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Teacher Motivation and the Use of Computer-based Interactive Multimedia

Katrina T. Toth
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Katrina T. Toth entitled "Teacher Motivation and the Use of Computer-based Interactive Multimedia." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Education.

Edward L. Counts, Jr., Major Professor

We have read this dissertation and recommend its acceptance:

Donald J. Dessart, Russ French, Julie K. Little

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Accepted for the Council:

Dr. Anne Mayhew
Vice Provost and
Dean of Graduate Studies

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TEACHER MOTIVATION AND THE USE OF COMPUTER-BASED INTERACTIVE MULTIMEDIA

A Dissertation

Presented for the

Doctor of Education

Degree

University of Tennessee, Knoxville

Katrina Tomilson Toth
December, 2002

DEDICATION

This dissertation is dedicated to my loving and nurturing parents.

Mr. Walter Robert Tomilson

and

Mrs. Dorothy Marie Pitts Tomilson

who provided me with the desire to seek knowledge

and

the determination to achieve dreams

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There are many significant people who have contributed to the success of this endeavor. Throughout this process there have been university faculty, Oneida Special School District faculty, fellow students, and family who have provided support and encouragement.

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ABSTRACT

The purposes of this study were (a) to describe the use of multimedia within a participating population of teachers, and (b) to identify factors that motivate teachers to use multimedia for instructional purposes. Teachers from the Oneida Special School District located in Oneida, Tennessee, were invited to participate in this study.

This study was conducted in two phases. Phase I used a questionnaire to collect data on the use and development of multimedia. Forty-six teachers participated in this portion of the study. Phase II used an interview process to identify the factors that motivated teachers to use multimedia in the classroom. Five respondents from among the 21 respondents reporting the highest usage of multimedia resources were interviewed.

Some of the findings of the Phase I questionnaire indicated that 64% of the respondents reported using some type of edutainment software, while 47% of the respondents reported using the Internet. Respondents also reported using commercially produced multimedia resources or resources created by groups or other individuals far more then self-created multimedia resources.

An analysis of the Phase II interview transcripts indicated that teachers were motivated to use and develop multimedia when they believed it was a potentially powerful tool, when they perceived it as relevant to the educational setting, and when they valued the use of multimedia resources. Beliefs, relevance, relatedness, and personal value were identified as important factors that motivated these teachers to integrate technology and multimedia within the educational setting.

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INTRODUCTION TO THE STUDY

INTRODUCTION

Past research has indicated that limited research has been conducted regarding the relationship between multimedia and learning in the educational environment (Mayer, 2001). Further, the findings of the research that have been conducted do not always agree. One study on reading comprehension reported that when students read CD-ROM storybooks comprehension did not increase (Matthew, 1997). While another study reported that there was a significant difference in comprehension when using the CD-ROM storybook (Doty, Popplewell, & Byers, 2001). White and Kuhn (1997) conducted research to determine whether there was a significant difference in recall when students were presented information via text, oral readings, and interactive multimedia. The results indicated that two-thirds of the participants recalled more information when using multimedia; however, the findings were less than significant (White & Kuhn).

One of the concerns that arose in the research is whether media even has an impact on learning. The following summary of a review of literature expresses this concern "It seems reasonable to assume, therefore, that media are delivery vehicles for instruction and do not directly influence learning" (Clark, 1983, p. 453). In opposition to this view, Kozma (1991) indicates that some will learn regardless of resources while "Others will be able to take advantage of a particular mediums characteristics to help

construct knowledge" (p. 205). Although these views continue to be controversial, research into the effects of media on learning has continued.

Research on the use of computer technology within the field of education has also demonstrated conflicting results. "ACOT, a research-and-development collaboration among public schools, universities, research agencies, and Apple Computer began in 1985, a time when promises and excitement about the potential of technology to enhance the learning process abounded" (Sandholtz, Ringstaff, & Dwyer, 1997, p. 3). The findings indicated that the integration of technology within the classroom facilitated a change in the teacher's role from lecturer to mentor, collaboration increased across disciplines, and student interest was enhanced (Sandholtz et al.). Additionally, attendance improved at ACOT sites, and at one site in Memphis, Tennessee, test results indicated that ACOT students scored significantly higher than other students (Dwyer, 1994).

While positive outcomes were noted in the ACOT research, other findings have not been as favorable. Research has been conducted to determine whether high access to computer technology facilitated learning across the curriculum (Gardner, Morrison, & Jarman, 1993). A total of 426 students participated in this research and 235 of the students each received a laptop computer for one school year (Gardner et al.). Pre and post testing were conducted in three subject areas, and the findings suggested no significant difference in mathematics, English, or science achievement (Gardner et al.). Statistical measures that have been used to assess the relationship of technology availability to educational outcomes have shown that learning outcomes, drop out rates,

and attendance were not significantly influenced by the degree of computer technology availability (Alspaugh, 1999).

Although the findings of the research do not overwhelmingly support the integration of technology within the educational setting, the field of education continues to emphasize the importance of technology integration (Becker, 1994, 2000; Mellon, 1999; O.T.A., 1995). Overall, technology resources and support systems have increased within the educational setting (Becker, 2000; Marcinkiewicz, 1995); however, the use of technology by teachers has been less than anticipated (Marcinkiewicz, 1995).

Based on the previous findings, researchers have attempted to investigate why teachers utilize computers in the classroom setting (Ertmer, Addison, Lane, Ross, & Woods, 1999). Teachers reported using computers as an incentive, a presentation, a reward, and a motivator (Ertmer et al.). The five reasons that were given for the use of computers were as follows: motivate students, prepare students for future demands, increase interest in lessons, facilitate learning for students experiencing problems, and teacher enjoyment (Ertmer et al.).

Sylvia and Hutchison (1985) also investigated a number of factors that influence teacher motivation. One hundred and thirty-five participants completed 37 questions that related to motivation and job satisfaction. The data were organized into six groups: relationships, supervisory feedback, intrinsic factors, work environment, job satisfaction, and expectations. Findings from the analysis of data suggested that the participants were motivated by autonomy, reasonable responsibility, and intrinsic factors related to satisfaction (Sylvia & Hutchison).

Research conducted by Dexter, Anderson, and Becker (1999) indicated that teachers were motivated to use computer technology when they observed increased student motivation, active student learning, student success, successful use of computers by other teachers, increased student interest, and successful completion of teaching goals. Therefore, teachers were motivated when they observed signs of student motivation and successful teacher modeling or when they experienced success within their own classroom environment. Research on motivation has indicated that teacher motivation is influenced by a wide variety of factors that interact with one another to influence the action and behaviors of the individual (Vallerand, 1997). These factors, therefore, influence teachers to decide whether to select, utilize, or develop multimedia within the educational setting.

Teacher motivation and technology integration are interrelated phenomena (Dusick, 1998). Through a review of literature Dusick provides an overview of the attitudes and beliefs that influence or interfere with technology integration within the classroom setting. The degree of personal self-efficacy, the level of competency using technology, the ability to make the time commitment necessary to learn technological skills, and the degree to which the teacher believes that the use of technology is relevant are among the factors described that influence teachers to use technology for instructional purposes (Dusick).

PROBLEM

Educational facilities have worked to improve technology resources; however, research has indicated that even with additional resources teachers are not integrating technology at the level anticipated (Marcinkiewicz, 1995). Therefore, one problem is to determine the degree to which this population is using multimedia within the educational setting.

Past research has identified a number of factors that can interfere with the use of computer technology within the educational setting (Ertmer et al; O.T.A., 1995). A study conducted by Ertmer et al. used first-order and second-order barriers to investigate the use of technology in the classroom. First-order barriers were described as barriers that were outside the control of the teacher, while second-order barriers related to intrapersonal beliefs, according to Brickner (as cited in Ertmer et al., 1999).

Therefore, an additional problem that exists within the field of education is how to design a support system that will rouse teachers to become intrinsically motivated and support teachers to ensure technology integration within the classroom setting. The identification of factors that motivate teachers to integrate technology is essential to the development of a proper support system.

PURPOSE

Research conducted in the past suggests that a relationship exists between teacher motivation, technology integration, and the selection of teaching resources including

multimedia. The purposes of this study are (a) to describe what the current status of multimedia usage and development is within a particular educational population, and (b) to identify the factors that motivate teachers within that population to integrate the use of commercially produced or teacher-created multimedia within their classrooms.

The findings of this study will present teachers, supervisors, administrators, and the school system with information that can be used for technology planning. Data from grouped responses can be used to assess the degree to which teachers are integrating computer-based multimedia within the educational setting. In addition, this information may be used to evaluate the support system that currently exists within the Oneida Special School District.

Once the factors that motivate teachers to use or develop multimedia are identified, administrators, faculty, principals, teachers, and university professionals can build support systems that effectively meet the needs of educators. According to research, support systems have demonstrated positive effects upon teacher motivation when (a) district support existed; (b) the district provided teachers the equipment, relevant training, peer support, and the time necessary for successful implementation; and (c) the size of the class was reduced (Becker, 1994). Research suggests that proper resources and supports are essential if teachers are to successfully integrate computer technology into the instructional process (Becker, 1994; O.T.A., 1995).

DESIGN OF STUDY

This study was designed to answer four research questions.

1. What types of multimedia are this population currently using?
2. Which type of multimedia is most frequently used?
3. To what degree are teachers developing their own multimedia?
4. What motivates teachers to use multimedia in the educational setting?

This study was organized into two phases. The initial phase of this study (Phase I) used a questionnaire to collect descriptive data from 46 volunteer respondents. The collective data were used for the following purposes: (a) to describe the use and development of multimedia within the participating population, and (b) to answer the first three research questions forming the foundation of this study.

The second phase of this study (Phase II) used an interview process to investigate the factors that motivate teachers to use and create multimedia. Five participants were randomly selected from a list of 21 teachers reporting the most frequent use of multimedia. Each of the 5 participants was interviewed and narrative information was analyzed from the transcripts in order to address question 4.

NEED FOR STUDY

Research on multimedia has been conducted in the past; however, Jonassen, Peck and Wilson (1999) and Mayer (2001) have indicated that additional research is necessary

if effective multimedia is to be designed and integrated within educational settings. In addition, Willis, Thompson, and Sadera (1999) indicated that further research is necessary in order to develop support systems that facilitate the use of computer technology within the field of education.

Through questionnaires and interviews of the selected participants, this research will identify factors that motivate teachers to utilize multimedia. These findings will provide additional information to the current body of knowledge that exists regarding teacher motivation and use of multimedia within the classroom setting.

The information collected through this research may support the findings of Becker (1994) or it may identify factors necessary to facilitate the use of multimedia that have not previously been identified. Once motivating factors have been identified, other P-12 educational systems may be able to construct support systems that facilitate the integration of multimedia. A support system may include activities such as half-day workshops, collaborative workshops on multimedia development, teacher observations, peer tutoring by experienced teachers, stipends for the development of multimedia modules, development of a district-wide site to access teacher-developed multimedia or university-school partnerships.

ASSUMPTIONS

- The questionnaire was adequate to obtain the information necessary to answer the following questions: (a) the types of multimedia used, (b) the type of multimedia

most frequently used, and (c) the degree to which teachers created their own multimedia for instructional use.

- The interview guide and the interview process were adequate to collect narrative information necessary to identify factors that motivate teachers to use and create multimedia.
- The scores calculated for each questionnaire identified teachers who used multimedia most frequently.
- The participants who completed the questionnaire were representative of those teachers in the school district who use technology in the classroom.
- The five teachers who were interviewed were representative of the sample of 21 teachers who scored highest on the questionnaire.

LIMITATIONS

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1. Ninety-six teachers were sent questionnaire packets and a total of 46 teacher volunteers responded.
2. The data collection was limited to a particular time frame. The time frame was from November 1, 2001 until January 3, 2002.
3. The study collected data that was limited to the use of CD-ROMs, the Internet, including WebQuest and ThinkQuest, and videodiscs.
4. The interview sample was randomly selected from the volunteer respondents who had received one of the top 21 scores on the questionnaire used during Phase I.

5. The data collected through the questionnaire and the interview process cannot be generalized to the population of the Oneida Special School District.

DELIMITATIONS

- The questionnaire was delimited to teachers working within the Oneida Special School District.
- Each of the five randomly selected questionnaire respondents was chosen from a list of 21 teachers who reported the most frequent use of multimedia.
- The population was comprised of 96 classroom teachers employed by the Oneida Special School District between November 1, 2001, and Spring 2002.
- The information collected through this study was limited by the use of one questionnaire and five interviews.

DEFINITION OF TERMS

Documentary software - Documentary software presents information and data using multimedia in such a way that it resembles a documentary film. Examples of documentary software include *Franklin Delano Roosevelt, A Passion for Art,* and *Critical Mass* (Gordonson, 2002).

Edutainment software - Edutainment software is software that contains educational content that has been presented in such a way that the software is also entertaining (Shuman, 1998).

Extrinsic motivation - "Extrinsic motivation is motivation to engage in an activity for some external consequence" (Zimbardo & Weber, 1994, p. 315).

Internet - "The Internet is a *network of networks* composed of thousands of smaller regional networks connecting millions of users in more than 90 nations around the globe" (Jonassen et al., 1999, p. 20).

Intrinsic motivation - "Motivation to engage in an activity for its own sake, in the absence of external reward is called intrinsic motivation" (Zimbardo & Weber, 1994, p. 315).

Meaningful learning - Meaningful learning is a cognitive process in which the student is able to recall and apply information in order to solve a problem (Mayer, 2001).

Mindtools - "Mindtools, therefore, are computer applications that require students to think in meaningful ways in order to use the application to represent what they know" (Jonassen, 2000, p. 4).

Multimedia – "Multimedia can be defined as a computer-based communications process that incorporates text, graphics, sound, animation, and video" (Shuman, 1998, p. 5). In addition, interactive qualities are present when the user is enabled to control content exploration (Shuman).

P-12 Teachers - P-12 teachers refers to any teacher working directly with students in a classroom type setting from prekindergarten to 12th grade. This includes any teachers currently teaching students in the Oneida Elementary School, the Oneida Middle School, or the Oneida High School.

Paradigm - "A paradigm may be viewed as a set of *basic beliefs* (or metaphysics) that deals with ultimates or first principles" (Guba & Lincoln, 1994).

Perceived relevance - Perceived relevance refers to the individual's belief that an entity, object, or concept has a value or use that is considered important. Perceived relevance influences whether something is seen to have value.

Perceived Self-efficacy – "Perceived self-efficacy is concerned with judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122)**.**

Reliability - "Reliability is the degree to which a test consistently measures whatever it is measuring" (Gay & Airasian, 2000, p. 169).

Simulation software - Simulation software is software that enables users to explore, investigate, analyze, and process information in order to make decisions and problem solve (Norton & Wilburg, 1998).

Teacher motivation - Teacher motivation is an invisible force that is influenced by social factors, interpersonal relationships, intrinsic motivators, and extrinsic rewards. Motivation energizes the teacher to take a course of action and maintain a behavior. This definition is a combination of the definitions described by Vallerand (1997) and Samuel Ball (1977).

Technology integration - Technology integration is defined as the process of integrating computer technology and curriculum to facilitate learning.

ThinkQuest - A ThinkQuest is an electronic resource that has been collaboratively designed by students. These resources review a variety of topics and are available for student use at the website referred to as ThinkQuest (ThinkQuest, 2002).

Validity - Gay and Airasian (2000) define the term validity according to the following statement: "It is concerned with the appropriateness of the interpretations made from test scores" (p. 161).

Factor - A factor or factors can be defined as any positive or negative entity that influences motivation.

