to Question 5.

Table 8

Hypothesis One: Question 5

Question 5	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	2	9.5%	12	57.1%	5	23.8%	1	4.8%
Group 2	0	0.0%	15	14.9%	29	28.7%	50	49.5%	7	6.9%

May not add due to rounding.

Hypothesis Two: Frequency of Students Attitudes

Hypothesis Two: There is no relationship between computer-assisted instruction and learning autonomy.

Question 1. Is there a relationship between online learning with supplemental tutorials and self-efficacy?

This question was intended to determine if students believe there is a relationship between online learning with supplemental multimedia tutorials and self-efficacy. Student responses from this question indicated that more than 66% of the students in Group 2 agreed with the statement (14.9% strongly agreed and 51.5% agreed). Students in Group 1 indicated that only 43% of them believe online learning with supplemental tutorials fosters self-efficacy. Table 9 shows the frequency of replies to Question 1.

Table 9

Hypothesis Two: Question 1

Question 1	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	10	47.6%	8	38.1%	1	4.8%
Group 2	1	1.0%	10	9.9%	23	22.8%	52	51.5%	15	14.9%

May not add due to rounding.

Question 2. Are students more autonomous learners when online tutorials are available to assist classroom activities?

This question was developed to analyze whether students feel they are more autonomous learners when online multimedia tutorials are available to assist the classroom activities. Student responses from Group 2 indicated that 83% of the students agreed with the statement (21.8% strongly agreed and 61.4% agreed) while 52% of respondent from Group 1 agreed with the statement. Table 10 shows the frequency of replies to Question 2.

Table 10

Hypothesis Two: Question 2

Question 2	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	1	4.8%	9	42.9%	11	52.4%	0	0.0%
Group 2	0	0.0%	3	3.0%	14	13.9%	62	61.4%	22	21.8%

May not add due to rounding.

Question 3. Are students more open-minded about computer software when online resources are available?

Students' levels of self-directed and intrinsic motivation are increased as a result of introduction online multimedia tutorials. This question was developed to gauge whether students felt they were more open-minded about computer software when additional online resources were available. Student responses from this question indicated that about 64% of the students from Group 2 agreed with the statement (13.9% strongly agreed and 50.5% agreed) compared to 38% from Group 2. Table 11 shows the frequency of replies to Question 3.

Table 11

Hypothesis Two: Question 3

Question 3	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	3	14.3%	10	47.6%	8	38.1%	0	0.0%
Group 2	0	0.0%	12	11.9%	24	23.8%	51	50.5%	14	13.9%

May not add due to rounding.

Question 4. Do students have more learning control when online tutorials are available?

This question was incorporated to determine whether students' feel they have more learning control when online tutorials are available to reference. Supplemental resources available for students to reference emphasize the role of the active learner. Learning is self-regulated. Student responses from this question indicated that about 70% of the students who have had experience with online multimedia tutorials agreed with the statement (9.9% strongly agreed and 60.4% agreed). Of the 21 students in Group 1, only 29% agreed with the question. Table 12 shows the frequency of replies to Question 4.

Table 12

Hypothesis Two: Question 4

Question 4	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	13	61.9%	6	28.6%	0	0.0%
Group 2	0	0.0%	9	8.9%	21	20.8%	61	60.4%	10	9.9%

May not add due to rounding.

Question 5. Do students identify less learning frustration when online multimedia tutorials are available?

This question was developed to identify if students feel less frustration learning a new application when online multimedia tutorials are available. Student responses from this question indicated that more than 53% of the students from Group 2 agreed with the statement (10.9% strongly agreed and 42.6% agreed) while only 19% of the students from Group 1 agreed with the statement. Table 13 shows the frequency of replies to Question 5.

Table 13

Hypothesis Two: Question 5

Question 5	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	3	14.3%	14	66.7%	3	14.3%	1	4.8%
Group 2	0	0.0%	16	15.8%	31	30.7%	43	42.6%	11	10.9%

May not add due to rounding.

Hypothesis Three: Frequency of Students Attitudes

Hypothesis Three: There is no relationship between computer-assisted instruction and classroom autonomy.

Question 1. Do students spend more time on developing projects when online tutorials are available?

Self-directed learning with supplemental tutorials enables students to work at their own pace. This question was developed to identify if students feel there is more development time on projects that include additional online multimedia tutorials as a resource. Student responses from Group 2 indicated that 50% of the students agreed with the statement (5.9% strongly agreed and 44.6% agreed). Only 19% of the students from Group 1 agreed with the research question. Table 14 shows the frequency of replies to Question 1.

Table 14

Hypothesis Three: Question 1

Question 1	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	2	9.5%	14	66.7%	3	14.3%	1	4.8%
Group 2	0	0.0%	20	19.8%	30	29.7%	45	44.6%	6	5.9%

May not add due to rounding.

Question 2. Is less time spent on instruction when online multimedia tutorials are available?

This question was included to examine if less time was spent on instruction in classes where online multimedia tutorials are utilized. Time is a critical issue in learning. The role of the instructor needs to be that of a facilitator instead of teacher with the implementation of hypermedia. As a facilitator, students can spend additional time be on learning the application. Student responses from this question indicated more than 67% of the students from Group 2 agreed with the statement (7.9% strongly agreed and 59.4% agreed) whereas only 14% of the students from Group 1 indicated that they agreed. Table 15 shows the frequency of replies to Question 2.

Table 15

Hypothesis Three: Question 2

Question 2	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	16	76.2%	3	14.3%	0	0.0%
Group 2	3	3.0%	11	10.9%	19	18.8%	60	59.4%	8	7.9%

May not add due to rounding.

Question 3. Do students prefer online tutorials instead of traditional handouts?

This question was developed to evaluate if students prefer online tutorials instead of traditional handouts. Student responses from this question indicated a majority of the students (46%) from Group 2 disagreed to the question (40.6% disagreed and 5.0% strongly disagreed). Similarly, nearly 43% of students in Group 1 also disagreed with the statement. Table 16 shows the frequency of replies to Question 3.

Table 16

Hypothesis Three: Question 3

Question 3	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	9	42.9%	8	38.1%	4	19.0%	0	0.0%
Group 2	5	5.0%	41	40.6%	30	29.7%	19	18.8%	6	5.9%

May not add due to rounding.

Question 4. Is there a relationship between computer-assisted instruction with online multimedia tutorials and students' autonomy?

At some point, students will need to answer their own questions that may not be covered in the classroom. This question was included to explore the relationship between computer-assisted instruction with online multimedia tutorials and students' autonomy. Student from Group 2 indicated more than 66% of the students agreed with the statement (5.9% strongly agreed and 60.4% agreed) while only 24% of the respondents from Group 1 agreed with the statement. Table 17 shows the frequency of replies to Question 4.

Table 17

Hypothesis Three: Question 4

Question 4	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	3	14.3%	13	61.9%	5	23.8%	0	0.0%
Group 2	0	0.0%	7	6.9%	27	26.7%	61	60.4%	6	5.9%

May not add due to rounding.

Question 5. Do students control the pace of their learning when online multimedia tutorials are available?

Learners take different time to process information and acquire knowledge. With supplemental multimedia tutorials, students have the ability to access the information any day at any time and control the tutorials at their own pace. This question was created to gauge whether students' felt they had more control over the pace of their learning when online multimedia tutorials are available. Student responses from this question indicated nearly 86% of the students in Group 2 agreed with the statement (13.9% strongly agreed and 71.3% agreed) while only 38% of students in Group 1 agreed to the same statement. Table 18 shows the frequency of replies to Question 5.

Table 18

Hypothesis Three: Question 5

Question 5	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	2	9.5%	10	47.6%	8	38.1%	0	0.0%
Group 2	0	0.0%	5	5.0%	10	9.9%	72	71.3%	14	13.9%

May not add due to rounding.