WebQuest - "Developed by Bernie Dodge (Classroom Connect, 1996-1997), a WebQuest is an inquiry-oriented activity in which some or all of the information that students interact with comes from the Internet" (Norton & Wilburg, 1998, p. 181).

ORGANIZATION OF THE STUDY

Chapter I of this dissertation was organized into nine sections. The introduction and problem sections described the complex problem of how to motivate and support teachers to ensure integration of computer-based technology within the curriculum. The purpose and need for study sections described why and how this study might contribute information necessary to the solution of the larger problem. The design of study section was also included to describe the organization of this study. In addition, this chapter described the assumptions, limitations, and delimitations identified in the design and implementation of this study.

Chapter II was organized into five sections and also included a summary section. Each section contained relevant research on the following topics: motivation, multimedia defined, multimedia in P-12 settings, multimedia in university settings, and multimedia design principles.

Chapter III contained six sections. Each section introduced the following information: introduction to methodology, description of Oneida Special School District, population and sample, data collection procedures, and data analyses.

Chapter IV was divided into two sections. The first section of this chapter described the Phase I findings obtained through the use of the questionnaire. The second section of this chapter described the findings obtained through the use of an interview process, as well as the analysis of the interview transcripts.

Chapter V, the final chapter, described the emergent themes that were identified through the analysis process. Beliefs, relevance, relatedness, and value were the themes that emerged through the analysis of the interview transcripts. In addition, conclusions, implications, and recommendations for further research were also described in this chapter of the study.

CHAPTER II

REVIEW OF LITERATURE

MOTIVATION

Researchers have long attempted to identify the factors that influence motivation and human behavior (Bandura, 1982; Berg, Reno, & Coker, 1992; Deci, 1975; Parkay, Greenwood, Olejnik, & Proller, 1988). Although motivation has long been studied, the definition of motivation is neither concise nor simplistic. Motivation as described by Vallerand (1997) is a multidimensional concept in which a number of social factors, intra-personal beliefs, and interpersonal relationships interact to influence actions and behavior. Samuel Ball (1977) indicated "The term motivation is usually defined by psychologists as the processes involved in arousing, directing, and sustaining behavior" (p. 2). Other researchers have investigated factors necessary to facilitate motivation and influence human behavior (Bandura & Adams, 1977; Czubaj, 1996).

Mechanistic, Organismic, Humanistic, and Cognitive are among the theories that have been used to investigate the phenomenon of motivation (Deci, 1975). Each of these theories has explored motivation from a different perspective. Mechanistic Theory viewed humans as objects manipulated by the environment; Organismic Theory envisioned humans as participants within the environment; Humanistic Theory identified humans as independent decision makers (Deci); and Cognitive Theory emphasized a thought process in which "It assumes that people decide what to do on the basis of their evaluations of the likely outcomes of their behavioral alternatives" (Deci, p. 15).

Further, the study of motivation has focused on three types of motivation that are referred to as intrinsic, extrinsic, and amotivation (Vallerand, 1997). "Intrinsically motivated activities are ones for which there is no apparent reward except the activity itself" (Deci, 1975, p. 23). Extrinsic motivation refers to motivation that comes about because of rewards or external pressures (Deci), and "Extrinsically motivated behaviors are related to basic drives which generally operate in a cyclical fashion to interrupt the ongoing intrinsically motivated behavior" (Deci, p. 125). Amotivation refers to a lack of either intrinsic or extrinsic motivation (Vallerand), and it has been shown to have an influence on behavioral outcomes (Vallerand & Bissonnette, 1992).

Motivation is so complex that large amounts of research have been conducted in order to better understand this phenomenon (Bandura, 1982; Bandura & Adams, 1977; Cohen, 1983, 1986; Deci, 1975; Deci & Ryan, 1985; Sylvia & Hutchison, 1985). In addition, research efforts have also been directed toward both intrinsic and extrinsic motivation in order to better understand the influences that autonomy, competence, and interpersonal connectedness can have on motivation (Deci & Flaste, 1995; Vallerand, 1997).

Intrinsic motivation has been investigated by attempting to ask why, how, and what leads to a particular behavior (Cohen, 1986). "Intrinsically motivated behaviors are ones which a person engages in to provide himself with a sense of competence and self-determination" (Deci, 1975, p. 125). Researchers have reviewed and analyzed the results of surveys conducted by other investigators in order to understand the relationship between intrinsic motivation and pre-service teacher attitudes toward teaching (Berg et al., 1992). The findings suggested that intrinsic factors were significant motivators for

attracting pre-service educators (Berg et al., 1992). One important intrinsic factor that was identified as a motivator for the pre-service teacher was that they wanted to improve the quality of life for both themselves and students (Berg et al.).

Although the desire to improve the quality of life was one intrinsic factor identified within research, Mills (1991) indicated that intrinsic motivation could be explained through another paradigm. This paradigm refers to a higher state of mind: "In this higher level of well-being and positive motivation, people are energized by an intrinsic interest in what they are doing, not by what others think or what they are trying to prove about themselves" (p. 75). Although Mills indicated that a higher state of mind influences behavior, other researchers have shown that factors such as perceived self-efficacy, teacher efficacy, commitment, autonomy, competence, and interpersonal connectedness can also influence motivation.

"Perceived self-efficacy is concerned with judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122). An accurate perception of self-efficacy is critical if an individual is to make appropriate decisions (Bandura, 1982), the level of self-efficacy held by an individual can be influenced in a positive way in order to change or modify behavior (Bandura & Adams, 1977), and the accomplishment of short-term goals can facilitate both the development of self-efficacy and self-motivation (Bandura, 1982). The influence of perceived self-efficacy on behavior is not limited to the individual; even groups can develop a level of group efficacy that can affect the motivation of an entire group (Bandura, 1982). Based on the previous information, self-efficacy and group efficacy are therefore important factors that can influence both teacher motivation and beliefs (Bandura, 1982).

Teacher beliefs regarding self-efficacy and locus of control have been shown to be influenced by outside forces such as stress (Parkay et al, 1988). A survey conducted by Parkay et al. involved 321 teacher participants and consisted of questions relating to teacher beliefs, teacher efficacy, and the degree of stress. The schools that participated in the research were identified as either high stress or low stress schools, and the results suggested a correlation between high stress schools and physiological problems experienced by teachers. The results of this research suggested that when high levels of stress existed within an educational system, the degree of teacher efficacy was negatively affected and the locus of control tended to be external (Parkay et al.). Further, a number of teachers at high stress schools believed that they were powerless to improve or alter the situation. The findings of this research suggest that the level of stress within the educational environment can affect teacher beliefs and influence teacher motivation (Parkay et al.).

Teacher motivation has also been investigated through research on personal efficacy, general efficacy, and educational climate (Coladarci, 1992; Coladarci & Breton, 1997) to determine whether a relationship exists between these factors and teacher commitment. Three hundred and sixty-four K-8 teachers from Maine were invited to participate in this study conducted by Coladarci (1992). Personal efficacy was assessed using a question, such as, "When the grades of my students improve, it is usually because I found more effective teaching approaches" (Coladarci, p. 329). General efficacy was investigated using the following type of question: "When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on the home environment" (Coladarci, p. 329). Additional questions evaluated

the educational climate focusing on principal and peer relationships within the educational setting. "The central finding of the present study was that personal and general efficacy were the two strongest predictors of commitment to teaching" (Coladarci, p. 334).

Teacher commitment was investigated through the analysis of survey data collected through the Administrator and Teacher Survey of 1984 (Tyree, 1996). The analysis of findings suggested that the degree of involvement with students or subjects, the level at which the teacher identifies with students, and the degree of loyalty all related to teacher commitment (Tyree, 1996). Teacher commitment was further investigated through the research of Sederberg and Clark (1990). Eighteen Minnesota teachers who had been selected as teacher of the year were interviewed in order to determine the factors that facilitate and maintain high vitality teaching (Sederberg & Clark). The incentives to facilitate commitment were identified as livable wage, professional retreats, significant decision-making, good supervision, and appreciation. Further, an analysis of the qualitative data revealed themes that were observed frequently: wanting to emulate a model teacher, dedication to teaching, and a desire to share a love for learning with students (Sederberg & Clark).

Research regarding job satisfaction was also conducted in order to identify the factors that can influence motivation and job satisfaction (Davis & Wilson, 2000). This research was conducted using a questionnaire that investigated principal empowering behaviors and the analysis of the data suggested that motivation increased as principal empowering scores increased (Davis & Wilson). These findings support the conclusion of Deci and Flaste (1995) that when teachers are provided an environment in which they

are able to make decisions, their locus of control becomes internal and their intrinsic motivation increases.

Intrinsic motivation has also been investigated using the following extrinsic factors: deadlines, evaluation, tokens, expectancy, goal imposition, competition, and avoidance of punishment (Deci & Ryan, 1985, 1987). Theorists believed that these extrinsic factors would enhance motivation and improve individual performance. However, both rewards and surveillance have been shown to have a negative impact on motivation within the educational setting (Lepper & Greene, 1975). Research related to the receipt of awards for completion of a task has shown a decrease in intrinsic motivation within students who were expecting the award (Lepper, Greene, & Nisbett, 1973). When monetary rewards or threats were used to facilitate extrinsic motivation, the level of intrinsic motivation diminished (Deci & Flaste, 1995). Further, participants involved in research related to the use of deadlines, surveillance, or negative feedback also exhibited a decrease in intrinsic motivation when these extrinsic factors were used to influence motivation (Deci & Ryan, 1985). These findings are significant because learning appears to be influenced positively when subjects are intrinsically motivated to learn rather than when they are extrinsically motivated (Deci, 1975; Deci & Flaste, 1995; Deci & Ryan, 1985).

Although extrinsic factors have been shown to have a negative influence on intrinsic motivation, identified and integrated regulation are believed to have a positive influence on intrinsic motivation (Vallerand & Bissonnette, 1992). Identified regulation refers to the premise that the individual comes to identify a particular behavior as important and freely chooses to perform the behavior (Vallerand & Bissonnette).

Integrated regulation refers to the individual's willing performance of a behavior that has become a part of the individual's valued goals (Vallerand & Bissonnette). An example of identified regulation would be a teacher spending extra time to enhance computer skills, while an example of integrated regulation would be a teacher deciding to study course work rather than enjoying a sporting event because achieving the desired goal is important. "Thus, extrinsic motivation need not lead to negative effects. It can also be beneficial for the individual, depending on the type of extrinsic motivation involved (Vallerand & Bissonnette, 1992, p. 613)."

The complex phenomenon of motivation can best be described through a review of the Hierarchical Model (Vallerand, 1997). This model is a three-dimensional phenomenon that exists within the individual and is comprised of global, contextual, and situational levels (Vallerand). The global level refers to the individual's personality; the contextual level refers to whether the events are educational, interpersonal relations, or leisure activities; and the situational level refers to a particular time or event (Vallerand). This model describes social factors as having an influence on motivation; however, individual perceptions regarding the level of autonomy, competence, and relatedness are significant mediators that bring about thought or action (Vallerand).

Autonomy refers to the premise that the individual is in control of his or her own behavior, and this need to be in charge of one's own behavior influences the individual's level of intrinsic motivation (Deci & Flaste, 1995). If an individual perceives that he or she is being controlled to behave in a particular way, then the locus of control becomes external and the level of intrinsic motivation is reduced (Deci & Flaste). Autonomy has also been shown to have an influence on job satisfaction (Frase & Sorenson, 1992).

Seventy-three teacher participants from the San Diego School District completed a questionnaire, and an analysis of the findings suggested a strong positive relationship between job satisfaction and the factors of autonomy and feedback (Frase & Sorenson).

Competence has also been identified as a mediator of behavior (Vallerand, 1997; Deci & Flaste, 1995). "The feeling of competence results when a person takes on and, in his or her own view, meets optimal challenges" (Deci & Flaste, p. 66). Each time an individual is able to successfully complete a challenging task the level of competence is increased and "the intrinsic needs for competence and self-determination motivate an ongoing process of seeking and attempting to conquer optimal challenges" (Deci & Ryan, 1985, p. 32). Competence and autonomy are both identified as important factors that can influence motivation (Deci & Flaste; Vallerand).

Interpersonal connectedness or relatedness is a third mediator of behavior that has been identified using the Hierarchical Model (Vallerand, 1997). This concept refers to the degree to which an individual is connected to another individual, group, or entity and "the intrinsic need for relatedness leads people to be part of groups – initially their nuclear family, then larger groups, then society, and finally (one hopes) the global community – and this need, for good and for bad, opens people up to being socialized" (Deci & Flaste, 1995, p. 103). The individual will therefore be influenced by the level of relatedness that exists between themselves and significant others (Deci & Flaste; Vallerand). Relatedness is just one more piece of the puzzle that is necessary to understand motivation.

There is no universal definition that concisely defines motivation; however, the understandings that have emerged through this review of literature includes the

following: (a) motivation is influenced by a variety of factors such as self-efficacy, autonomy, competence, setting, supports, and the degree of interpersonal relationships; (b) humans possess the ability to change behavior when an action or behavior is identified as relevant or important; (c) perceptions can influence the effect of extrinsic motivators on intrinsic motivation; and (d) when an action or behavior is necessary to accomplish a goal it may become part of the goal. These understandings are necessary if we are to comprehend *Why We Do What We Do* (Deci & Flaste, 1995).

MULTIMEDIA DEFINED

There is no common definition for multimedia, yet through a review of literature particular elements or themes can be identified. First, the computer is the tool through which interactive multimedia can be accessed, manipulated, and modified (Jonassen, 2000; Jonassen et al., 1999). The computer has been described as an essential component for the use of interactive multimedia as seen in the following statement: "Interactive multimedia instruction (IMI) is an instructional program which includes a variety of integrated sources in the instruction with a computer at the heart of the system" (Schwier & Misanchuk, 1993, p. 6).

Second, interactive multimedia communicates a message using a variety of media such as graphics, sound, and animation (Jonassen et al, 1999; Shuman, 1998). Further, "Multimedia represent the integration of more than one medium into some form of communication" (Jonassen, et al., p. 88). Mayer (2001) has indicated, "I define multimedia as the presentation of material using both word and pictures" (p. 2).

Third, interactive multimedia facilitates user control, and the ability to freely navigate the presentation positively influences student motivation (Bruntlett, 1999; Shuman, 1998). "The ability of the user to interact with the program is perhaps the single most critical feature of multimedia" (Shuman, p. 5). However, the level of interactivity can vary from one presentation to another and according to Schwier and Misanchuk (1993) the three types of interactivity can best be described as reactive, proactive, and mutual. Reactive interactivity refers to the user being able to explore information, while proactive interactivity refers to the user being able to create information (Thompson and Jorgenson, 1989). The term mutual interactivity refers to a process in which the choices provided by the computer program are based on the responses of the user, an example of this type of interactivity is virtual reality (Schwier & Misanchuk).

The level of interaction referred to by these authors relates to a cognitive level of interaction in which the learner interacts with information in ways that facilitate understanding or meaning (Jonassen et al., 1999). Even narration and animation can be designed in such a way as to enable the user to control the material (Mayer & Chandler, 2001). This level of interactivity enables the learner to review material at a pace that can minimize or prevent cognitive overload and ease the learning process (Mayer & Chandler).

Although the definition of multimedia can vary among experts, the definition for this study was as follows: "Multimedia can be defined as a computer-based communications process that incorporates text, graphics, sound, animation, and video" (Shuman, 1998, p. 5). In addition, interactive qualities are present when the user is enabled to control content exploration (Shuman). For the purpose of this study, three

specific types of multimedia have been investigated. The following sections were designed to review basic information on the CD-ROM, the Internet including WebQuests and ThinkQuests, and videodiscs.