Hypothesis Four: Frequency of Students Attitudes

Hypothesis Four: Computer-assisted instruction has no effect on students' learning.

Question 1. Do students retain more information when supplemental online tutorials are available?

This question was developed to assess whether students feel they retain more information when additional online multimedia tutorials are available. Research indicates that students who utilize instructional tutorials learn more in less time. Student responses from this question indicated more than 55% of the students from the Group 2 agreed with the statement (6.9% strongly agreed and 48.5% agreed). Students from Group 1 indicated that only 33% agreed with the statement. Table 19 shows the frequency of replies to Question 1.

Table 19

Hypothesis Four: Question 1

Question 1	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	3	14.3%	10	47.6%	7	33.3%	0	0.0%
Group 2	1	1.0%	10	9.9%	34	33.7%	49	48.5%	7	6.9%

May not add due to rounding.

Question 2. Do students like their classes more when online tutorials are available?

This question was created to gauge if students like their classes more if online multimedia tutorials are available. Student responses from this question indicated 65% of the students from Group 2 agreed with the statement (7.9% strongly agreed and 57.4% agreed) while only 29% of the respondents from Group 1 indicated they agreed with the question. Table 20 shows the frequency of replies to Question 2.

Table 20

Hypothesis Four: Question 2

Question 2	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	1	4.8%	13	61.9%	6	28.6%	0	0.0%
Group 2	1	1.0%	12	11.9%	22	21.8%	58	57.4%	8	7.9%

May not add due to rounding.

Question 3. Are students more motivated when online tutorials are available?

This question was developed to analyze if students feel more motivate when online tutorials are prevalent. Student responses from Group 2 indicated that 45% of the students agreed with the statement (5.9% strongly agreed and 38.6% agreed) however a close majority (36.6%) of these students were undecided about their motivation. In Group 2, only 24% of the students agreed with the statement. Table 21 shows the frequency of replies to Question 3.

Table 21

Hypothesis Four: Question 3

Question 3	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	5	23.8%	10	47.6%	5	23.8%	0	0.0%
Group 2	0	0.0%	19	18.8%	37	36.6%	39	38.6%	6	5.9%

May not add due to rounding.

Question 4. Are lessons learned more efficiently when online tutorials are utilized?

This question was included to assess whether students felt learning was more efficient when online tutorials were utilized. Student responses from this question indicated 60% of the students from Group 2 agreed with the statement (11.9% strongly agreed and 48.5% agreed). More than 76% of the students in Group 1 were undecided in response to the question and only 19% agreed with the statement. Table 22 shows the frequency of replies to Question 4.

Table 22

Hypothesis Four: Question 4

Question 4	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	0	0.0%	16	76.2%	4	19.0%	0	0.0%
Group 2	0	0.0%	11	10.9%	29	28.7%	49	48.5%	12	11.9%

May not add due to rounding.

Question 5. Do online tutorials have positive effects on students' learning?

This question was developed to evaluate whether online tutorials have positive effects on students learning. Student responses from this question indicated more than 72% of the students from Group 2 agreed with the statement (11.9% strongly agreed and 60.4% agreed). Of the 21 students in Group 2, only 29% agreed with the question. Table 23 shows the frequency of replies to Question 5.

Table 23

Hypothesis Four: Question 5

Question 5	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	13	61.9%	6	28.6%	0	0.0%
Group 2	1	1.0%	3	3.0%	24	23.8%	61	60.4%	12	11.9%

May not add due to rounding.

Hypothesis Five: Frequency of Students Attitudes

Hypothesis Five: The level of anxiety of students who use online multimedia tutorials is not different from the anxiety level of students who do not use online tutorials.

Question 1. Do students feel learning is easier with online tutorials?

This question was included to evaluate whether students felt learning was easier with online multimedia tutorials to assist their instruction. Student responses from the Group 2 indicated that almost 70% of the students agreed with the statement (10.9% strongly agreed and 58.4% agreed) whereas nearly 29% of the students from Group 2 agreed with the statement. Table 24 shows the frequency of replies to Question 1.

Table 24

Hypothesis Five: Question 1

Question 1	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	2	9.5%	13	61.9%	6	28.6%	0	0.0%
Group 2	0	0.0%	7	6.9%	24	23.8%	59	58.4%	11	10.9%

May not add due to rounding.

Question 2. Are students more engaged in their coursework when online tutorials are available?

This question was developed to assess whether students felt more engaged in their coursework when online multimedia tutorials are available. Student responses from this question indicated more than 60% of the students who had prior experience with online multimedia agreed with the statement (5.9% strongly agreed and 54.5% agreed) compared to 19% from the students who had no prior experience. Table 25 shows the frequency of replies to Question 2.

Table 25

Hypothesis Five: Question 2

Question 2	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	1	4.8%	15	71.4%	4	19.0%	0	0.0%
Group 2	0	0.0%	12	11.9%	28	27.8%	55	54.5%	6	5.9%

May not add due to rounding.

Question 3. Do students have more positive attitudes about learning new software when additional online tutorials are available?

This question was included to assess whether students had better attitudes about learning new software when additional tutorials were available. Student responses from Group 2 indicated about 64% of the students agreed with the statement (9.9% strongly agreed and 54.5% agreed). Only 19% of the students from Group 1 agreed with the statement. Table 26 shows the frequency of replies to Question 3.

Table 26

Hypothesis Five: Question 3

Question 3	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	1	4.8%	15	71.4%	4	19.0%	0	0.0%
Group 2	0	0.0%	11	10.9%	25	24.8%	55	54.5%	10	9.9%

May not add due to rounding.

Question 4. Do students feel less anxiety when online tutorials are available?

This question was developed to gauge if students felt less anxiety when online tutorials are available to assist classroom instruction. Student responses from this question indicated more than 64% of the students who have experience with online multimedia tutorials agreed with the statement (10.9% strongly agreed and 53.5% agreed). Only 29% of the students from Group 1 noted that they agreed with the question. Table 27 shows the frequency of replies to Question 4.

Table 27

Hypothesis Five: Question 4

Question 4	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	1	4.8%	3	14.3%	11	52.4%	6	28.6%	0	0.0%
Group 2	0	0.0%	11	10.9%	25	24.8%	54	53.5%	11	10.9%

May not add due to rounding.

Question 5. Does human voice diminish learning anxiety when added to online multimedia tutorials?

This question was developed to gauge if human voice diminished learning anxiety when added to online multimedia tutorials. A majority of students (38.6%) from Group 2 were undecided about their anxiety levels with supplemental tutorials while 52% of the students from Group 1 noted they were also undecided. Table 28 shows the frequency of replies to Question 5.

Table 28

Hypothesis Five: Question 5

Question 5	SD		D		U		A		SA	
	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%
Group 1	0	0.0%	3	14.3%	11	52.4%	5	23.8%	2	9.5%
Group 2	2	2.0%	16	15.8%	39	38.6%	31	30.7%	13	12.9%

May not add due to rounding.

Hypotheses Findings

To test the hypothesis, the means for each hypothesizes questions were summed to compare the two groups. A *t* test at the 95% confidence level was administered to compare the perceptions of the students who had no prior experience using online multimedia tutorials (Group 1) and the students who had experience (Group 2). For each *t* test, the null hypothesis indicated that there is no difference in the perceptions of the two group; the statistical alternative is the means of the two groups are different (student perceptions towards online multimedia to support education are statistically significant).

Hypothesis One Findings

Null hypothesis one stated students who use web-based tutorials are no more independent than students who do not use online multimedia tutorials. The average mean scores for all five questions were summed to test the hypothesis. The average mean for students in Group 1 was 3.34 compared to 3.79 for students in Group 2.

The data collected from the questionnaire indicated that students' perceptions towards online multimedia tutorials to support instruction are favorable for those who had experience with online multimedia tutorials. Student responses from Group 1 were primarily undecided ($M = 3.34$, $SD = 0.85$) towards the questions whereas the students from Group 2 typically agreed ($M = 3.79$, $SD = 0.75$) with the statements (see Table 29).

Table 29

Hypothesis One: Means of Student Responses

	Group 1 ($n = 21$)		Group 2 ($n = 101$)	
Hypothesis One	*M*	*SD*	*M*	*SD*
Question 1	3.33	0.88	3.77	0.76
Question 2	3.14	0.96	3.68	0.79
Question 3	3.57	0.81	4.03	0.69
Question 4	3.33	0.73	3.98	0.69
Question 5	3.33	0.85	3.50	0.82

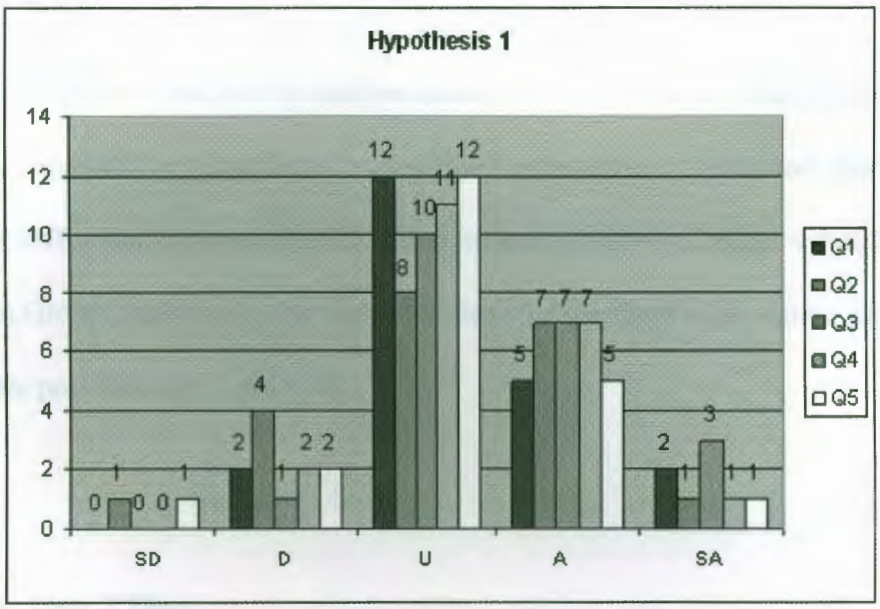

Figure 1. Hypothesis One: Group 1 Frequencies

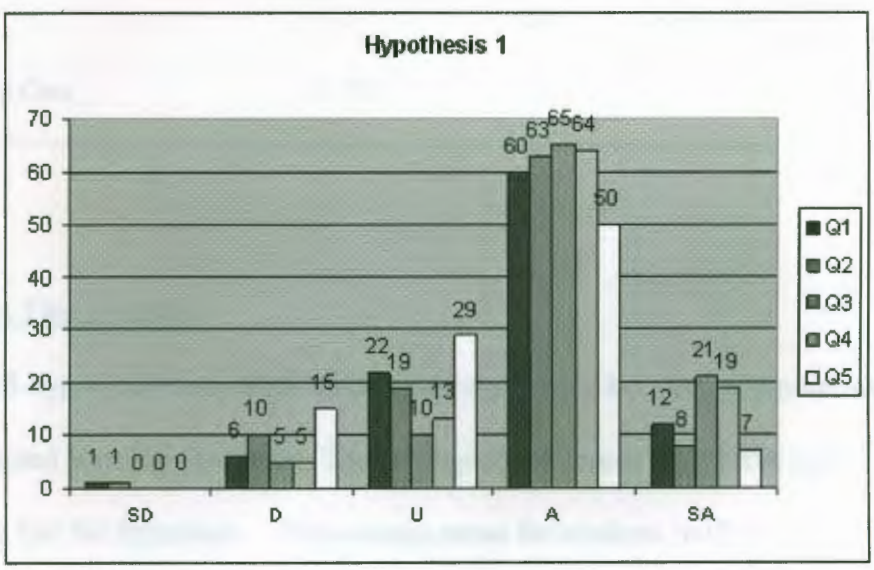

Figure 2. Hypothesis One: Group 2 Frequencies

Hypothesis One: T Test

The questions designed to analyze students' independence when online multimedia tutorials are included with classroom instruction, as predicted, there was a significant difference between the two group means, $t(120) = -3.383$, $p < 0.001$ with the students in Group 2 indicating that they feel more independent when online multimedia tutorials are provided (see Table 30).

Table 30

Hypothesis One: T Test

Independent Samples T Test			
	t	df	Significance
Hypothesis One	-3.383	120	.001

$p < .005$

Hypothesis Two Findings

Null hypothesis two stated there is no relationship between computer-assisted instruction and learning autonomy. The average mean scores for all five questions were summed to test the hypothesis. The average mean for students in Group 1 was 3.27 compared to 3.73 for students in Group 2.

The data collected from the questionnaire indicated that students' perceptions towards online multimedia tutorials to support instruction are favorable for those who had

experience with online multimedia tutorials. Student responses from Group 1 were primarily undecided ($M = 3.27$, $SD = 0.69$) towards the questions whereas the students from Group 2 typically agreed ($M = 3.73$, $SD = 0.80$) with the statements (see Table 31).

Table 31

Hypothesis Two: Means of Student Responses

	Group 1 ($n = 21$)		Group 2 ($n = 101$)	
Hypothesis Two	*M*	*SD*	*M*	*SD*
Question 1	3.38	0.74	3.71	0.86
Question 2	3.48	0.60	4.04	0.67
Question 3	3.24	0.70	3.68	0.85
Question 4	3.19	0.60	3.73	0.75
Question 5	3.10	0.70	3.50	0.88