CD-ROM

The use of CD-ROM software empowers students to become active participants in the selection of information that is to be explored and reviewed (Bruntlett, 1999). "The power of a CD-ROM lies in its interactivity, the way in which its content can be navigated and explored in as much or as little detail as the user desires" (Bruntlett, p. 74). CD-ROM software provides multimedia environments in which the student can interact with vast amounts of information and can experience places or events that would normally not be accessible (Bruntlett).

There are several ways in which CD-ROMs can be classified. However, for the purpose of this study CD-ROM software was investigated using four categories. CD-ROM software and titles were categorized as reference, documentary, simulation, or edutainment software. CD-ROM software may fall into more than one category and the CD-ROM *A.D.A.M. The Inside Story* (A.D.A.M. Software, Inc., 1996) is one such program that can be categorized as educational, entertainment, and reference software (Shuman).

Reference software refers to programs that work similar to encyclopedias and dictionaries; however, these software programs enable users to navigate freely to explore databases and hyperlinks in order to acquire information about particular topics (Shuman, 1998). *Encarta Reference Library 2003* (Microsoft Corporation, 2002) is an example of

a program categorized as a reference CD-ROM (Gordonson, 2002). Research conducted in Britain found that teachers reported having students use CD-ROM reference software because it motivated students and supported student independence (Wishart, 2000).

Documentary software is another category in which CD-ROMs may be categorized. A documentary is described as a presentation that incorporates factual information about a particular event (Mish, 2000). Documentary software provides factual information in order to inform the user about significant events that have occurred in the past. The presentation format of the documentary software would contain information using multimedia in such a way that it resembles a documentary film (Gordonson, 2002).

In addition, simulation software represents another category. Simulation software provides students with the opportunities necessary to explore and manipulate environments that could not be experienced otherwise, such as ecosystems (Cox, 1999). Students are enabled to investigate challenging mathematical problems through the use of simulation software (Nicaise & Barnes, 1996). Further, simulation software has been shown to facilitate user control, student success, learning experiences, and motivation (Cox). The program entitled *The Oregon Trail* (TLC Education Properties LLC, 2001) is one example of simulation software (Gordonson, 2002).

The last category of CD-ROM software to be reviewed is edutainment. "As the name suggests, edutainment is the combination of education and entertainment" (Shuman, 1998, p. 15). According to Shuman (1998), one example of an edutainment CD-ROM is *Math Blaster* (Vivendi Universal Publishing, 2000). The types of CD-ROM

software on the market are so numerous that teachers must critically evaluate the software for student use.

The processes used to evaluate CD-ROMs have been limited, and more comprehensive evaluation must be accomplished to appropriately assess the capabilities of the software to maximize student learning (Aldrich, Rogers, & Scalfe, 1998). An evaluation guide was designed through the research of Aldrich et al. to assess whether (a) material can be accessed in multiple ways, (b) students can develop new ideas, (c) students are enabled to integrate multimedia, and (d) students can create or manipulate models that facilitate understanding. Multimedia uses multi-sensory modalities to present information that can be experienced passively, while interactive multimedia enables the student to take charge of learning and to be actively involved in the learning experience (Ambron, 1990).

"The most common form of multimedia today is CD-ROM, but the internet is fast becoming the most common multimedia format, though maybe not necessarily the most widely available" (Bruntlett, 1999, p. 73). According to the Digest of Education Statistics (2000), Internet access increased 60% over the five-year period of 1994 to 1999 within all public schools. This access to the Internet provides educational facilities the capabilities to search, explore, and retrieve global resources.

Internet

The Internet has the potential to become a significant resource within the educational setting, but only if teachers integrate its use within the classroom. Multimedia presentations can be much more easily accessed than in the past, and the web

sites that are available on the Internet include a wide variety of subjects that can be integrated into the educational curriculum.

What's Asthma All About? (Neomedicus, 2001) is an example of an educational site that has been designed to provide the user critical information about asthma. The use of animation within this presentation enables the learner to comprehend a complex process that is difficult to describe in words. This web site could easily be used as a resource within the health and science curriculum.

Remembering Pearl Harbor (National Geographic Society, 2001) is a web site that describes events that occurred December 7, 1941, in Pearl Harbor, and it includes oral histories from survivors of this event. Through the use of this multimedia presentation, the user can explore and navigate the information in a nonlinear way to better understand this historical event. Social studies and history curriculum could easily use this particular web site as an instructional resource.

New England Aquarium (New England Aquarium, 2002) is an example of a web site on the Internet that enables students to take virtual tours including a whale watch. Through the use of this site students can observe ocean life that might not otherwise be accessible. This particular site could easily be integrated into the science curriculum in order to study the ocean, whales, or environmental issues.

These are but a few examples of resource sites that exist on the Internet. Integration of appropriate Internet resources within the educational curriculum can enable students to investigate and explore unusual or extraordinary events that might not be experienced otherwise. However, the Internet with all its potential benefits also has limitations.

The Internet provides access to staggering amounts of information, the information provided via the Internet is increasing in volume daily, and information contained within web pages is not always accurate (Maddux, 1998). When 200 web pages were reviewed on the Internet, a majority of these web pages were identified as being of poor quality and a significant number had inoperable links or misinformation (Maddux). If educators are to minimize information overload and facilitate meaningful use of the Internet, the WebQuest may offer an alternative.

"A WebQuest is an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web" (Dodge, 1998, para. 2). The WebQuest is a web page created through the use of a text-editing program. Guidelines for developing a WebQuest are available at *The WebQuest Page* (Dodge, 1998). In addition, a web page entitled *Using a WebQuest In Your Classroom* (Memphis Schools, 2002) can also be accessed to learn more about developing WebQuests for the classroom setting. Teachers can either use existing WebQuests or they can develop their own WebQuest resources for classroom usage.

Linda Good developed *The Light in the Forest* (Good, 2001) so that students could enhance their knowledge through reading. Jason Hovey created the *Planetary Web Quest* (Hovey, 2000) so students could explore and investigate the Solar System. L. Swain designed *Using the Periodic Table* (Swain, 2000) to provide students with information regarding chemical elements and compounds. Each of these examples demonstrates how the WebQuest can be used to create multimedia that can be integrated with curriculum standards in a relevant way.

ThinkQuest (ThinkQuest, 2002) is also an educational resource on the Internet that can be used by students to explore, review, and learn information. ThinkQuest is a non-profit organization that publishes research that has been created by students for peers (ThinkQuest, 2002). ThinkQuests are web pages developed through the use of some type of text-editing program or authoring software. These instructional projects vary in degree of interactivity and the use of multimedia ranges from text and images to animations and movies.

The Internet is continually evolving, and new web-based resources are added to the sites already available. As more and more information becomes available on the Internet, the evaluation process necessary to identify reputable sites and reliable information becomes more complex. Therefore, it is essential that students learn how to navigate the Internet successfully in order to locate, evaluate, critique, interpret, organize, and disseminate information using a variety of media (Fulton, 1998).

Videodisc

As previously indicated, CD-ROMs and the Internet are the two types of multimedia most commonly used within the field of education. This was not always the case and during the early 1980s the videodisc was envisioned as the technology tool for teaching (Manning, Ebner, Brooks, & Balson, 1983).

At one time the videodisc player was the technology with which to explore complex life processes invisible to the learner (Woods, 1984). The memory capabilities of one videodisc enabled the storage of large picture databases containing up to 54,000 individual pictures, as well as audio files (Woods, 1984). However, the cost of design,

development, and production was extremely expensive according to Butler (as cited in Manning, Ebner, Brooks, & Balson, 1983).

During the early 1980s videodisc technology was used to develop courseware that could present complex processes in a manner that could be better understood by the viewer (Woods, 1984). The instructional nature of the videodisc incorporates information designed to facilitate learning, and the media used to facilitate understanding consists of graphics, text, sound, and animation (Schwier & Misanchuk, 1993). "The random access capabilities of videodisk allow students to use a remote control device to pause, review, and search for information that they may have otherwise missed or forgotten" (Kozma, 1994, p. 12). The interactive multimedia stored on the videodisc is presented in segments so that user control is facilitated and the media integrated within the program is coherent (Schwier & Misanchuk), thereby providing the learner with an interactive environment that can be investigated and explored according to the needs of the student (The Cognition and Technology Group at Vanderbilt, 1990).

The Cognition and Technology Group at Vanderbilt (1990) used videodisc technology to create interactive lessons based on Anchored Instruction, and these videodiscs were designed to facilitate problem-solving skills in the subject areas of language arts and mathematics. *The Young Sherlock Holmes* (Cognition and Technology Group at Vanderbilt, "n.d.") was developed to focus on language arts skills, whereas *The Adventures of Jasper Woodbury Problem Solving Series* (Cognition and Technology Group at Vanderbilt, 1992-1996) focused on mathematical problem-solving skills (The Cognition and Technology Group at Vanderbilt, 1990).

Even within the last seven years this technology has continued to be used to develop instructional courseware for educational purposes across the curriculum. A series of videodiscs produced by Houghton Mifflin Company for grades 4 through 8 were designed to enhance student literacy skills. This series of 15 videodiscs entitled Channel R.E.A.D., Reading Enters Another Dimension (Landmark Learning, 1994), was developed using graphics, audio, animation, and narrative to elaborate the critical elements of story development; genre, vocabulary, conflicts, and problem solving. Some of the titles within this series include *Get the Message* (Landmark Learning, 1994), *The Case of the Missing Mystery Writer* (Landmark Learning, 1994), *The Heights of Adventure* (Landmark Learning, 1994), and *Heroes of the Marsh* (Landmark Learning, 1994).

Glencoe McGraw-Hill has also produced videodiscs for the science curriculum. *The Secret of Life* (Sicker, 1995) videodisc was developed as an instructional tool for teaching about cells, genetics, and animal behaviors. Through the use of graphic time-lapse photography, students can view complex processes not otherwise observable (Sicker, 1995).

Holt, Rinehart, and Winston produced a videodisc for students in grades 9 through 12. This videodisc can be used to explore at least 20 countries around the world including Japan, Egypt, and Hungary. This videodisc, entitled *The World Today Videodisc Program* (Lawyer, 1995), includes information on land usage, geographic landscapes, economics, and trade.

However, as CD-ROM technology improved and data storage capabilities increased other technologies began to replace the videodisc, and at the present time few

videodiscs are produced for educational purposes (Jonassen et al., 1999). Currently, the CD-ROM and the Internet are identified as the two technologies most commonly used within the educational setting (Bruntlett, 1999).

In summary, the use of multimedia within the educational setting provides students with opportunities to control and utilize information to promote personal understanding. CD-ROMs enable students to explore information according to the individual desires of the student. The Internet provides teachers and students a resource with which to easily acquire information from distant lands around the globe. In addition, videodiscs provide students a means with which to view complex processes that are not visible without magnification and time-lapse photography. This section reviewed the definition of multimedia, and provided an overview of computer-based multimedia resources in order to establish a foundation on which to pursue this investigative process.

MULTIMEDIA IN P-12 SETTINGS

Research conducted in a Pre-K setting focused on how young children interacted with a multimedia program using the computer and a videodisc to explore concepts such as in, out, up and down (Liu, 1996). The findings indicated that students' were interested in the animal characters, they were able to maintain focus, and they were able to operate the mouse in order to navigate the program with minimal assistance (Liu). Even at an early age students were able to interact with a multimedia program in order to investigate and explore abstract concepts. Research has also been conducted to determine whether learning has occurred through the use of multimedia.

Health programs have used multimedia programs to present instructional materials regarding health and illness (Yawn, Algatt-Bergstrom, Yawn, & Wollan, 2000). Fourth grade students, ages 6 through 12, participated in research that was conducted to evaluate the effectiveness of a CD-ROM game designed to teach them about asthma (Yawn et al.). The posttest results conducted after six weeks of usage indicated that the students using this instructional game significantly outperformed nonusers on questions related to asthma (Yawn et al.).

Further, a variety of research has been conducted on reading and the use of CD-ROM storybooks to facilitate literacy. Discis books were used to investigate whether CD-ROM storybook software would help students improve reading skills (Miller, Blackstock, & Miller, 1994). The elementary school students who participated in this study repetitively read either a CD-ROM storybook with sound or a traditional storybook. The storybooks were read two days per week and the findings indicated that the repetitive reading of the CD-ROM storybook increased reading skills in pronunciation and definition more than the repetitive reading of a hardback storybook (Miller et al.).

Research conducted on vocabulary building investigated the degree to which electronic books promote vocabulary (Higgins & Hess, 1999). Both the experimental group and the control group used an electronic CD-ROM to read a story; however, only the experimental group was provided supplemental resources for words that they did not comprehend. The findings of this research indicated that the experimental group was able to perform better on the posttest and that the effective use of electronic book animation was facilitated through the use of supplementary clarification provided by the

researcher (Higgins & Hess). In addition to reading skills, spelling has also been investigated within the research literature.

A behavioral spelling program and a cognitive spelling program were designed in order to determine the most effective program (Cates & Goodling, 1997). The participants were fifth grade students who used a spelling program for ten minutes per day for one month. The findings indicated that students using either of the programs significantly improved spelling skills, and that the students increased spelling skills by an average of 30 words (Cates & Goodling).

The benefits of an interactive literacy program referred to as *WiggleWorks* (1994-1996) has also been investigated at two different educational settings using first and second grade students (Ross, Hogaboam-Gray, & Hannay, 2001). The instruments used to collect the data included a measure of computer skills, student feedback on use, and student self-reporting measures of both enjoyment and level of confidence. The findings suggested that the integration of *WiggleWorks* (1994-1996) positively impacted the students by enhancing their self-efficacy and promoting positive attitudes toward the use of computer technology (Ross et al.). Although research has investigated the literary benefits of CD-ROM storybooks, other multimedia software have been investigated to gain information on problem-solving skills.

Eighty-seven elementary students living in Taiwan participated in a study conducted over a six-week period in order to investigate whether a program referred to as *Jane's Choice* could be used successfully to achieve the following: to enhance students' problem-solving skills and to compare the affects of using a storybook versus a CD-ROM to present mathematical concepts (Shyu, 1999). The computer-based CD-ROM and the

storybook were designed to incorporate Anchored Instruction and the only difference between the two media was the interactivity within the CD-ROM (Shyu, 1999). The pre and posttest findings suggested that there were no significant differences in problem-solving achievement when comparing the group using the CD-ROM to the group using the storybook (Shyu). As well as problem-solving skills, the effective design of software has been researched in other subject areas such as geography.

Students age 13 to 15 attending a Dutch school were subjects in a research project to determine the effects of multimedia lessons in geography. "The assessment focused on time on task, interaction, and information handling skills" (Smeets & Mooij, 1999, p. 487). The Utrecht University staff developed the lessons used in this research, and these lessons were to be presented using a CD-ROM database, as well as a videodisc. This research was conducted over a two-year time frame. The results indicated that students using multimedia required more time to prepare for the process, they spent less time on task, and their information-handling skills did not increase; however, the interaction within the classroom setting was significantly greater (Smeets & Mooij).

Additionally, research has been conducted to evaluate the effectiveness of simulation software within the field of education (Henderson, Klemes, & Eshet, 2000). Second grade students were participants in a research project on simulation software, and the study was conducted over a six-week period during which data were collected via pre and posttests, observations, and interviews. The findings revealed that the use of simulation improved general thinking skills, but did not significantly improve higher order thinking skills (Henderson et al.).

Simulation software has also been used to enable students to explore concepts of gravity and Newtonian principles (Jimoyiannis & Komis, 2001). Through this computer-based interactive media 90 students ages 15 to 16 explored a concept like velocity, and the findings indicated that the level of achievement for these students was significantly different (Jimoyiannis & Komis).