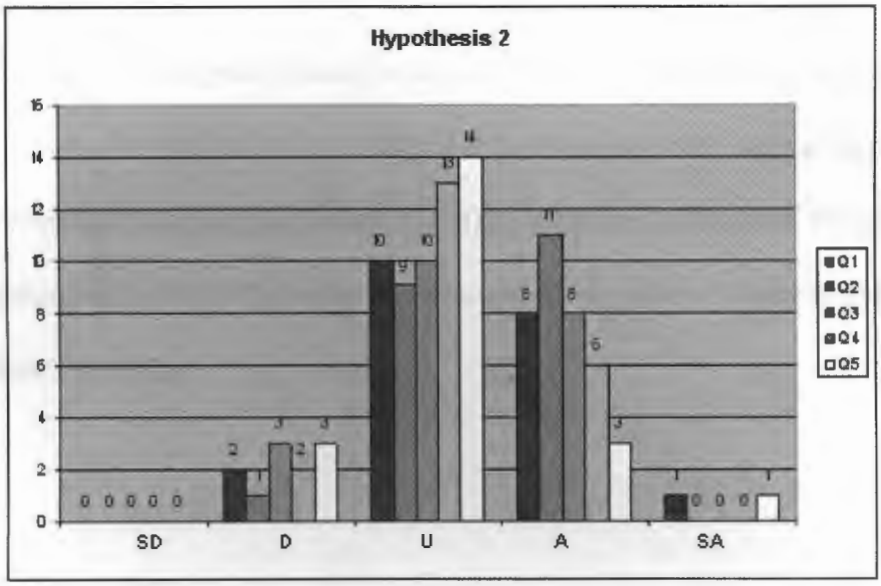

Figure. 3. Hypothesis Two: Group 1 Frequencies

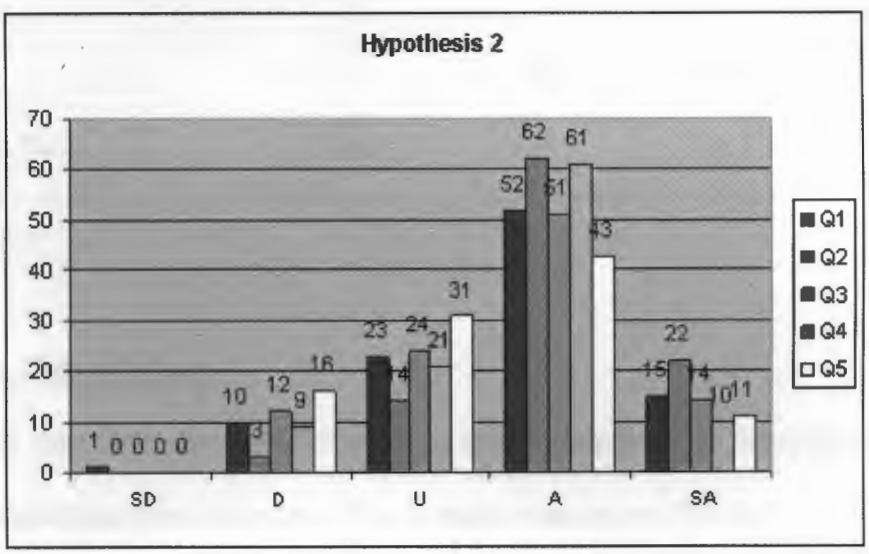

Figure 4. Hypothesis Two: Group 2 Frequencies

Hypothesis Two: T Test

The questions designed to analyze students independence when online multimedia tutorials are included with classroom instruction, as predicted, there was a significant difference between the two group means, $t(120) = -3.145$, $p < 0.002$ with the students in Group 2 indicating that they feel more independent when online multimedia tutorials are provided (see Table 32).

Table 32

Hypothesis Two: T Test

Independent Samples T Test			
	t	df	Significance
Hypothesis Two	-3.145	120	.002

$p < .005$

Hypothesis Three Findings

Null hypothesis three states there is no relationship between computer-assisted instruction and classroom autonomy. The average mean scores for all five questions were summed to test the hypothesis. The average mean for students in Group 1 was 3.03 compared to 3.48 for students in Group 2.

The data collected from the questionnaire indicated that students' perceptions towards online multimedia tutorials to support instruction are favorable for those who had

experience with online multimedia tutorials. Student responses from Group 1 were primarily undecided ($M = 3.03$, $SD = 0.70$) towards the questions whereas the students from Group 2 typically agreed ($M = 3.48$, $SD = 0.81$) with the statements (see Table 33).

Table 33

Hypothesis Three: Means of Student Responses

	Group 1 ($n = 21$)		Group 2 ($n = 101$)	
Hypothesis Three	*M*	*SD*	*M*	*SD*
Question 1	3.05	0.80	3.38	0.86
Question 2	3.05	0.50	3.60	0.89
Question 3	2.76	0.77	2.81	1.00
Question 4	3.10	0.62	3.67	0.68
Question 5	3.19	0.81	3.96	0.63

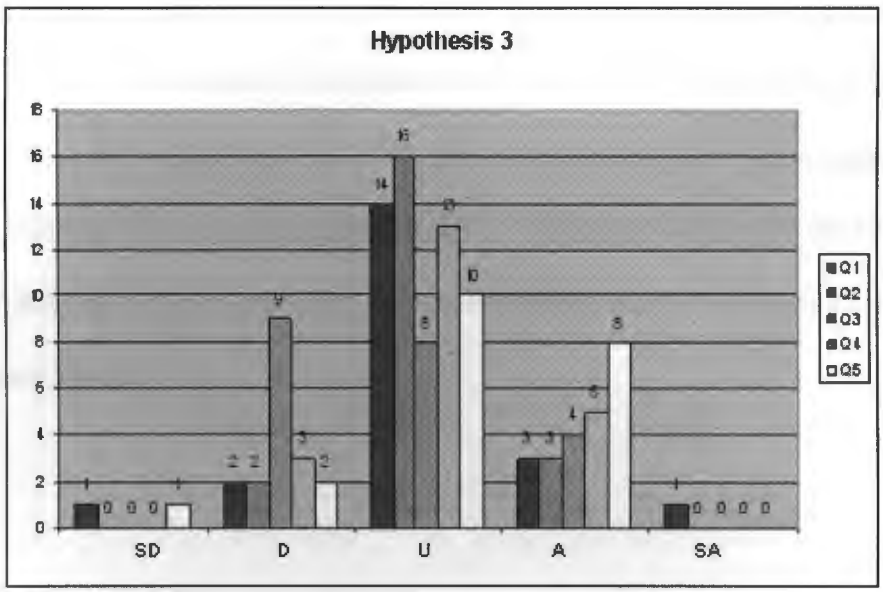

Figure 5. Hypothesis Three: Group 1 Frequencies

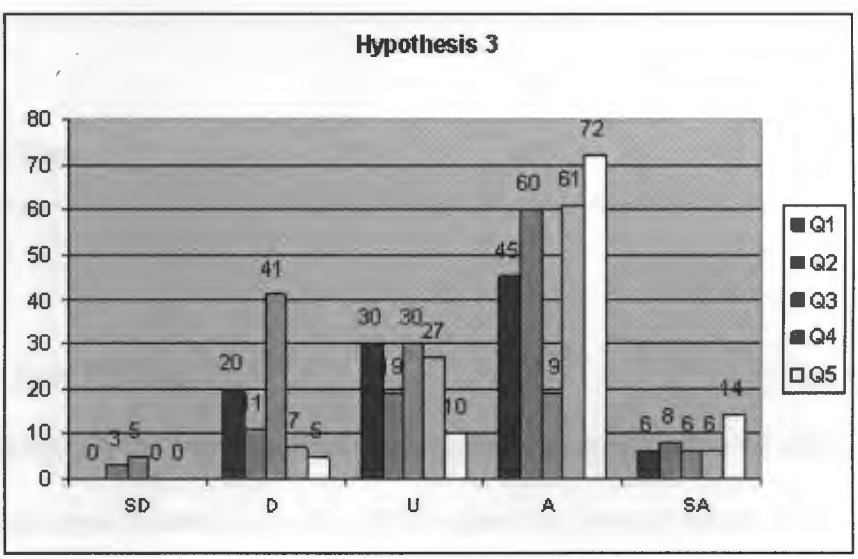

Figure 6. Hypothesis Three: Group 2 Frequencies

Hypothesis Three: T Test

The questions designed to analyze students independence when online multimedia tutorials are included with classroom instruction, as predicted, there was a significant difference between the two group means, $t(120) = -3.213$, $p < 0.002$ with the students in Group 2 indicating that they feel more independent when online multimedia tutorials are provided (see Table 34).

Table 34

Hypothesis Three: T Test

Independent Samples T Test			
	t	df	Significance
Hypothesis Three	-3.213	120	.002

$p < .005$

Hypothesis Four Findings

Null hypothesis four states computer-assisted instruction has no effect on students learning. The average mean scores for all five questions were summed to test the hypothesis. The average mean for students in Group 1 was 3.09 compared to 3.58 for students in Group 2.

The data collected from the questionnaire indicated that students' perceptions towards online multimedia tutorials to support instruction are favorable for those who had

experience with online multimedia tutorials. Student responses from Group 1 were primarily undecided ($M = 3.09$, $SD = 0.72$) towards the questions whereas the students from Group 2 typically agreed ($M = 3.58$, $SD = 0.80$) with the statements (see Table 35).