Additional research has also been conducted using high school students within a university setting. Researchers conducted this study at the University of Hawaii Laboratory School in order to investigate how individual learning styles influence the effectiveness of instruction via a multimedia physics tutorial (Crosby & Iding, 1997). The participants in this research were 12th-grade students attending university science classes, and the tutorial provided opportunities for interactivity including predicting outcomes. The findings suggested that the learning preference of the individual had an influence on the outcome of learning and that the student's level of application was performed below the level of knowledge acquired (Crosby & Iding).

A summary of the research on multimedia provided conflicting results. A number of the research articles suggested that the use of multimedia facilitated learning. However, other research results indicated that no significant difference was perceived when multimedia was used within the educational setting. These findings suggest that if we are to measure the effectiveness of multimedia within the educational setting we need to design alternative assessment strategies (Kozma, 1994).

MULTIMEDIA IN UNIVERSITY SETTINGS

Although research findings in the P-12 setting have been inconclusive, multimedia has been and continues to be used to design and develop instructional courseware for adult learners. Multimedia research has often focused on learning outcomes using pre and posttests. However, students' perceptions have also been used to assess the effectiveness of multimedia.

Two studies were conducted in order to determine the relevance of media, level of interest, and clarification of concepts (Nowaczyk, Santos, & Patton, 1998). The first study was conducted in a psychology class with 20 students, and the instructor used commercially prepared overheads and video from a videodisc. The second study was conducted with 88 students in a statistics class, and the instructor used teacher-created presentations to present course materials (Nowaczyk et al.). Students from the psychology class indicated that the videos from the videodisc were relevant, interesting, and clarified concepts. Students from the statistics class initially reported that the multimedia clarified concepts but they also indicated that the multimedia negatively impacted classroom interactions and did not prepare them for more advanced concepts (Nowaczyk et al.).

Research conducted in a statistics class used three types of modules for instructional purposes (González & Birch, 2000). The findings suggested that the multimedia module was equally as effective as a basic computer module without multimedia and a paper and pencil module, therefore indicating no significant difference between the modes of presentation for the modules (González & Birch). Research on

interactive multimedia has not been limited to statistics, and other subject areas such as physics have also used multimedia for instruction.

Physics has used multimedia to present information on complex processes such as oscillatory motion, and an interactive multimedia program, referred to as *Slice*, was investigated in order to determine whether student learning increased (Harms, Krahn, & Kurz, 1998). The findings of pre and post testing showed that the degree of learning was not significant and this was attributed to the fact that students were not able to deal successfully with the freedom they were given to conduct independent learning (Harms et al.).

Research conducted in a first year physics course assessed the effectiveness of a computer-based learning package referred to as Software Teaching of Modular Physics, also known as *SToMP* (Watkins, Augousti, & Calverley, 1997). The research on this program compared posttest scores of students using *SToMP* with those students learning physics through traditional instruction. "What can be said of the package, in terms of the attainment of learning outcomes by the students, is that it is about as good as the teaching method which it replaces" (Watkins et al., p. 171).

Just as physics has used interactive multimedia for instructional purposes, so too has science. Forty-one undergraduate students participated in research regarding computer-based simulation software that was designed to present opportunities for investigation of Newton's laws of motion (Rieber, Smith, Al-Ghafry, Strickland, Chu, & Spahi, 1996). Through the use of this game-like simulation, students were able to explore the complex dynamics of motion and were able to test or predict events. Posttest results showed an increase in student understanding regarding Newton's law of motion;

however, qualitative data indicated that feedback from the interviewer facilitated comprehension (Rieber et al.). Additional research has even been conducted in the area of medicine.

Students attending medical school were participants in a research project that used a simulation program in order to enable students to investigate calcium homeostasis (Pilkington & Parker-Jones, 1996). Through the use of this system students were able to apply knowledge to diagnose and treat an imbalance within this complex regulatory system and to obtain a better understanding of cause and effect dynamics. The findings indicated that after using this simulation, student performance increased in questions related to calcium homeostasis (Pilkington & Parker-Jones). "The most frequently cited advantages of the system were its realistic simulation and the ability to test hypotheses" (Pilkington & Parker-Jones, p. 10).

Additional research has also been conducted in the area of social work education. Research conducted at a university in the Midwest investigated the use of multimedia modules referred to as *Building Family Foundations* (Thurston & Cauble, 1999). The participants consisted of 35 students majoring in social work, and the results of the research indicated that there was a significant increase in students' knowledge and a statistically significant increase in student confidence regarding the application of necessary social work skills. However, a team of design specialists was required to develop and evaluate this module over a five-and-a-half-year period (Thurston & Cauble).

Based on the ambiguous findings of the previous articles, further investigation is necessary. Research needs to focus on how the characteristics of a medium can influence

learning (Kozma, 1994). However, even a review of research literature on the characteristic of animation has suggested that the effectiveness of animation for instructional purposes has not been clearly substantiated (Rieber, 1990). "Media and their attributes have important influences on the cost or speed of learning but only the use of adequate instructional methods will influence learning" (Clark, 1994, p. 27).

The previous research has focused on the effectiveness of software within the educational setting; however, other research has been conducted in order to evaluate and improve multimedia. The use of narration has been investigated within interactive multimedia in order to comprehend whether learners need cues or information to effectively navigate an environment successfully (Laurillard, 1998).

The Project MENO was conducted in order to determine whether narrative structure needed to be used in multimedia to direct learning and maximize student success (Laurillard). The *Homer* disc was used for the research project and it was designed to facilitate opportunities for synthesis, analysis, and interpretation of information using an outline, learner control, and feedback (Laurillard). These findings supported the concept that the use of narrative structure facilitated the learning experience by providing direction and suggestions for exploration but not without altering user control (Laurillard).

Research on the effectiveness of multimedia within adult education has also presented inconclusive findings. However, a number of studies have reported that simulations can be powerful tools with which to enhance learning and clarify complex concepts. Animated simulations have been reported to provide the learner with

environments that enable manipulation of information to better understand cause and affect relationships.

MULTIMEDIA DESIGN PRINCIPLES

"Although the use of animated visuals is both common and popular among CBI designers, the theoretical and empirical foundations for their use have not been firmly established" (Rieber, 1990, p. 77). Rieber indicated that a review of literature on animation provided no significant or substantial information regarding the effects of animation on learning. However, since that time Mayer and his associates have conducted research that has contributed information toward the establishment of multimedia principles that facilitate learning (Mayer, 1997, 1999; Mayer & Anderson, 1992; Mayer & Chandler, 2001; Mayer, Moreno, Boire, & Vagge, 1999; Mayer & Sims, 1994).

Mayer and Anderson (1991) conducted research regarding the effects of animation on problem solving skills and recall. Animation was used to describe the operation of a tire pump and this animation was presented to subjects using different sequences. Animation and sound were presented simultaneously, sound was presented before animation, only sound was presented, and only animation was presented. The findings indicated that the subjects who viewed the simultaneous animation and narration performed better on problem solving and recall (Mayer & Anderson, 1991, 1992).

Learning was described as a generative process in which the learners' prior experiences and knowledge influence the concepts and ideas that are generated (Wittrock,

1974, 1990). "According to this model of generative comprehension, to learn with understanding a learner must actively construct meaning" (Wittrock, 1990, p. 349). Learning for the purpose of this study will be referred to as meaningful learning. "Meaningful learning is distinguished by good transfer performance as well as good retention performance" (Mayer, 2001, p. 17). Through a series of experiments conducted by Mayer and other associates, meaningful learning has been measured in order to determine the level of recall and transfer that takes place using alternative methods of presentation (Mayer, 1997, 1999; Mayer & Anderson, 1991, 1992; Mayer & Chandler, 2001; Mayer et al., 1999; Mayer & Sims, 1994). Two of the experiments were designed to present the same cause-effect information to participants using alternative methods (Mayer & Chandler). Experiment 1 used a multimedia animation with narration to explain lightning by showing either the whole of the presentation and then the parts or a part of the presentation and then the whole. Experiment 2 used the same presentation but incorporated either user control or repetition of the whole presentation twice. Findings suggested that participants who viewed either the user control presentation or the part to whole presentation significantly outperformed the other groups on the transfer of learning (Mayer & Chandler).

Research has also included experiments in which multimedia presentations have been used to test retention, learning transfer, and matching skills (Mayer, Moreno, Boire, & Vagge, 1999). Experiment 1 was conducted to measure the effects of altering the sequence of narration and animation in a presentation about lightning, while Experiment 2 was conducted using a presentation on brakes in order to verify the findings of Experiment 1. Findings indicated that the participants who received the information via

narration and animation concurrently, scored higher on retention and transfer than other participants in this study (Mayer et al.).

Additional research has also been conducted to determine whether the effects on learning were the same in low and high spatial participants (Mayer & Sims, 1994). Experiment 1 consisted of presenting a computer-based animation with narration regarding the operation of a tire pump, and the presentation was displayed using either animation with narration, narration and then animation, or animation and then narration (Mayer & Sims). Experiment 2 used animation and narration to show how the respiratory system works and the presentations were displayed using the same methods as Experiment 1. The findings suggested that the participants with high spatial ability performed significantly better with the concurrent use of animation and narration; however, performance did not improve for participants with low spatial ability (Mayer & Sims).

Although research has focused on meaningful learning, cognitive load theory has also been researched in order to better understand cognition. "Cognitive load theory suggests that effective instructional material facilitates learning by directing cognitive resources toward activities that are relevant to learning rather than toward preliminaries to learning" (Chandler & Sweller, 1991, p. 293). Research conducted in the past has focused on the premise that using two sensory modes to present materials would minimize the risk of cognitive overload (Tindall-Ford, Chandler, & Sweller, 1997). The findings of that research indicated the following: "If visual and auditory working memories are partially distinct, total available working memory may be increased by using both processes rather than just the visual processor" (Tindall-Ford et al., p. 283).

Chandler and Sweller (1991) have also conducted additional experiments on cognitive load theory in which redundant materials were reduced with a significant improvement in learning. The findings of other experiments suggested the following: "In areas where mental integration between diagrams and text is essential in order to make sense of the material, then integrated formats should replace conventional formats" (Chandler & Sweller, 1992, p. 242). In addition, research findings have also indicated that color-coding and the elimination of visual text that is narrated minimize cognitive overload (Kalyuga, Chandler, & Sweller, 1999).

As well as cognitive load theory, modality and contiguity principles have also been investigated (Moreno & Mayer, 1999). Experiment 1 consisted of 132 participants who were presented a multimedia presentation on lightning via three methods: animation with narration, text located away from the animation, and text presented close to the animation. The findings indicated that participants viewing the animation and narration at the same time scored significantly higher on recall or retention, transfer or application of learning, and matching. Experiment 2 was conducted with 127 participants in order to assess the effects of animation and screen text versus narration. The findings indicated that the participants who viewed on-screen text with animation scored significantly less in all areas of learning (Moreno & Mayer).

This review of literature has identified a number of design principles that incorporate cognitive load theory as a means with which to develop effective interactive multimedia (Chandler & Sweller, 1991; Moreno & Mayer, 1999; Tindall-Ford et al., 1997). The appropriate use of multimedia design principles has been shown to promote and enhance meaningful learning (Kalyuga, Chandler, & Sweller, 1999, 2000; Mayer,

1996, 1997, 1999; Mayer & Anderson, 1992; Mayer & Moreno, 1998; Mayer & Sims, 1994; Moreno & Mayer, 1999). "In summary, our research has generated five basic principles for the design of multimedia explanations – multimedia, contiguity, coherence, modality, and individual differences. Each principle is based on multiple empirical tests as well as a cognitive theory of multimedia learning" (Mayer, 1996, p. 17).

The research findings related to design principles provides valuable information necessary for the development of effective multimedia. These findings support the use and development of properly designed multimedia within the classroom setting.

SUMMARY

This review of literature provided a theoretical and empirical foundation that was necessary to conduct research on the phenomenon of teacher motivation. Motivation was shown to play a significant role in the decisions that teachers make within the educational setting. Teachers were reported to be motivated to use multimedia when student motivation increased and when independent student centered learning was facilitated (Wishart, 2000).

Research on multimedia suggested that when used properly it could facilitate the following: (a) students' understanding of complex physiological processes (Wooley-McKay, 1984), (b) retention of information through using visual and auditory senses simultaneously (Cruver & Shannon, 2001), and (c) opportunities for students to direct learning (Jonassen, 2000). Based on previous research, technology including multimedia possesses the capabilities necessary to meet the educational needs of the individual and to

enhance critical thinking skills necessary to create solutions in both artistic and meaningful ways (Peck & Dorricott, 1994).

At the current time, educational agencies are recognizing technology as essential even though the benefits of technology have not been established (Mellon, 1999). If technology integration continues to be mandated without proper support systems, then the risk of failure increases for education (Mellon). Jonassen, Campbell, and Davidson (1994) have indicated the following: "Media are best used as environments and tools for affording and facilitating the use of those resources (i.e., thinking) in the act of knowledge construction, not as purveyors of messages or conveyors of knowledge" (p. 38).

CHAPTER III

METHODOLOGY

INTRODUCTION

As indicated in the summary of the previous chapter, CD-ROMs and the Internet were the two most frequently used types of multimedia. Teachers were motivated to integrate these resources when they experienced student motivation and independent student learning. This study was designed to (a) describe what the current status of multimedia usage and development is within a particular educational population, and (b) identify the factors that motivate teachers to integrate the use of commercially produced or teacher-created multimedia within the classroom setting.

Four research questions provided the basis for data collection.

1. What types of multimedia are this population currently using?
2. Which type of multimedia is most frequently used?
3. To what degree are teachers developing their own multimedia?
4. What motivates teachers to use multimedia in the educational setting?

Data collection was divided into two phases. Phase I used a questionnaire to collect quantitative data regarding the use and creation of multimedia by teachers. These data were used to answer research questions 1, 2, and 3.

Phase II used an interview process to investigate the motives that influence

teachers to use multimedia within the educational environment. The qualitative data collected in Phase II provided findings pertinent to research question 4.

The remainder of this chapter contains the following: (a) a description of Oneida Special School District, (b) a description of the population and sample, (c) presentation of the research instruments used in each phase of the study, (d) the data collection procedures, and (e) the data analyses. A description of the school district was considered important to the reader's understanding of the findings and conclusions.

DESCRIPTION OF ONEIDA SPECIAL SCHOOL DISTRICT

On May 17, 1915, the General Assembly of the State of Tennessee enacted Senate Bill 1064 that established the Oneida Special School District as an educational system independent from Scott County (Smith, 1985). Senate Bill 1064 also designated that five Trustees govern the Oneida Special School District (Smith, 1985).

Since its establishment in 1915, the Oneida Special School District has overcome a series of obstacles. In 1988, the state fire marshal declared that the K-12 school had to be closed or improvements had to be made (Hoffman, 1998). The community rallied together and decided to raise the funds necessary to save its' school. Although the average per capita income within the community was approximately $9,000 annually, the community voted to raise taxes 43% and the $1.5 million dollars raised through the community effort encouraged further support from the Thompson and Tibbals families (Hoffman, 1998).

"In 1990, the Oneida, Tennessee public schools district was considered among the

worst in the state" (Summit Education Initiative, 2002, n.p.). Since that time the Oneida Special School District has improved test scores and ranks among the top schools within the state of Tennessee (Summit Education Initiative, 2002).

Prior to 1995 computer technology resources were minimal, Internet access was nonexistent, and computers with multimedia capabilities were limited. Even when computers were accessible to teachers, few used the computers that were available to them (Kite, 1995). However, since 1995 each school within the Oneida Special School District has been provided updated computer technology and network capabilities via a T1 line.

In addition to Internet access, technical support is available at each school, providing teachers the support necessary to facilitate the use of technology. The technical support staff services include hardware acquisition, computer setup, computer installation, on-site technical computer repairs, general maintenance, troubleshooting services, network maintenance, and staff training. Staff training is provided at either a local or district level and is based on the needs of the teacher. The district training site, acquired through a 21st Century Grant, is located at Central Office.

At the time of this study the Oneida Special School District is comprised of an elementary, middle, and a high school. Each of these school settings has been described in the following section.

O.S.S.D. – Elementary, Middle, and High Schools

Oneida Elementary School

Students attend classes from prekindergarten to fifth grade within this setting.

The curriculum is structured according to the Tennessee Curriculum Frameworks and computer technology is integrated in order to support and enhance learning. In addition to the available technology, prekindergarten to second grade students attend the Bridges Lab. The purpose of the Bridges Lab is to develop eye-hand coordination and bridge the gap that exists between the brain and motor skills.

The technology within the elementary school includes four computer workstations within most classroom settings. Most of the student workstations are networked and connected to the Internet. Also, each teacher has an instructor's computer that is linked to the Internet and capable of being viewed for classroom instruction.

The Oneida Elementary Library also has six student computer stations that are used for Accelerated Reading. In addition to the classroom and the library computers, five computer labs are located within the elementary school. The Writing to Read Lab serves students in kindergarten and first grade, the Writing to Write Lab serves second and third grade students, and the three additional labs serve students attending fourth and fifth grades. The labs serving the fourth and fifth grade students provide access to special programs such as *Fast Forward* and *PowerPoint* Authoring.

One special program for the students at the elementary school is the Best Buddies program. Additionally, Great Expectation is a program for third grade students, and DARE is a program that exists for fifth grade students.

Oneida Middle School

Students attend classes in grades 6, 7, and 8 within the middle school setting. Basketball, football, boys' soccer, girls' soccer, and cheerleading are the athletic programs

available in this educational setting. In addition, there are also two bands within the middle school. One band is for sixth grade students, while the second band is for seventh and eighth grade students.

The computer technology available to each classroom teacher in the middle school setting includes a computer that has network access, Internet connectivity, and whole class instruction capabilities. In addition there are two computer labs that are available for middle school students. One computer lab contains 50 student stations where students can work on independent projects and authoring programs. The second lab located in the middle school is referred to as the Skills On Wheels Lab and it contains 15 computers.

In addition to these resources, the middle school and the high school share a library where there are an additional 20 computers. ACT software, SAT software, and multimedia programs are available for student use.

A review of the most recent State report card for the Oneida middle school indicated that the achievement grade for reading, language arts, math, science, social studies, and writing ranged from A to B (Tennessee State Department of Education, 2002). These grades do not include the value added assessment results.

Oneida High School

The 355 students attending Oneida High School can participate in one of three academic tracks: college, technical, or the dual-path (college and technical). Additionally, Advanced Placement Dual Credit classes in English, calculus, trigonometry, American history, and biology II are also available to students. Students

participate in a School to Career Program in order to better prepare them for postgraduate requirements and the workplace. This program enables students to explore careers through job shadowing in the private sector and other activities.

Art Club, Band, Best Buddies, and Beta Club are among more than 20 clubs currently meeting within this educational setting. Basketball, football, golf, and soccer are among the sports available to young men within the high school setting. Cheerleading, soccer, golf, and basketball are among the sports available to the young women attending high school.

The computer technology available in the high school includes a social studies computer lab, business computer lab, and English computer lab. The social studies lab provides a total of 24 computers for student use. The business lab contains 26 computers and the English lab has 7 computers. In addition to the lab areas, each teacher has a computer in the classroom that is available for classroom instruction.

SAT scores were noted as above average for the 2000-2001 school year and ACT scores have ranked at the national level of 21 for two out of the last three years (Tennessee State Department of Education, 2001). The Oneida High School Scholars Bowl Team currently ranks 10th in the state of Tennessee for the year 2002.

POPULATION AND SAMPLE

The Oneida Special School District was selected because it is an independent small town educational setting located within rural Scott County. The total teaching population within Oneida Elementary, Oneida Middle School, and the Oneida High

School was invited to participate in Phase I of this research.

Contact was made with the Oneida Special School District Central Office. A meeting was arranged to discuss the proposed study. A Letter of Introduction (Appendix A) and a questionnaire packet were delivered to Superintendent Brown for review. Once approval was received from the Superintendent, letters of introduction and survey packets were provided to the principals at each site. Contact was made with the teachers of the Oneida Special School District via their central mailbox. Ninety-six teachers were sent survey packets, and a total of 46 teachers responded.

The interview portion of this study (Phase II) consisted of five randomly selected teachers who were interviewed individually in order to explore individual perceptions regarding motivation and the use of multimedia. The interview sample was randomly selected from the survey respondents who had received one of the top 21 scores on the questionnaires used during Phase I. The researcher conducted each of the five interviews in the classroom settings located in the Oneida Special School District.

INSTRUMENTS

Phase I – Questionnaire Design

The Questionnaire (Appendix D) was developed after a review of literature regarding integration and application of multimedia in P-12 instructional settings. The purpose of the questionnaire was to collect data that would describe (a) the type of multimedia currently used within a particular population, (b) the type of multimedia most frequently used, and (c) the degree to which teachers have developed their own

multimedia for instruction since November 1, 2001.

Seven questions were developed for the questionnaire in order to collect data necessary to answer the three questions stated in the previous paragraph. Questions 1 through 4 on the questionnaire related to the use and creation of computer-based software. Questions 5 and 6 were designed to collect data regarding the use and creation of Internet web pages, as well as WebQuests or ThinkQuests. Question 7 related to the use and development of videodiscs for instructional purposes. Part A of each question explored the use of computer-based resources created by individuals or groups other than the respondent. Part B investigated the degree to which respondents used self-created computer-based instructional resources within the educational setting.

The frequency with which the respondents used each type of multimedia was reported using a frequency scale. The scale used on the questionnaire was as follows: 0, 1 to 2 times, 3 to 10 times, 11 to 15 times, and 16 or more times.

Validity

The Dissertation Committee evaluated the questionnaire and modifications were made according to the recommendations of these reviewers. The modified questionnaire was then re-evaluated and accepted by the Dissertation Committee for use in this study.

The data collected through this questionnaire were used to answer the first three questions that were proposed in this study. All findings related to the volunteer participants of this population that actively engaged in this research project.

Reliability

Identical questionnaire packets were distributed to prospective members of the population. The researcher had no pre-existing relationships with the teaching population, and no incentives were offered to teachers for participation. The data from each questionnaire were recorded into a spreadsheet program using *Excel*. Internal consistency and descriptive statistics were analyzed using an *SPSS* program.

The questionnaire was tested for internal consistency using the Cronbach's alpha procedure. The Cronbach's alpha that was initially obtained was low. Questions 1 through 7 Part A, relating to the use of multimedia, were grouped together to check for internal consistency. Questions 1 through 7 Part B, relating to the development of multimedia, were grouped together so that the internal consistency could be recalculated. Questions 1 through 7 Part A were tested for internal consistency with a Cronbach's alpha of .4879. Questions 1 through 7 Part B were then checked for internal consistency and the results revealed a low Cronbach's alpha. The results of the internal consistency on questions 1 through 7 Part B was obtained because an average of 94% of the respondents reported no development of multimedia.

Descriptive statistics were calculated using the *SPSS* program to answer the following questions: (a) What types of multimedia are this population currently using? (b) Which type of multimedia is most frequently used? (c) To what degree are teachers developing their own multimedia? The findings of the questionnaire data have been described in Chapter IV.

Questionnaire Review

Undergraduate and graduate students with prior teaching experience reviewed the proposed questionnaire for formatting and readability. Students' comments and suggestions were used to revise the questionnaire. The revised questionnaire was then submitted to the Dissertation Committee for review and evaluation.

Phase II – Interview Instrument Design

The purpose of the interview process was to collect narrative information necessary to describe the phenomenon experienced by each of the respondents (Kvale, 1996). An Interview Guide (Appendix G) was designed after a review of qualitative literature. The interview guide was developed using a phenomenological perspective. "The phenomenologist views human behavior-what people say and do-as a product of how people interpret their world" (Bogdan & Taylor, 1975, p. 13). To obtain a phenomenological prospective, questions in the interview guide were phrased using reflective statements such as, "what comes to mind", "think back to a time", or "think of a time." These phrases were used to enable each respondent to reflect on a particular event. It was anticipated that through the use of this reflective process each respondent would provide a more detailed narrative of his or her perceptions regarding real world experiences.

The questions listed in the interview guide were ordered so that general questions were asked initially and more specific questions were asked as the interview process progressed. The semi-structured interview guide was designed so that the proposed interviews would flow in a logical order toward the phenomenon being investigated, and

the interviewer would have the freedom to explore phrases, concepts, or ideas described by the respondent.

Validity

The initial draft of the interview guide was developed after an extensive review of literature regarding qualitative methodology. This interview guide was initially designed while auditing a class in qualitative research during the summer of 2001. Reviews and revisions were made to the initial interview guide according to the recommendations suggested by professional researchers with expertise in qualitative research. The revised interview guide used in this study was reviewed and approved by the Dissertation Committee.

The investigator endeavored to interpret the process by which the individual perceives the lived world, and in the process of investigation the interviewer collected and analyzed data in such a way as to limit bias including preconceived notions (Bogdan & Taylor, 1975). Prior to interviewing the five randomly selected respondents, the investigator was interviewed by another doctoral student experienced in interviewing. This interview was conducted so the investigator could identify her biases and presuppositions. This interview was conducted using the proposed interview guide and the interview process was audio taped, transcribed, and reviewed by the investigator. The investigator's identified biases and presuppositions were then bracketed during the interview and analysis process in order to minimize the risk of personal perceptions influencing the process (Orleans, 1991; Stewart & Mickunas, 1974**;** Tesch1990).

Pre-suppositions

Review of the investigator's transcript revealed the pre-suppositions described within this paragraph. Computers were viewed as essential tools within the educational environment. The Internet, when properly used, was recognized as the most valuable multimedia with which to enable student control of learning. Authoring tools and teacher-designed instructional courseware were valued more than CD-ROM software. The selection of media was influenced by peer recommendations and personal classroom experiences. Research, professional journals, and computer magazines were not viewed as ways to select multimedia. Further, "lack of time" was believed to be the major barrier to both teacher development of multimedia and the use of multimedia within the educational setting.

Counter balance for pre-suppositions

The interview guide was designed so that responses were not influenced toward any particular medium. No question asked about a particular type of multimedia. Each respondent was provided the freedom to reply according to his or her perceptions of lived world experiences. Questions not listed on the interview guide were asked only to clarify statements rather than to substantiate, justify, or support experiences.

During the interview process the investigator did not ask about the issue of time; however, if time was mentioned during the interview, then the interviewee was provided the opportunity to discuss the concept of time. Statements consistent with the investigator's pre-suppositions and beliefs were bracketed during the interview process, the transcription process, and the data analysis. The investigator refrained from

communicating approval or disapproval of responses during the interview process.

The qualitative interview process used for this particular research was conducted using a phenomenological approach, and this approach included phenomenological reduction. According to Kvale (1996), "A phenomenological reduction calls for a suspension of judgment as to the existence or nonexistence of the content of an experience" (p. 54).

Reliability

The investigator conducted each interview using the same interview guide. Each interview was audio taped in order to obtain an accurate record of the interview process. The principal investigator transcribed each audiotape verbatim and questionable terminology was marked by parenthesis. In addition, the principal investigator analyzed each transcript using the same analysis process.

DATA COLLECTION PROCEDURES

Phase I – Process

The method of data collection for this phase was a questionnaire. Teachers working in the Oneida Special School District were invited to participate in this phase of the study. The investigator delivered the initial questionnaire packet to each teacher on January 3, 2002, via the teacher's school mailbox. A total of 46 teachers participated in the questionnaire portion of this study. Each survey packet included (a) an Instruction Sheet (Appendix B); (b) an Information Sheet stating Human Subjects Rights and

descriptions of both Phase I and Phase II of the research project (Appendix C); (c) two informed consent statements; (d) the Questionnaire (Appendix D); (e) a Software Resource Sheet (Appendix E); and (f) a self-addressed stamped envelope for sending the completed questionnaire and one signed informed consent statement back to the investigator. A second mailing was conducted on January 25, 2002, because less than 100% of the teachers responded to the initial survey.

Upon receipt of the completed questionnaire a score was calculated in order to identify the teachers reporting the most frequent use of multimedia. Each answer to a question was assigned points according to the following criteria: (a) 0 points were given for an answer of 0, (b) 1 point was given for an answer of 1-2, (c) 2 points were given for an answer of 3-10, (d) 3 points were given for an answer of 11-15, and (e) 4 points were given for an answer of 16 or more. Each question received a score and the total scores ranged from 0 to 13. The top 21 scores on the questionnaires ranged from 6 to 13 out of a possible score of 56 points. The scores obtained on these questionnaires represent the status of multimedia use by the volunteer respondents. In order to determine what is motivating those who use multimedia most, that group of scores became the basis for selecting interview participants.

Phase II – Process

Five participants were randomly selected from a list of 21 teachers reporting the most frequent use of multimedia. The investigator initially contacted each of the 5 randomly selected interview participants by phone. Each participant was provided an Information Sheet (Appendix F) to allow the individual time to review the proposed

interview process. Prior to each taped interview, the informed consent statement was reviewed with each potential participant. Two informed consent statements were provided to each prospective participant and a signature was obtained prior to the interview process. Each participant retained one of the informed consent statements, and the other informed consent statement was delivered to a secure location at the University of Tennessee in Knoxville.

Each of the 5 participants was interviewed separately, and each of the interviews was scheduled at a time and location convenient for the participant. Interviewees were briefed before the interview process for the following purposes: (a) to make them aware of the purpose of the study, (b) to make them aware of the tape recorder, and (c) to enable them to ask questions. The audio taped interviews lasted approximately one hour, and the interviewees were provided the opportunity to ask questions or discuss concerns upon completion of the interview process. Each audiotape was transcribed verbatim, and each transcript was analyzed using the same analysis process. Data were represented in narrative form with quotations that substantiated the analysis of the data.

Phenomenological reduction was the process used to analyze the construct of teacher motivation and the use of multimedia within a randomly selected sample of the sample. Phenomenological reduction refers to the process of reorganizing data and in this case, narrative text, into some type of classification system in order to make sense of the information. "A phenomenological reduction calls for a suspension of judgment as to the existence or nonexistence of the content of an experience" (Kvale, 1996, p. 54). It calls for a process in which presuppositions are "bracketed" or set aside in order to minimize the influence of those presuppositions on the interpretation of findings (Kvale).

During this phase of the study, the verbatim transcripts of five randomly selected teachers within the Oneida Special School District were collected and were analyzed using a phenomenological approach.

DATA ANALYSES

Phase I

Upon receipt of the completed questionnaire and the signed informed consent statement, an unidentifiable number was assigned to each document. Each number was used to (a) assist with the identification of non-responders, and (b) to randomly select participants for the interview process conducted during Phase II of the study. Data from the questionnaires were not used in this study unless the investigator received a signed informed consent statement.

Data collected from each participant's questionnaire were entered into a spreadsheet using *Excel.* The information from the *Excel* program was then imported into an *SPSS* program in order to analyze internal consistency and descriptive statistics.

Throughout the process the investigator kept the identity of each participant confidential. Informed consent statements and the questionnaires were taken to a secure location at the University of Tennessee within four days from the receipt of these documents. These documents will continue to be securely stored at the University of Tennessee for a period of three years.