Table 35

Hypothesis Four: Means of Student Responses

	Group 1 ($n = 21$)		Group 2 ($n = 101$)	
Hypothesis Four	*M*	*SD*	*M*	*SD*
Question 1	3.10	0.83	3.52	0.80
Question 2	3.14	0.73	3.61	0.83
Question 3	2.90	0.83	3.33	0.84
Question 4	3.10	0.62	3.63	0.82
Question 5	3.19	0.60	3.81	0.71

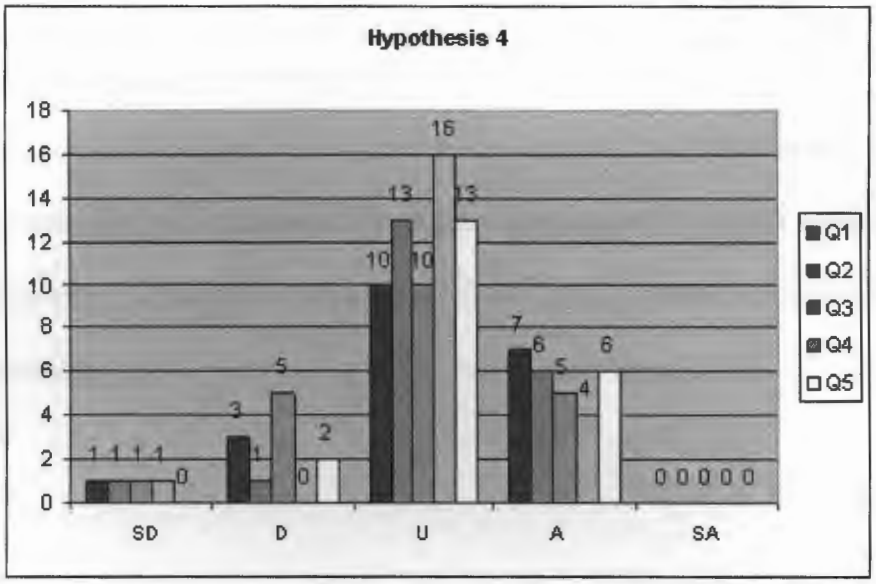

Figure 7. Hypothesis Four: Group 1 Frequencies

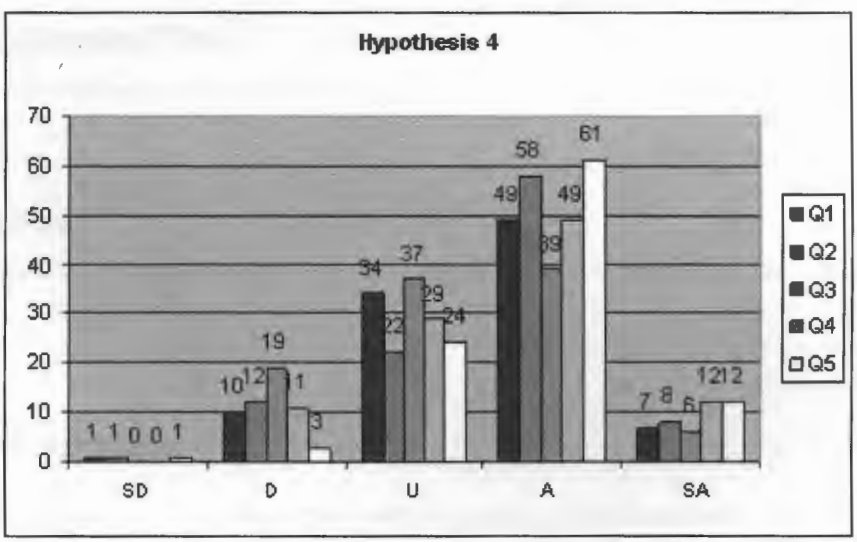

Figure 8. Hypothesis Four: Group 2 Frequencies

Hypothesis Four: T Test

The questions designed to analyze students independence when online multimedia tutorials are included with classroom instruction, as predicted, there was a significant difference between the two group means, $t(120) = -3.308$, $p < 0.001$ with the students in Group 2 indicating that they feel more independent when online multimedia tutorials are provided.

Table 36

Hypothesis Four: T Test

Independent Samples T Test			
	t	df	Significance
Hypothesis Four	-3.308	120	.001

$p < .005$

Hypothesis Five Findings

Null hypothesis five states the level of anxiety of students who use online multimedia tutorials is not different from the anxiety level of students who do not use online tutorials. The average mean scores for all five questions were summed to test the hypothesis. The average mean for students in Group 1 was 3.13 compared to 3.60 for students in Group 2.

The data collected from the questionnaire indicated that students' perceptions towards online multimedia tutorials to support instruction are favorable for those who had experience with online multimedia tutorials. Student responses from Group 1 were primarily undecided ($M = 3.13$, $SD = 0.72$) towards the questions whereas the students from Group 2 typically agreed ($M = 3.60$, $SD = 0.81$) with the statements (see Table 37).

Table 37

Hypothesis Five: Means of Student Responses

	Group 1 ($n = 21$)		Group 2 ($n = 101$)	
Hypothesis Five	*M*	*SD*	*M*	*SD*
Question 1	3.19	0.60	3.75	0.73
Question 2	3.05	0.67	3.56	0.77
Question 3	3.05	0.67	3.65	0.80
Question 4	3.05	0.80	3.66	0.81
Question 5	3.29	0.85	3.38	0.96

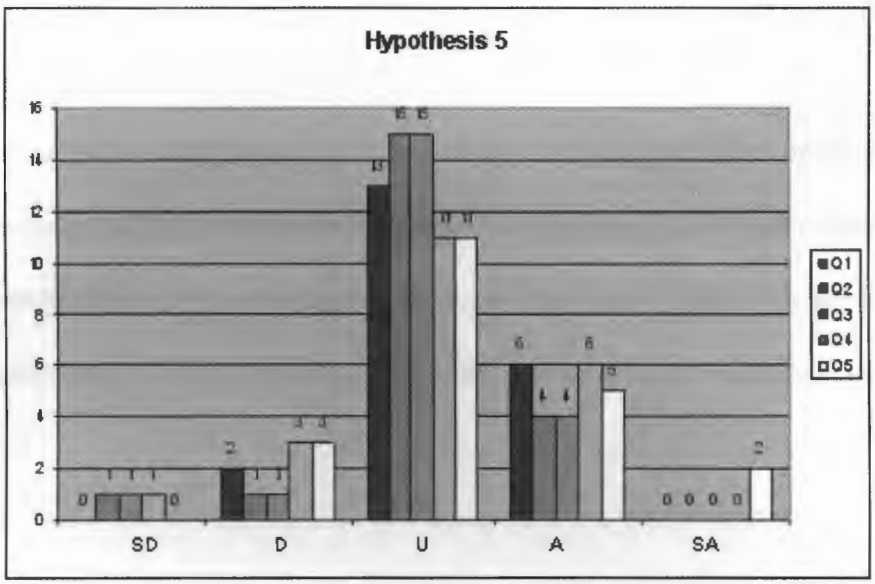

Figure 9. Hypothesis Five: Group 1 Frequencies

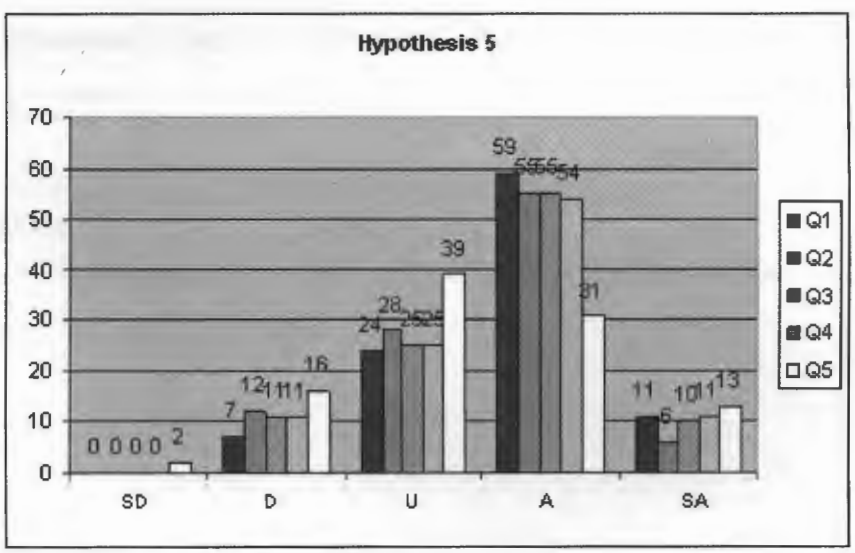

Figure 10. Hypothesis Five: Group 2 Frequencies

Hypothesis Five: T Test

The questions designed to analyze students independence when online multimedia tutorials are included with classroom instruction, as predicted, there was a significant difference between the two group means, $t(120) = -3.081$, $p < 0.003$ with the students in Group 2 indicating that they feel more independent when online multimedia tutorials are provided.