Phase II

Method of data collection for this phase of the research project included audiotapes and transcribed documents. The investigator was responsible for interviewing the participants, storing audiotapes, transcribing documents, and destroying audiotapes and transcripts.

Each of the five transcripts was analyzed using the same method of analysis. The analysis was conducted in three stages. Initially the transcripts were repeatedly read and concepts described by the respondents were noted in the margin of the document. Statements and complete thoughts were then sorted into one or more of the related concepts. As the concepts and statements were reviewed the following seven categories emerged: accessibility issues, classroom issues, community, computer usage, media selection, student issues, and teacher perceptions. Stage 2 of the analysis process involved a sorting of the 21 concepts into one of the seven emerging categories. Stage 3 of the analysis process involved the rereading of the statements within the seven categories previously described. During the re-reading process the following four themes emerged: beliefs, relevance, relatedness, and value. A more detailed description of the analysis process has been provided in the Phase II Findings section of Chapter IV.

The 21 concepts, seven categories and four themes that emerged through this analysis process were used to describe the phenomenon of motivation. Strauss and Corbin (1998) indicated, "A central category has analytic power. What gives it that power is its ability to pull the other categories together to form an explanatory whole" (p. 146).

CHAPTER IV

RESULTS

INTRODUCTION

A total of 46 teachers participated in Phase I of this study. Questionnaires were used to collect descriptive data regarding the use and development of multimedia. Five teachers participated in Phase II of this study. Interviews were conducted with the five teachers to collect narrative information related to motivation and the use of multimedia.

PHASE I – FINDINGS

Ninety-six survey packets were distributed to the teachers in the Oneida Special School District. Fifty-seven teachers responded to the questionnaire; however, 11 questionnaires could not be used because the informed consent statement was not returned or was returned without a signature. The data indicated that 47.9% or 48% of the teacher population in the Oneida Special School District participated in Phase I of this study.

The Questionnaire (Table 1) used during Phase I was designed to collect information on the use and development of multimedia. The Phase I findings have been described in the following sections of this chapter.

Table 1. Questionnaire data regarding the number of teachers using commercially produced multimedia resources, multimedia resources created by individuals or groups other than the volunteer respondents, and self-created multimedia resources (n = 43-46)

1.	Since November 1st I have required students to use Reference software for in-class research ____ times.					
		0	1-2	3-10	11-15	16 or >
	a. Commercial software	34	3	9	0	0
*	b. Software I created	40	2	1	0	0

2.	Since November 1st I have required students to use Simulation software individually or in collaborative groups ____ times.					
		0	1-2	3-10	11-15	16 or >
	a. Commercial software	38	3	1	0	4
*	b. Software I created	43	1	0	0	0

3.	Since November 1st I have required students to use Documentary software for in-class activities ____ times.					
		0	1-2	3-10	11-15	16 or >
	a. Commercial software	37	7	2	0	0
*	b. Software I created	43	0	1	0	0

4.	Since November 1st I have required students to independently use Edutainment software ___ times. (Edutainment Software is defined as software that is both educational and entertaining for the user.)					
		0	1-2	3-10	11-15	16 or >
*	a. Commercial software	16	2	13	1	13
*	b. Software I created	37	1	2	0	3

5.	Since November 1st I have required students to independently use the Internet for research or review of information ___ times.					
		0	1-2	3-10	11-15	16 or >
	a. Web pages created by other individuals or groups	24	8	12	0	2
*	b. Web pages I created	40	2	1	0	0

6.	Since November 1st I have required students to use Web Quests or Think Quests to complete tasks independently or in small groups ___ times.					
		0	1-2	3-10	11-15	16 or >
	a. Web Quests or ThinkQuests created by other individuals or groups	41	3	2	0	0
*	b. Web Quests or ThinkQuests I created	43	1	0	0	0

7.	Since November 1st I have required students to use Videodiscs independently or in collaborative groups ___ times.					
		0	1-2	3-10	11-15	16 or >
*	a. Commercial videodiscs	31	11	3	0	0
*	b. Videodiscs I created	43	1	0	0	0

Phase I - Overview

The findings of this research are limited to the 46 teacher respondents who completed the questionnaire and included a signed informed consent statement. The questionnaire investigated the use of multimedia between November 1, 2001, and January 3, 2002.

Phase I was organized to collect data on the use and development of multimedia. The following section provides a review of findings regarding question 1 of this study.

Question 1: What types of multimedia are this population currently using?

The data collected to answer this question were obtained from Part A of questions 1 through 7 on the Questionnaire (Appendix D). A review of the data revealed that only 45 of the 46 teacher respondents answered question 4 Part A and question 7 Part A. These questions related to the usage of edutainment software and videodisc usage. The percentage of respondents using edutainment software and videodiscs was therefore based on a total of 45 participants.

The findings displayed in Table 2 indicate that some teachers used a variety of multimedia for instructional purposes. The range of use varied across applications, from a low of 11% for WebQuests or ThinkQuests to a high of 64% for edutainment software. Forty-seven percent of the respondents reported using the Internet within the classroom for instructional purposes.

Table 2. Number and percent of teachers using either commercially produced software or multimedia resources created by individuals or groups other than respondents

Resources	Used		Did not use	
	Number	Percent	Number	Percent
Reference	12	(26.1%)	34	(73.9%)
Simulation	08	(17.4%)	38	(82.6%)
Documentary	09	(19.6%)	37	(80.4%)
Edutainment	29	(64.4%)	16	(35.6%)
Internet	22	(47.8%)	24	(52.2%)
WebQuest or ThinkQuest	05	(10.9%)	41	(89.1%)
Videodiscs	14	(31.1%)	31	(68.9%)

The bar graph displayed in Figure 1 shows the types of multimedia used by the participating respondents. In addition, non-usage of these multimedia resources has also been described in this graph.

Teachers reported using edutainment software more than twice as often as videodiscs or reference software; more than three times as often as documentary or simulation software; and nearly six times as often as WebQuests or ThinkQuests. These findings indicated that some respondents had used each type of multimedia investigated in this study; however, the rate and frequency of use for multimedia resources varied among respondents.

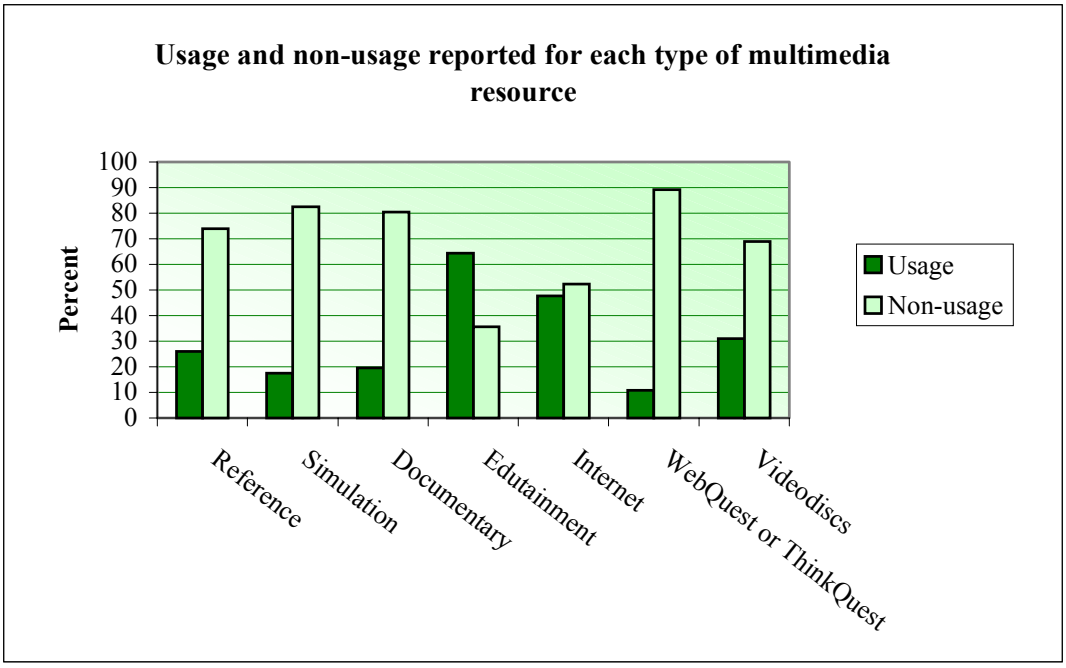

Figure 1. Percentages of respondents using multimedia resources (n = 45-46)

Results indicated that different types of multimedia were used for instructional purposes. However, neither the frequency of use nor the number of teachers using multiple types of multimedia has been clearly defined. The following section reviews findings collected to answer question 2.

Question 2: Which type of multimedia is most frequently used?

The data collected to answer question 2 was obtained from Part A of questions 1 through 7 on the Questionnaire (Appendix D). A review of the data revealed that only 45 of the 46 teacher respondents answered question 4 Part A and question 7 Part A. The percentage of respondents using edutainment software and videodiscs was therefore based on a total of 45 participants.

The questionnaire used in this study asked respondents to report the frequency with which they used each particular type of multimedia for instructional purposes. The categories used to record the frequency of usage included 0, 1 to 2 times, 3 to 10 times, 11 to 15 times, and 16 or more times. Because the response rate within the category of 11 to 15 times was low, the categories of 11 to 15 times and 16 or more times were consolidated into the category of 11 or more times. The percentage of respondents using a particular type of computer-based resource was calculated using the *SPSS* program, and the findings are presented in Figure 2.

The multimedia resources reported as most frequently used in the category labeled 11 or more times were edutainment software, simulation software, and the Internet. More than 30% of the respondents indicated that edutainment software was the most frequently used resource within this category, while 8.7% reported using simulation software and 4.3% reported using the Internet.

Results displayed within the category of 3 to 10 times indicate that edutainment software, the Internet, and reference software were the most frequently used resources within this category. A total of 28.9% of the respondents reported using edutainment software, 26.1% reported using the Internet, and 19.6% reported using reference software. Edutainment software was reported as the most frequently used resource in both the categories labeled as 3 to 10 times and 11 or more times. Respondents also reported that the Internet was the second most frequently used multimedia resource.

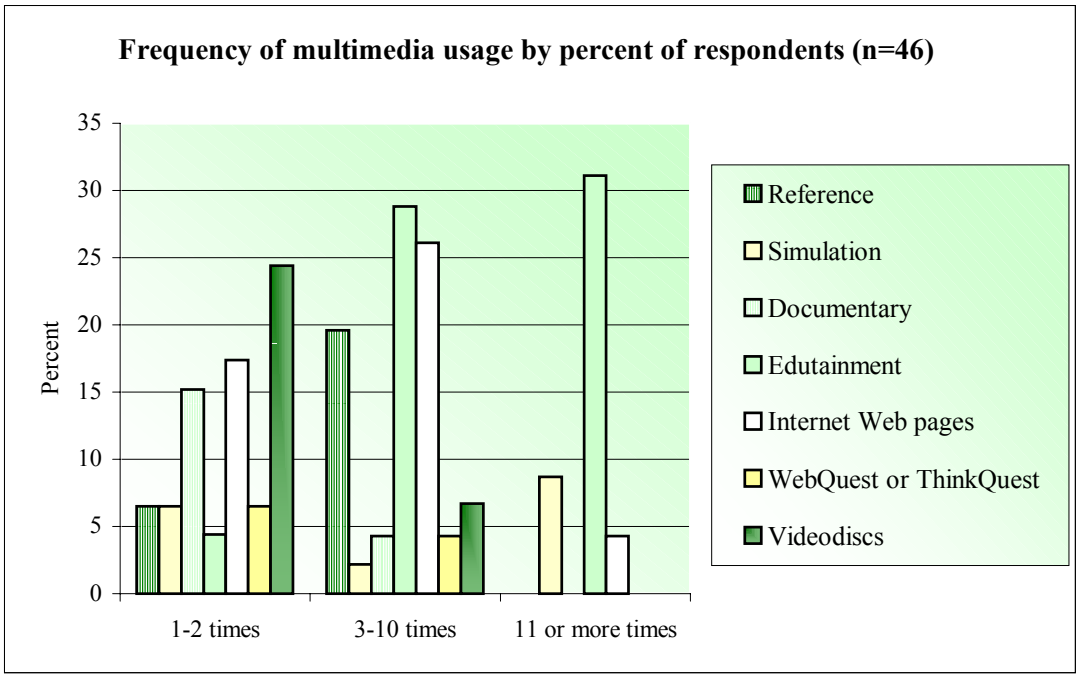

Figure 2. Frequency of multimedia usage

Previous findings have not reported the degree to which teachers have developed their own multimedia resources. The next section describes findings collected through the investigation of question 3.

> Question 3: To what degree are teachers developing their own multimedia?

The data used to answer question 3 were collected from Part B of questions 1 through 7 on the Questionnaire (Appendix D). Part B of each question asked teachers to report the frequency with which they used self-created multimedia resources for instructional

purposes. These self-created multimedia software resources could have been created using any authoring program. Internet web pages, WebQuests, and ThinkQuests could have been developed using any text-editing program or basic HTML.

A review of the data in Table 3 revealed that 43 respondents answered questions related to reference software, edutainment software, and the Internet. A total of 44 respondents answered questions related to simulation software, documentary software, videodiscs, and WebQuest or ThinkQuest. According to Table 3, 14% of the respondents reported creating edutainment software, and 7% of the respondents reported creating reference software and Internet web pages. While, Figure 3 shows that self-created simulations, documentary software, videodiscs, WebQuest or ThinkQuest were used the least.

Table 3. The frequency with which the respondents reported the use of multimedia resources that they had created for instructional purposes. The results are reported by number and percent of respondents

Created Resources	1-2 times		3-10 times		11 or more times	
	Number	Percent	Number	Percent	Number	Percent
Reference	02	(04.7%)	01	(02.3%)	00	(00.0%)
Simulation	01	(02.3%)	00	(00.0%)	00	(00.0%)
Documentary	00	(00.0%)	01	(02.3%)	00	(00.0%)
Edutainment	01	(02.3%)	02	(04.7%)	03	(07.0%)
Internet Web pages	02	(04.7%)	01	(02.3%)	00	(00.0%)
WebQuest/ThinkQuest	01	(02.3%)	00	(00.0%)	00	(00.0%)
Videodiscs	01	(02.3%)	00	(00.0%)	00	(00.0%)

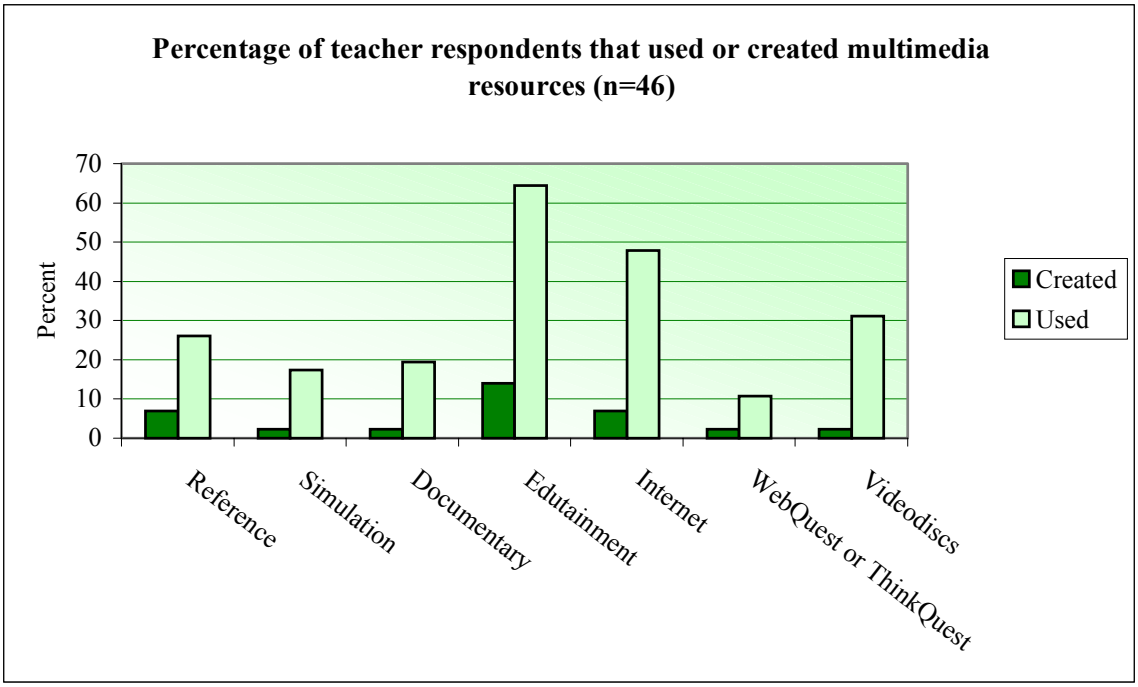

Figure 3. Comparison between created and used multimedia resources

Phase I - Summary

The data collected during Phase I indicated that some respondents had used a variety of multimedia for instructional purposes. Edutainment software and the Internet were reported as the two most frequently used types of multimedia. WebQuests or ThinkQuests were identified as the types of multimedia resources used the least by these respondents. Seventeen percent of the respondents reported using simulation software; one-half of these respondents reported using the simulation software 16 or more times. Additionally, multimedia resources created by individuals or groups other than the respondents were used far more frequently than self-created resources.