Table 38

Hypothesis Five: T Test

Independent Samples T Test			
	t	df	Significance
Hypothesis Five	-3.081	120	.003

$p < .005$

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter includes a summary of the problem addressed throughout the research as well as the research procedures that were demonstrated. An overview of the finding, conclusions and recommendations are also presented.

Summary

The purpose of this study was to analyze the perceptions students had towards online multimedia tutorials to assist classroom instruction. The population of this study was comprised of students enrolled in four summer 2007 courses. The four courses included were: (1) Web Publishing, (2) Capstone (3) Educational Media and Classroom Computing (4) Teaching Elementary School Social Studies. The sample population was derived from 122 completed questionnaires. Students were asked to fill out a 29-item questionnaire to gauge their perceptions of computer-assisted education with online multimedia tutorials; three of which were related to their demographics. Twenty-five of the questions were directly related to the research questions gauging students' feelings toward online multimedia tutorials to complement education, while an additional question was included for the researcher's recommendation.

The following hypotheses and research questions were developed for this study:

Hypothesis One

Null hypothesis one: Students who use web-based tutorials are no more independent than students who do not use online multimedia tutorials.

1. Do students retain more information when online tutorials are available?

2. Are students who use online supplemental material more independent learners than users who learn by traditional means?
3. Is students' learning enhanced when online tutorials are available?
4. Do online tutorials allow students to work at their own pace?
5. Do students ask fewer questions when online multimedia tutorials are available?

Hypothesis Two

Null hypothesis two: There is no relationship between computer-assisted instruction and learning autonomy.

1. Is there a relationship between online learning with supplemental tutorials and self-efficacy?
2. Are students more autonomous learners when online tutorials are available to assist classroom activities?
3. Are students more open-minded about computer software when online resources are available?
4. Do students have more learning control when online tutorials are available?
5. Do students identify less learning frustration when online multimedia tutorials are available?

Hypothesis Three

Null hypothesis three: There is no relationship between computer-assisted instruction and classroom autonomy.

1. Do students spend more time on developing projects when online tutorials are available?

2. Is less time spent on instruction when online multimedia tutorials are available?
3. Do students prefer online tutorials instead of traditional handouts?
4. Is there a relationship between computer-assisted instruction with online multimedia tutorials and students' autonomy?
5. Do students control the pace of their learning when online multimedia tutorials are available?

Hypothesis Four

Null hypothesis four: Computer-assisted instruction has no effect on students learning.

1. Do students retain more information when supplemental online tutorials are available?
2. Do students like their classes more when online tutorials are available?
3. Are students more motivated when online tutorials are available?
4. Are lessons learned more efficiently when online tutorials are utilized?
5. Do online tutorials have positive effects on students' learning?

Hypothesis Five

Null hypothesis five: The level of anxiety of students who use online multimedia tutorials is not different from the anxiety level of students who do not use online tutorials.

1. Do students feel learning is easier with online tutorials?
2. Are students more engaged in their coursework when online tutorials are available?

3. Do students have more positive attitudes about learning new software when additional online tutorials are available?
4. Do students feel less anxiety when online tutorials are available?
5. Does human voice diminish learning anxiety when added to online multimedia tutorials?

Questionnaire Findings

Data was collected through the distribution of the questionnaire during class. Students were asked to mark the response that most closely indicated their feelings towards each statement and to choose only one response for each item. Questions on the survey addressed students' overall perceptions of online multimedia tutorials from their previous classroom experiences. Basic statistical tests (e.g. mean, median, mode, standard deviation, variance and frequency) were conducted to chart the distribution of students' attitudes towards multimedia education. A *t* test was also conducted to test for significance between students in the two groups.

Summary of Demographics

This study was restricted to students at a Midwestern university during the summer 2007 semester. The majority of students sampled in the study were upperclassmen. Of the 122 respondents, nearly 92% of the students were juniors or seniors and an additional three percent were graduate students. A majority of the students (58%) were enrolled in the College of Education. Nearly 83% of the students sampled had experience using online multimedia tutorials prior to this study. Of the total population, 21 students had no prior online multimedia tutorial experience. The 21

students who have never used online-multimedia tutorials were added to Group 1. The remaining 101 students were added to Group 2 for analysis.

Summary of Findings by Hypothesis

To test the five hypotheses, five additional research questions were included for each hypothesis. Each item on the questionnaire was related directly to the research question it aligned with. The questionnaire utilized a Likert five-item scale to gauge students' perceptions towards online multimedia instruction. Their responses were calculated by the researcher by using descriptive statistics (mean, median, mode, standard deviation and frequency). A *t* test at the 95% confidence level was administered to compare the perceptions of the students who had no prior experience using online multimedia tutorials (Group 1) and the students who had experience (Group 2). The results of the tests are summarized as follows.

Null Hypothesis One. The purpose of this null hypothesis was intended to gauge whether students feel they are more independent learners when web-based tutorials are available. Students who noted no prior experience with online multimedia tutorials prior to this investigation reported a mean score range of 3.14 to 3.57 for the five research questions. Students who noted they had experience reported an average mean score 0.45 higher than that of Group 1. The reported mean score for students in Group 2 was between 3.50 and 4.03.

Null hypothesis one was designed to analyze students' independence when online multimedia tutorials are included with classroom instruction. A *t* test produced a significant difference $t(120) = -3.383$, $p < 0.001$ between the two student groups. The

null hypothesis was rejected. As predicted, there was a significant difference in students' perceptions towards learner independence between the two groups.

Null Hypothesis Two. The intention of this null hypothesis was to test for a relationship between computer-assisted instruction and learning autonomy. The average reported mean for students who noted they had no previous educational multimedia experience (Group 1) was 3.27 compared to 3.73 for students in Group 2.

Null hypothesis two was incorporated to analyze students learning autonomy with supplemental multimedia learning tutorials. A *t* test produced a significant difference $t(120) = -3.145$, $p < 0.002$ between the two student groups. The null hypothesis was rejected. As predicted, there was a significant difference in students' perceptions towards learning autonomy between the two groups.

Null Hypothesis Three. The purpose of this null hypothesis was to determine if there was a perceived relationship between online multimedia tutorials and classroom autonomy. Students in Group 1 reported a mean score range of 2.76 to 3.19 for the five research questions. Students in Group 2 reported an average mean 0.45 higher than that of the students without multimedia experience. The reported mean score range for students in Group 2 was between 2.81 and 3.96.

Null hypothesis three was included in this study to analyze students' perceptions towards online multimedia tutorials and classroom autonomy. A *t* test produced a significant difference $t(120) = -3.213$, $p < 0.002$ between the student groups. The null hypothesis was rejected. As predicted, there was a significant difference in students' attitudes towards classroom autonomy between the two groups.

Null Hypothesis Four. The purpose of this null hypothesis was to study whether computer-assisted instruction with online multimedia tutorials had positive effects on student learning. The average reported mean for students with no prior experience with online multimedia tutorials was 3.09 compared to 3.58 for students in Group 2. Students who had experience had a mean score nearly 0.5 higher than students in Group 1.

Null hypothesis four was developed to gauge students' feelings towards computer-assisted instruction with online multimedia tutorials. A *t* test indicated a significant difference $t(120) = -3.308$, $p < 0.001$ between the two groups. The null hypothesis was rejected. As predicted, students who had previous experience with online multimedia tutorials had more favorable perceptions towards computer-assisted learning.

Null Hypothesis Five. The purpose of this null hypothesis was to gauge whether anxiety of students who use online multimedia tutorials was perceived different than the anxiety of students who do not use online multimedia tutorials. Students in Group 1 reported a mean score range of 3.05 to 3.29 for the five research questions. Students who noted experience with online multimedia tutorials reported an average mean of nearly 0.50 higher than that of the other students. The reported mean score range for students in Group 2 were between 3.38 and 3.75.

Null hypothesis five was included to assess students' anxiety towards learning with supplemental online multimedia tutorials. A *t* test produced a significant difference $t(120) = -3.081$, $p < 0.003$ among the two groups. The null hypothesis was rejected. As predicted, students believed their learning anxiety was diminished when online multimedia was incorporated in education.

Question 26. The researcher included an additional question as an indicator for future development. Do students feel classes introducing new application software should provide supplemental online multimedia tutorials? Students from Group 1 reported a mean score of 3.43 compared to 3.92 for students in Group 2 indicating a desire that new classes teaching technical software applications should also include supplemental learning tutorials.

Conclusions

This study was developed to analyze students' perceptions towards online multimedia tutorials and subsequently to improve classroom instruction. Five hypotheses were included in this research to monitor students' perceptions towards supplemental resources to assist classroom instruction as related to their learner independence, learner autonomy, classroom autonomy, effect on learning and their anxiety.

This research found that students' perceptions towards online multimedia tutorials were significantly higher for students who had experience using similar tutorials. Based on the results, it can be concluded that this study lends support to the suggestion that using online multimedia tutorials to complement classroom instruction is an effective teaching method.

As technology and education become more integrated in the classroom, instructors as well as educational institutions are continually interested in more efficient delivery methods. Prior research stated that moving away from an instructor-centered delivery style to a learner-centered environment makes knowledge comprehension more effective. By moving the responsibility from the educator to the student, naturally it

follows that it is increasingly the student's obligation to learn the information. Taking this approach allows students to spend more time actively engaging in a particular activity.

Students surveyed in this analysis typically agreed with the preliminary research on the benefits technology has in the classroom, if utilized effectively. A majority of the earlier research noted the benefit technology has on students in the classroom, but fails to monitor students' acceptance of this new learning medium. Hypothesis one was intended to analyze students' independence when online multimedia-based tutorials are included with their instruction. A majority of the students believed that they retained more information while being more independent learners. These students also noted that their learning was enhanced and had the flexibility to work at their own pace. As to whether they asked fewer questions; that was not as clear.

Hypothesis two was included to examine students' learning autonomy. Learners take different amounts of time to process information and acquire knowledge. An adaptive learning environment puts the emphasis on the student to learn at a pace that is consistent with his/her needs. Student responses indicated they were more autonomous learners and had more learning control when supplemental tutorials were available. Students' feelings toward learning frustration were also diminished by implementing supplemental resources to a traditional classroom.

Supplemental multimedia tutorials can be integrated to build students' self-reliance. Students have the ability to answer questions themselves instead of tracking down someone else for information. Hypothesis three was incorporated to observe

students' perceptions towards classroom autonomy. Students who have utilized supplemental resources indicated they have more control over their learning when presented with this medium. They feel less time is spent on instruction which leaves more time to develop their projects. When presented with a question about whether they prefer online multimedia-based tutorials as a substitute for traditional handouts, students more consistently disagreed with the question. It has been noted that traditional education is still the preferred and accepted teaching method and this item re-establishes that notion. Additional resources should be presented an available for students to complement current teaching practices.

Studies have consistently shown that computer-based education has positive effects on students learning. Hypothesis four was included to monitor the effects computer-assisted instruction has on students' learning. A majority of the students surveyed noted the positive effect online tutorials had on their previous classroom experience. They also feel their learning is more efficient and they like their classes more with supplemental resources.

Finally, hypothesis five was developed to examine students' anxiety when presented with online multimedia tutorials. Learning control has been linked to a number of positive outcomes in education. Students tend to be more motivated, have an increased level of engagement and decreased anxiety when presented with self-paced resources. A majority of students surveyed in this study also agree with the research. They felt less anxiety towards new technology, have more positive attitudes and are more

engaged in the activities. However, when confronted with a question assessing the benefit that human voice has as a resource, many of these students were undecided.

Recommendations

Based on the conclusions of this study, the following recommendations are made by the researcher. The study should be replicated in additional settings to determine if the same inferences hold true with a larger sample size and comparison groups of similar sizes. In some situations it may be difficult to determine if traditional instructional delivery methods are obscuring students' abilities to embrace alternative learning techniques because of an unfamiliarity with the process, but using similar categories of knowledgeable and naïve student groupings should assist in that determination. It is equally important to consider demographical factors (classification, gender, age and college) which could contribute to students' perceptions towards supplemental online multimedia tutorials, particularly for the students who have experience in this type of educational setting. Findings similar to this researchers results should encourage other educators to provide both in-classroom and out-of-classroom supplemental resources that provide the most efficient instructional delivery system to students, recognizing the individual and autonomous nature of the 21st century learner. And finally, an analysis of student outcomes of those who had access to supplemental multimedia experiences compared to classrooms which did not will help with providing a learning strategy to tailor instruction to a given situation for the greatest educational benefit.

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APPENDIX A:

PERMISSION FOR HUMAN SUBJECTS

Office of Sponsored Programs

University of Northern Iowa

Human Participants Review Committee
UNI Institutional Review Board (IRB)
Office of Sponsored Programs
213 East Bartlett Hall

Date: June 7, 2006

To: Alex Goerdt
17158 Meadowlark Dr.
Peosta, IA 52068

From: Mary Losch, Ph.D.
UNI Human Participants Review Committee (IRB)

Title: Computer-assisted Education

Re: ID# 05-0225

Your project "Computer-assisted Education" has been approved following review under the expedited review procedure in accordance with federal guidelines 45 CFR 46:110. For your project, the applicable expedited review category referenced in 45 CFR 46.110 of the federal regulations is:

Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

You may begin enrolling human research participants in your project. If you modify your project in a way that increases the physical, emotional, social, or legal risk to the participants or you change the targeted participants, you should notify the Human Participants Review Committee in the Office of Sponsored Programs before continuing with the research.

Your project must be reviewed annually and therefore this approval will be active until 5/21/2007. You will receive a reminder and Annual Review/Closure form approximately 10 months from now asking for an update on your project. However, you are responsible for seeking continuing IRB approval for your study, *whether you receive a reminder or not*, and may not enroll any new subjects beyond the expiration date without continuing approval.

If you leave the university and/or complete the project before that time, please complete the Project Closure form at that point (available at http://fp.uni.edu/osp/research/policies.htm) and submit it to the Human Participants Office.

If you have any further questions about the Human Participants Review policies or procedures, please contact me at mary.losch@uni.edu, or Anita Kleppe, the IRB Administrator, at 319.273.6148 or anita.kleppe@uni.edu. Best wishes for your project success.

cc: Institutional Review Board
Shahram Varzavand, Advisor

Office of Sponsored Programs

University of Northern Iowa

Human Participants Review Committee
UNI Institutional Review Board (IRB)
Office of Sponsored Programs
213 East Bartlett Hall

Date: May 24, 2007

To: Alex Goerdt
17158 Meadowlark Dr.
Peosta, IA 52068

From: John Henning, Ph.D.
UNI Human Participants Review Committee (IRB)

Title: Computer-assisted Education

Re: ID# 05-0225

Your project "Computer-assisted Education" has been approved following its periodic review under the expedited review procedure in accordance with federal guidelines 45 CFR 46.110.