PHASE II – FINDINGS

Five interviews were conducted for this portion of the study. The 5 interview participants were randomly selected from among the top 21 teachers reporting the most frequent use of multimedia resources. Each of the interviews was conducted using the Interview Guide (Appendix G); interviews were tape recorded, and the narrative information was transcribed for analysis.

The following paragraphs have described the analysis process used to explore each transcript and the findings are described in the following sections of this chapter. The interview process was used to investigate the phenomenon of teacher motivation.

The process of analysis did not use the interview guide to organize concepts, categories, or themes. The transcripts were initially analyzed by identifying the concept described by the respondent within each statement or phrase. The interview transcripts were reviewed repeatedly in order to allow themes and patterns to become apparent. As the transcripts were read, notes were made regarding the concepts that came to mind, as the interviewees described the phenomena under investigation. Each re-reading reinforced concepts and terms recorded by previous reviews until 21 concepts were revealed through the readings. The 21 concepts were hardware availability, software access, training and technical support, curriculum relationships, risk factors, time concerns, family and culture, administration, classroom relationships, computer usage, teacher computer skills, student computer skills, media types, media characteristics, criteria for selection of media, teacher feelings, teacher beliefs, teacher satisfaction, student achievement, student needs, and student reactions.

The thoughts reflected in the comments and statements of each interviewee were then sorted under the related concept or concepts. As the data were organized within the different concepts, categories began to evolve. Seven categories became evident during the analysis process and they were as follows: accessibility issues, classroom issues, community, computer usage, media selection, student issues, and teacher perceptions. Once the statements or phrases were sorted within the categories the statements and phrases were repeatedly reread. As the statements and phrases were reviewed the following four themes emerged: beliefs, relevance, relatedness, and value.

Phase II - Overview

Each of the transcripts was analyzed using the process described in the previous section of this chapter. The findings presented in the following sections of this chapter have been organized within the seven emergent categories and the four emergent themes in order to present representational quotations that address question 4 of this study.

> Question 4: What motivates teachers to use multimedia in the educational setting?

Categories

Category I: Accessibility Issues

Accessibility Issues for the purpose of this study encompass hardware availability, software resources, training, and technical support. Hardware availability

refers to the access and performance of computers, peripheral devices, and Internet connectivity. The following representational quotations provide insight into the perceptions of each of the five respondents regarding accessibility.

> It made me feel very positive in trying to reinforce what I was teaching using the computers and the technology that . . . I do have access to.

> Well the school facility, . . . the technology, and equipment I have here is very first rate. I mentioned the computer lab we have which probably has 28 computers in the Library. Every teacher has a computer, scanner, and we have a very outstanding printer that we pool into.

> You can go to different sites on the Internet, and I have a computer hooked to the TV where . . . the whole class can view it at one time. We were at a game site where they were to name a particular animal, and so they got to come up and take turns and the children really enjoyed that.

> I'm very fortunate I have a new computer system that is hooked up to the Internet and I find I use it everyday, everyday!

> Sometimes they can print out the facts, we did something about sharks . . . when we went onto an Internet site about sharks . . . we printed out facts and we also printed out pictures.

Although hardware availability is essential for the integration of computers within the field of education, well-designed software resources are also necessary (OTA, 1995). Software accessibility resources include the programs that are accessible through the computer via discs, CD-ROMs, the network, or the Internet. Network software, CD ROMs, and authoring tools were the three types of software programs described by the respondents. The following quotations reflect experiences and perceptions regarding the use of software.

> Mostly I use the programs on the network that we have locally that would be for beginning sounds, reading comprehension, and vowel sounds. . . . I also use the math that we have, the skills bank in math . . . this week for example we worked on graphing and tens and ones in the math.

> There are interactive CD-ROMs, I have for example . . . Photosynthesis . . . there is a self-test students can take at the end and I'll check that CD-ROM out to students who want to better prepare for a test . . . I'm sure there are sites out there [on the Internet] where this kind of information is available but I rely basically on pre-packaged CD-ROM formats for that.

> I love *PowerPoint*. I use it quite often especially to introduce new skills. I use it to combine the new skills and put these into presentations.

> If I need more lessons . . . you can use *PowerPoint*. . . .

> . . . I also have made a presentation for parents . . . parents come in, and we go over all my class rules and how to send money for books and those types of things, school things.

Access to both hardware and software, as well as training and technical support are critical if teachers are to use computers for instructional purposes (O.T.A., 1995). Training, for the purpose of this study, refers to any technology instruction performed onsite, at a training center, or outside of this system. Technical support refers to the onsite availability of staff to provide the support necessary to maintain equipment, correct technical problems, and resolve software issues. The representational quotations described below reflect the perceptions of respondents regarding training and technical issues.

> Our school system provides training for the teachers to go and learn how to use the computer. Plus we have an onsite person who can come, if your computer goes down or doesn't work for some reason. I think those are the two things that make us able to use them . . .

> A lot of training, a lot of workshops on how to use technology. I have attended workshops and couldn't wait to try what I had learned in the classroom.

> It's trial and error; you can make a mistake, and an expert is there to help [computer training classes]. I can learn if I get my hands on it. I've enjoyed all those workshops. The way its [computer training] been presented, very effective.

> The links, the hookups, and the technical support we have for setting up TVs and large screen formats . . . our school has made the investment in the technology and the support staff to make it work . . .

> Most of our training sessions. . . . They allow you time to explore and see how to use . . . [the program]. Then they give you some time to use the program on your own and try different things. Sometimes they offer activities like making a graph or making a spreadsheet . . . if you need help they give you help. Then they generally show something new or a new program or allow you time to look at . . . existing programs . . .

Accessibility Summary

Hardware, software, adequate training, and technical support are essential to the use of computer technology within the field of education (OTA, 1995). Based on an analysis of individual responses and a synthesis of the interview data, the overall perception of these five respondents was that hardware availability was rated anywhere from adequate for student needs to "…first rate." Software was reported to be available for classroom instruction through the network. In addition, those respondents who had

participated in training were more than satisfied with the quality, quantity, and process of training. Overall, both training and technical support were valued by those respondents who had used the available services.

Category II: Classroom Issues

Classroom issues in this case refer to curriculum relationships, identified risk factors, and time concerns. Curriculum relationships refer to (a) the factors that determine usage of a computer-based resource, and (b) the benefits that are derived through the use of these resources. Representative quotations were incorporated into this section to describe the thoughts of respondents.

> The children were having a hard time with area and perimeter, and so I have some software on each, and it seemed to clarify for them the differences between area and perimeter.

> . . . Accelerated Reader. They love it . . . they log into . . . the computer, they don't worry about what buttons to push; as far as the keyboard; they know exactly what to do.

> . . . If they don't do well, then they get to do that again, and it doesn't seem to bother them that their neighbors are doing something different . . . they seem to appreciate that this is what I'm working on, and I can do it, and

> they really don't know if they're behind or ahead, and that's why I think I like computer-based learning better than a lot of other things. . . .
>
> . . . We have a lot of interaction [collaboration and support of computer-based resources between subject areas] supporting student presentations and student hands-on production in multimedia or computer generated media . . . I think that's good that [the small size of our school] allows for a lot of interdepartmental action.

Respondents reported that unreliability and safety concerns were two risk factors that can interfere with the instructional process when using multimedia. Unreliability refers to the idea that something is not dependable. Safety concerns relate to things that are not free from risk. The following quotations represent the ideas of respondents regarding unreliability and safety concerns.

> It's not as smooth using multimedia and . . . sometimes you don't know how something is going to turn out, and so I felt good in the fact that I was willing to take a risk and use it, you know, and then it clearing things up for them made it better.
>
> . . . Another time I've gotten very frustrated is when I have planned a particular lesson off of the Internet, and you go over there and go to bring it up, and either the site is all of a sudden busy, or it freezes right in the

middle, and I feel like those are down times and unsuccessful times, and that's one reason I don't particularly like to use the Internet lessons…. because sometimes I think it's not the most reliable.

We also go on the Internet . . . I usually log those sites in myself, and very rarely do I let them "surf the Internet per se" . . . with some unfortunate misleading sites that . . . we try to monitor but sometimes they come on the screen.

The lack of time was also a concept identified through the analysis of data. Time demands within the educational setting included curriculum planning, evaluation of media, selection of instructional materials, implementation of instruction, and evaluation of learning.

I have around 40 minutes . . . 4 days a week to plan for the next week and so that means finding the skills you need to work on, looking and seeing what we have in our database that will support that, finding any additional worksheets that you need, looking over last week's lesson plans to see what was successful and things that may need to be reinforced, and then going back and re-teaching or picking up a skill to re-teach or review . . .

There was one set [of CD-ROMs] I got on food chains, and food webs, and ecology that . . . put me to sleep . . . I didn't have a chance to review it,

> and I was short for a lesson plan one day so I popped that in and ran that up, and it was not very good quality . . . it really pays to have time to review . . .
>
> . . . You can spend a lot of time [searching the Internet]; it can be very time consuming trying to find what you're looking for to weed through, you know, all the other stuff.
>
> We are departmentalized and there are 40 minute time periods. I try to give well-rounded lessons and pull in every resource I can think of.
>
> . . . If the State would . . . have specific sites already book marked or things like that . . . that the children could go to . . . that were grade specific and maybe off of a server that was just for them. . . . I think those would be successful . . .

Classroom Issues Summary

This section was written based on the individual statements of the respondents, and a synthesis of representative data contained within the five transcripts. An analysis of the data revealed that respondents selected and integrated multimedia when a perceived relationship existed between the curriculum, the needs of the students, and the instructional software program or Internet site. Clarification of concepts such as area and

perimeter, reinforcement of reading skills, and an understanding of scientific phenomena were facilitated through the use of multimedia.

Data revealed that the use of multimedia was inhibited when viewed as unreliable or unsafe. Overall, both unreliability and safety concerns were limiting factors in the use of the Internet. One respondent reported that unreliability issues were related to the unavailability of Internet sites during planned instruction. Additionally, two of the five respondents expressed concerns regarding the volume of sensational sites that could be accessed by accident on the Internet. Teacher motivation regarding the use of the Internet was negatively impacted when websites did not operate properly, or when sensational sites were accidentally encountered.

As well as curriculum relationships and risk factors, time was also an issue described by four of the five respondents participating in these interviews. Overall, time was viewed as a limiting factor that could interfere with the development of teaching materials and acquisition of instructional resources.

Category III: Community

The category of community refers to the social network that exists within the local community. This category includes family and culture, administration, and classroom relationships within the educational setting. Family and culture refer to any individual or group that may have an influence on the student. The following quotations represent the influences of family, culture, and community on students.

> They [students] want good graphics . . . the culture has made them to . . . really respond to lots of colors and motion … and I think you have to go with what they have evolved into their learning style.
>
> . . . The children of the generation I'm teaching now tend to respond to a very sophisticated, very graphic, very color oriented, very action oriented type of stimulus [influence of cultural experiences].
>
> I think it is important for us to . . . [prepare students for future demands] so they can become as good an expert [using computers] as they can be.
>
> Some parents do not want children working with computers or multimedia [family influence on instructional use of technology]. . . . They don't understand, a lack of knowledge about what the programs can do. Sometimes it's better than I can do myself. These programs are wonderful.

In addition to family and culture, administrative support can have either a positive or negative impact on the student, teacher, the educational process, and the community. Administration, for the purpose of this study, refers to the Board of Education, superintendent, supervisory staff, and principals working within the Oneida Special School District. The statements that follow express the thoughts that were reported by

respondents during the interview process and describe the impact of administration within the Oneida Special School District.

> . . . Our school has made the investment in the technology and the support staff to make it work, and I feel very fortunate that Oneida has that type of policy towards technology . . .

> They've given us money to get the equipment and without the school support for the technology we wouldn't have any type of that opportunity. So the smallness of school, . . . the Vision of the School Board, and the Superintendent allowed a lot of technology here at Oneida . . . which makes it a nice place to teach.

> Now this is what's nice about this school. When I first came . . . my experience on computer was very marginal. . . . [Superintendent] and [Principal] had me trained. I took training courses and it wasn't . . . five or six o'clock at night, it was during the school day, it was during holidays sometimes.

Classroom relationships were also a concept within the category of community. Classroom relationships refer to the interactions that occur between peers, or the student and teacher. For the purpose of this study interactions are defined as any verbal or non-

verbal communication that involves more than one individual. Representational replies describing perceived relationships are given below.

> When using computers, students think she's not up there talking so I don't have to listen.

> That was probably the *PowerPoint*. It made me feel great. I could make the presentation and they [students] wanted to know who made it. They [students] liked it and they [students] have made their own. They say, "Wow I can do this!"

> I bring in articles . . . they bring in articles and we discuss articles [from Internet searches]. . . . I have found about nine sites on the Internet that we use, and they are welcome to use other ones, but they have to have approval by myself. The Discovery Channel, National Geographic, ENN which is environmental news network, and CNN . . .

> . . . I don't tell them that I have changed it [CD-ROMs]. They will walk by one of the . . . stations and they will look at the screen and . . . they know in a second that I have put something new on there . . .

> . . . I do find most of the stuff I'm looking for [on the Internet]. I can't really say I've been unsuccessful because we've come up with some

> bizarre ideas in here when the kids will ask me a question, and I'll get . . . thinking maybe if I could find a picture . . .
>
> . . . Through time . . . the cooperative learning is a lot better and a lot smoother. They work real well together in teams or in partners and . . . they stay more interested in my opinion when I'm using multimedia within a lesson.

Community Summary

Based on a review of individual quotations and synthesis of the interview documents, the influence of culture and family was described by three of the five respondents. Overall, respondents who talked about culture and family reported that current cultural demands and values supported the use of graphic media; however, one respondent indicated that some parents do not want their children using multimedia within the educational setting. According to the statements of these respondents, culture and family influenced both the process of learning and the selection of media for instructional purposes.

Four of the five respondents reported that administration supported the integration of technology through training, onsite support, and the purchase of necessary computer resources. Two of the respondents described the school system as a positive environment in which to work.