You may continue enrolling human research participants in your project. If you modify your project in a way that increases the physical, emotional, social, or legal risk to the participants or you change the targeted participants, you should notify the Human Participants Review Committee in the Office of Sponsored Programs before continuing with the research.

Your project must be reviewed annually and therefore this approval will be active until 20 May 2008. You will receive a reminder and Annual Review/Closure form approximately 11 months from now asking for an update on your project. However, you are responsible for seeking continuing IRB approval for your study, *whether you receive a reminder or not*, and may not enroll any new subjects beyond the expiration date without continuing approval.

If you leave the university and/or complete the project before that time, please complete the Project Closure form at that point (available at http://www.uni.edu/osp/research/policies.htm) and submit it to the Human Participants Office.

If you have any further questions about the Human Participants Review policies or procedures, please contact me at John.Henning@uni.edu, or Anita Kleppe, the IRB Administrator, at 319.273.6148 or anita.kleppe@uni.edu. Best wishes for your project success.

cc: Institutional Review Board
Shahram Varzavand, Advisor

Sent 5/25/07 JB

APPENDIX B:

QUESTIONNAIRE

Online Multimedia Tutorials Questionnaire

The following items are related to the impact computer-assisted instruction has on students learning of technical programs with the use of online multimedia tutorials to support classroom instruction. To answer the questions below, an understanding of online multimedia tutorials is imperative. Online multimedia tutorials are designed around hypermedia which includes a combination of multimedia and hypertext which enables user to navigate using text and graphics. If additional clarity is needed, example tutorials for creating a web page are available at: http://www.goerdt.com/Captivate/

Please answer the following questions and mark the box that most closely indicates your feelings about each statement. Please choose only one response for each item.

1. What is your major? _____

2. What is your classification?

□ Freshman □ Sophomore □ Junior □ Senior □ Graduate

3. Have you ever used online multimedia tutorials before?

□ Yes □ No

4. I learn more when online multimedia tutorials are available to supplement classroom projects.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

5. I am a more independent learner when online multimedia tutorials are available to the class.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

6. My learning is enhanced by having online multimedia tutorials available to supplement my project.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

7. I feel online multimedia tutorials provide more flexibility to work on my own at my own pace.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

8. I have fewer questions about the material when online tutorials are available for reference.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

9. I am more likely to try [learn] new software when online multimedia tutorials are available.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

10. I think online multimedia tutorials give me more flexibility to work on my own.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

11. I am more open-minded about using computer software when I can access online multimedia tutorials.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

12. I believe online multimedia tutorials give me more learning control in completing the assignment.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

13. I feel less frustration when learning new software when online multimedia tutorials are available.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

14. I feel projects take less time to complete when online multimedia tutorials are available for reference.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

15. I feel that having online multimedia tutorials to support instruction frees up instructors' time to assist the class with more complex topics.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

16. I prefer online multimedia tutorials to support instruction instead of traditional instruction.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

17. I feel more learning freedom with new software when online multimedia tutorials are available.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

18. I feel online multimedia tutorials allow me to work at my own pace.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

19. I retain more information when online multimedia tutorials are available to assist class projects.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

20. I like my classes more when additional online multimedia tutorials are available to complete a project.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

21. I feel more motivated when online multimedia tutorials are provided to assist classroom instruction.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

22. Computer-assisted instruction with online multimedia tutorials allows me to learn more about a new application in less time.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

23. Computer-assisted education with online multimedia tutorials has positive effects on my learning.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

24. I feel learning new software is easier when online multimedia tutorials are available.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

25. I feel online multimedia tutorials increase my level of engagement in the project.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

26. I have a more positive attitude about working with new software when online multimedia tutorials are available for help.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

27. I feel less anxiety when learning new software if online multimedia tutorials are available for help.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

28. My learning anxiety is diminished when human voice is added to the online multimedia tutorials.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

29. I feel classes that teach new application software should provide supplemental online multimedia tutorials.

□ Strongly Disagree □ Disagree □ Undecided □ Agree □ Strongly Agree

APPENDIX C:

CONSENT LETTER

Dear Students:

This letter is an invitation to consider participating in a study I am conducting as part of my Master's Degree in the Department of Industrial Technology at the University of Northern Iowa under the supervision of Dr. Varzavand. I would like to extend the opportunity to assist my investigation. The following information is provided to help you make an informed decision about whether or not to participate.

The purpose of this study is to investigate students' perceptions of online multimedia tutorials to assist classroom instruction. Educational institutions are faced with the challenges of delivering valuable training options to meet the varying needs of students and staff. Computer technology has become and will continually be integrated into the classroom trying to make learning easier, more successful and efficient. Traditional hands-on technical training is the preferred and most effective training method, but due to limitations in education and the diversity of students, traditional education does not allow every student the same benefits to training. The purposes of this study is to look at the benefits that computer-assisted instruction has to offer students and instructors when it is used to compliment traditional training practices.

There will be no direct benefits to the participants of the study. Participation in this study is completely voluntary and you may decide to withdraw from this study at any time without any negative consequences by consulting the researcher and/or instructor.

With your permission, the data collected from this project will be analyzed and correlated with additional information from another class. Information obtained from this investigation will be kept confidential. There will be no identifying information published from the research.

If you have any questions regarding this study or would like additional information to assist you in reaching a decision, please contact me at 563-590-7040 or by email at alex@goerdt.com. If I have any comments or concerns resulting from my participation in this study, please contact the IRB Administration, Office of Sponsored Program at (319) 273-3217.

Yours Sincerely,

Alex Goerdt

Consent Form

I have read the information presented in the information letter about a study being conducted by Alex Goerdt of the Department of Technology at the University of Northern Iowa. I have had the opportunity to ask any questions related to this study, to receive answers to my questions, and any additional details I wanted.

I am aware that the data collected from this investigation will be used in a thesis with the understanding that all data will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through, the Office of Sponsored Program at the University of Northern Iowa. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the Office of Sponsored Program at (319) 273-3217.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

☐YES ☐NO

I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older.

_____ _____

(Signature of participant) (Date)

_____

(Printed name of participant)

_____ _____

(Signature of investigator) (Date)

_____ _____

(Signature of instructor/advisor) (Date)

APPENDIX D:

EVALUATION OF THE QUESTIONNAIRE

	Group 1 (n = 21)		Group 2 (n = 101)	
Question	M	SD	M	SD
Hypothesis 1				
Question 1	3.33	0.88	3.77	0.76
Question 2	3.14	0.96	3.68	0.79
Question 3	3.57	0.81	4.03	0.69
Question 4	3.33	0.73	3.98	0.69
Question 5	3.33	0.85	3.50	0.82
Hypothesis 2				
Question 1	3.38	0.74	3.71	0.86
Question 2	3.48	0.60	4.04	0.67
Question 3	3.24	0.70	3.68	0.85
Question 4	3.19	0.60	3.73	0.75
Question 5	3.10	0.70	3.50	0.88
Hypothesis 3				
Question 1	3.05	0.80	3.38	0.86
Question 2	3.05	0.50	3.60	0.89
Question 3	2.76	0.77	2.81	1.00
Question 4	3.10	0.62	3.67	0.68
Question 5	3.19	0.81	3.96	0.63

(table continues)

Hypothesis 4				
Question 1	3.10	0.83	3.52	0.80
Question 2	3.14	0.73	3.61	0.83
Question 3	2.90	0.83	3.33	0.84
Question 4	3.10	0.62	3.63	0.82
Question 5	3.19	0.60	3.81	0.71
Hypothesis 5				
Question 1	3.19	0.60	3.75	0.73
Question 2	3.05	0.67	3.56	0.77
Question 3	3.05	0.67	3.65	0.80
Question 4	3.05	0.80	3.66	0.81
Question 5	3.29	0.85	3.38	0.96