Classroom interactions were also considered to be a component of community. Overall, the interactions reported in the classroom setting were positively influenced

when using multimedia. Peer interactions within cooperative groups were reported to have increased, access to current events was facilitated through the Internet, resources were retrieved from the Internet, and students enjoyed the experience of using multimedia.

Category IV: Computer Usage

Computer usage refers to the use of computer resources for instructional purposes and includes multimedia via disks, CD-ROMS, network software, videodiscs, or the Internet. Quotations have been provided below in order to review the perspectives of teachers regarding the usage of computers within the educational setting.

> Then the skills based programs on the network are graded, and it will let me know if the child passed . . . so I select from the child who maybe doesn't score above 90%.

> The children really like . . . the computer programs that read to them . . . and one of the first ones that we start off with is . . . the Mercer's Stories *Grandpa and Me*, and it will read the story to them, and that fascinates them that it reads and blocks out the words as it goes, and they really love that . . .

> . . . Today I'm working on long o and long a. I'm using the computers for lessons that pertain to . . . Super Phonics . . .

. . . When I first introduce the Internet search students are very reluctant. I mean they're on the Internet all the time . . . talking to each other and doing all sorts of things, but when I actually make it part of the classroom in the beginning of the year, there's some reluctance.

. . . I'm constantly using it [the Internet] for ideas, for bulletin boards, lesson plans, images and just all kinds of things that I can use . . .

. . . I think it's called Tommy Time. . . . So I put on my little clock games all over there [the computer workstations]. I also logged into the Internet and found time and they learned there were different times . . . last year's group really did well on their TCAP scores on time, especially after we played that game. . . .

In addition to computer use, students' computer skills were also a concept identified during the analysis process. Student computer skills are defined as those skills necessary for students to access, navigate, and interact successfully within a particular program or Internet site. The following statements were included in order to describe the perceptions of respondents regarding student computer skill levels.

I know our computer class kids have to do PowerPoint's, and they have to do other types of presentation exercises, and quite often students will

> come into my class and do like a report . . . or they'll come up and do a PowerPoint . . .
>
> I think you have kids on computers now that are 5 . . . 6 years old and they are competent and have skills in it and they are playing games that are very 3D, very realistic, very virtual . . .
>
> . . . As far as the Internet, they know what buttons to push, they know to click the down button, the up button, and the enter button, they know how to print something out.

As well as student computer skills and computer usage, the teacher's skill level was also a concept described in the transcripts. Teachers' computer skills refer to the abilities necessary for effective use of computer technology including multimedia. The comments reported below reflect teacher perceptions regarding computer skills.

> . . . When I was getting my [degree] there was a technology class where we went through all the graph sheets, the databases, the PowerPoint presentations, all that kind of stuff, which was probably one of the more valuable classes I took . . . because it really gave me skills . . . hands-on skills that I could use in my classroom . . .

> . . . All of us are not programmers, and we don't really know how to program or have a great desire really, I guess or time to write the programs.
>
> . . . If I can find it [resource] at home and then copy the website and e-mail it to myself here, which I do a lot of that stuff . . . then when I come in here in the morning it's sitting on this machine waiting on me and then . . . we'll get back into the discussion, and I'll say well look what I found . . . I find it very useful.
>
> . . . I use the micro grader, it's a computer program, I do all my grades. I don't have to use that . . . calculator any more, it's really nice, and then when I'm done with that I read my e-mail . . .

Computer Usage Summary

The type of multimedia used for instructional purposes varied among respondents. The CD-ROM software used for instruction included software accessible through the network as well as individual CD-ROMS. Some respondents reported using the Internet to access resources. In addition, students used the Internet to conduct research assignments and review teacher selected resources.

Student computer skills would best be perceived as diverse. Internet skills ranged from novice to experienced. Some students navigated within sites located by the teacher

while others conducted their own searches using pre-approved resources. Student skills with CD-ROM navigation capabilities were evolving at different levels of competency.

Teachers' computer skills varied among respondents. Some teachers had used *PowerPoint* in the past when attending university classes. None of the teachers reported programming skills although a statement was made regarding the programming of software. Internet skills varied according to the way in which the Internet had been used as a resource. Some teachers used the Internet to search for instructional resources, communicate via e-mail, or forward retrieved resources to the classroom from a remote location other than the school.

Category V: Media Selection

The category of media selection refers to the types of media used by these respondents, the characteristics of media that have been used, and the criteria for selecting media. The previous sections of this analysis have described the types of multimedia used by these respondents. However the media used in these classrooms for instructional purposes were not limited to computer hardware or software. The following statements describe the types of media that have been used within the classroom setting.

> I use print media, I use electronic news services my . . . students have to do Internet search every week and come up with an article on a current topic in [subject area] and do a summary of it.

Our local Knoxville newspaper is our usual print source, but they can also bring in magazine articles from like *Time* and *Newsweek*. I don't allow any kind of tabloid services, any kind of electronic sites that don't have verification and factual backup.

. . . We use magazines for them; for example, we've been studying the seasons, and I have a variety of magazines that I use, and the children go through and find pictures . . . of winter, of spring, of summer . . .

So, I use a lot of . . . newspapers they're funny to watch with newspapers they can't read a word of them but they'll go through every page.

We use the little cassette CD player a lot. I have pre-recorded books that each . . . child goes through . . . then at the end of the week I'll put them up and bring four more out so they have access to the written word in the book with the pictures. . . . then, of course, we just have some little cassettes for dancing . . .

. . . We watch *Between the Lions*, it's a show on PBS that teaches phonic skills and . . . during *Between the Lions* . . . they're allowed to come to the computer and take Accelerated Reader Tests . . . for story books from the Library, for points, for prizes . . .

> Like I was saying in math and science we have math carts . . . lots of different manipulatives, every child has one . . .

> . . . They do Bridges, and Bridges is a program that we have . . . in this school system that is supposed to be able to connect the . . . motor skills to the brain. . . . It's supposed to bridge the gap. . . . We do Bridges everyday . . .

In addition to media types, media characteristics was also a concept described by the respondents. Media characteristics are those features that support the communication process. The characteristics described in this section relate primarily to multimedia; however, characteristics of other media have also been included. The statements provided below represent the perceptions of respondents regarding positive and negative media characteristics.

> When the students are challenged and when they have to search for things; when the programs don't just . . . completely lay it out for the kids, they have to do a lot of critical thinking and inquiry.

> Computer programs in which they actually . . . give a response either orally or typing in a key and it . . . goes on to the next question or it gives them another chance and it corrects what they've done . . .

> . . . Another [unsuccessful] time is when you select a program and it doesn't grade the responses, like if there's 20 questions, you don't know if they got 16 of them right on the first try or 20 of them right on the first try . . .
>
> . . . It provides work for the children to do and it can go over the same things . . . with one child and the child who does not need that repetitiveness . . . can go on to the next level or the next skill . . .

In addition to the types of media used within instruction and the characteristics of media, criteria for selection was also a concept described by the respondents. Criteria for selection refers to the standards used for selection of media. The representational quotations provided below describe factors that influence the selection of media.

> Depending on what skill we're working on in class . . . I choose it [the type of media] from there [the curriculum].
>
> I need things that they can look at with pictures . . . and things that . . . will help stimulate. . . . So I have to find materials that are age appropriate but yet interesting to them [student needs]….
>
> . . . Mostly it depends on what I'm working on in the classroom, what skills I'm working on [curriculum, as well as student needs].

> . . . Sometimes I decide simply because I want them to feel like school is fun and sometimes when we write they have fun . . . but it's just not like going to the computer or playing games or listening to a video cassette or playing with the manipulatives, they learn a little bit better doing the other things too, kind of ties it in . . .

Media Selection Summary

The types of media used by respondents for educational instruction included a variety of media. The media used within this educational setting included newspapers, magazines, cassettes, television, storybooks, manipulatives, pictures, CD-ROMS, network software, electronic news service, and the Internet.

A review of the information revealed that respondents described the positive characteristics of media as follows: (a) content was challenging, (b) program was capable of modification for individualized instruction, (c) effective feedback was included to clarify misconceptions, and (d) grading capabilities were incorporated to assess comprehension. Respondents were motivated to use different media to meet different learning styles.

As previously indicated, respondents were motivated to select a particular type of media when they identified a relationship between the media, curriculum demands, and student needs. Additionally, one respondent reported selecting media because it was fun. Fun was also a motivating factor in the selection of media for instructional purposes.

Category VI: Student Issues

Student needs, student reactions perceived by respondents, and student achievements are concepts addressed within the category of student issues. Student needs for the purpose of this study refers to those things that are necessary for student success. The opinions stated below represent concerns regarding student needs.

> . . . There's just some things that you have to memorize and I think one of them for example is the multiplication table. . . . and I think the same thing is true basically with addition and subtraction facts . . . but I think being able to go over them on the computer and practicing that way or using games. . . . I think that helps a lot too.

> We use software and the CD games so that they [students] can review and revise skills in math, … science, … social studies, and reading.

> . . . They were having difficulty with [time] . . . the half an hour . . . they weren't grasping that the hour hand also moved along with the minute hand. So I put on my little [computer] clock games . . .

In addition to student needs, student reactions were also described within the transcripts. Student reactions refer to the verbal and non-verbal messages communicated through interactions. Representational quotations were incorporated in the following section to describe the perceptions of the respondents to students' behavior.

> The students were very involved. They appeared to be challenged and very curious, and interested in what we were doing. We were using the computer the. . . . program was *Math World*.

> You can make those cards [authoring application] and . . . then once they choose the correct answer it goes to the next card. . . . Children will just punch an answer; it's easier than trying to sit there and figure it out. If they don't get it right, they'll just go back and punch another one and another one . . .

> They seem to be on task, their attention span lasts longer . . . . I have some that only have a 5 to 10 minute attention span but on the computer it lasts the full 20 minutes . . .

> . . . In the classroom when you answer a question you know if you get it right or wrong and the rest of the class lets you know really fast . . . even if you just say think again they know they missed it and they're not so afraid to mark something on the computer, they're more willing I think to take the risk or chance . . .

As well as student needs and the perceptions of respondents regarding student behaviors, student achievement was also recounted during the interview process. Student achievement in this study refers to the acquisition or accomplishment of a skill, task, or

learning outcome. The following statements were incorporated to describe the perceptions of the respondents regarding student achievement.

> . . . One year before I had the CD-ROMs I went through lecture in the lab and we had a test . . . [scores indicated] a 50% level of … competency in the material and the next year after I got the CD-ROMs . . . [student scores] probably approached . . . 70% or 75% . . .

> It pleases me and . . . it amazes me. . . . You can set them at the computer and they are totally focused [improved on-task behavior].

> . . . When [the student] came . . . [the student] was having a lot of . . . difficulty with [blending sounds] . . . and we have a reading comprehension program . . . watching [the student] progress and being able to do that until [the student] is more independent now. I think that's been one of my greatest successes this year.

Student Issues Summary

Based on the previous statements regarding student needs, multimedia met the needs of the student when it (a) clarified understanding, and (b) reinforced skills. In addition, multimedia was reported to facilitate review of math, science, language arts, and social studies.

Previous findings indicated that the use of multimedia increased curiosity, improved cooperative learning, and increased students' attention span. It was noted that the students' level of interest and involvement rose through the use of multimedia. In addition, students using the computer were perceived as more willing to take risks.

Students' achievement was enhanced with the use of multimedia. The comprehension of students was perceived to improve, as well as phonetic skills.

Category VII: Teacher Perceptions

The category of teacher perceptions refers to the feelings, beliefs, and expression of satisfaction. Feelings for the purpose of this study refer to the expressions or opinions expressed by the respondents regarding emotional experiences. The statements below represent feelings expressed during the interview process.

> I love it when they're enjoying learning, seeking knowledge, and staying involved.

> . . . They'll be sitting back there with the headphones on and reading out loud with it and you have to go tap them on the shoulder and quiet them back down and the next thing you know they're back up there reading with it and I think that's the joy that they can see . . . they can do something on the computer.

> Some students don't work well on computers. They have a fear that inhibits them. That's not the majority.

> . . . [Frustrated] When you have a child who just simply will not follow the directions with the headphones or whatever directions are given and they just will punch a key to go on . . .

In addition to feelings, belief was also a concept that related to teacher perceptions. The concept of belief refers to opinions expressed by the respondents. The quotations presented in the following section were used to describe the responses related to the concept of belief.

> . . . I think the computer because they can do something right then . . . is more motivating for them. I think there is more animation plus I think it's less scary for them to do. Also, I think they remember it longer because of the animation and the colors.

> . . . These children that have very short attention spans will sit in those chairs [using a software program] for 20 or 30 minutes. . . . They will sit there and occasionally you'll hear them laughing . . . they love it.

> . . . It seems like children that have fun learn it better. I think that's what it seems like. I know that when I'm having fun I learn it better.

As well as feelings and beliefs, personal satisfaction was also a concept contained within the category of teacher perceptions. Teacher satisfaction refers to a feeling of gratification that is experienced when a plan, idea, or objective is achieved. Representational quotations below describe the respondents' perceptions regarding personal satisfaction.

> Well, that as a teacher I love to see that little light bulb go on and that little joy come and I love to see them work and be happy with themselves and feel good about what they have done. I like to see that because I think that's what learning is about.

> When it comes to media I don't have any problem . . . When I use media they're always on task, they're having fun and when kids have fun they're always on task.

Teacher Perceptions Summary

Respondents reported positive feelings when students were successful during the educational process. However, a sense of frustration or negative feelings were recounted when students responded poorly to instruction or when students experienced failure during the instructional process.

As well as feelings, beliefs expressed by the respondents were motivating factors related to the use of multimedia. The beliefs identified through the analysis of information included the following: (a) multimedia and computers were motivating

because of the immediate success experienced by the student, and (b) learning should be "fun." In addition to the concepts of feelings and belief, personal satisfaction was also a concept described within the transcripts.

Emergent Themes

The seven previous sections of this chapter described the categories developed during the qualitative analysis process. Through an analysis of these findings the following four themes emerged: belief, relatedness, relevance, and value. The following sections of this chapter were organized using the four emergent themes, as well as statements, representational quotations, and a synthesis of the data contained within the five transcripts.

Theme I: Beliefs

Belief is defined as an opinion expressed by the respondents regarding the educational process. The section referred to as teacher perceptions, which can be reviewed on pages 101-104, provided representational quotations that express respondents' beliefs regarding computer technology including multimedia. In addition, the quotations below support the beliefs identified through an analysis of the data.

> [Motivated] Because of all the doors in the world that it [the Internet] opens. I mean it gives you so much more freedom and so many more things to choose from. I've always been fond of books and libraries and

stuff like that but I don't care how big the . . . world's biggest library is, it's still not going to compare to what's in that computer system . . . and that's at your fingertips. The world's largest library isn't.

I think it's more entertaining for children to learn and I think our children are so used to, I call it the "Big Bird Syndrome," in teaching. They're so used to watching TV, they're so used to being stimulated in that way that paper and pencil activities do not motivate children anymore . . .

It goes deeper into whatever I'm trying to teach. It reinforces certain skills.

So I think it's an effective tool [CD-ROMs] particularly with visual learners . . . which I think a lot of . . . students are, particularly because we're so media driven, I mean the video games, the movies, the computer games . . .

I think if you have fun and you're learning, I say that a lot but it's the truth, I mean if they're having fun, they're going to learn.

. . . I think in our world we need to become familiar with computers with all media.

The previous quotations, as well as a review of the section entitled teacher perceptions indicate that respondents were motivated to use multimedia based on the following beliefs: (a) these resources were believed to be potentially powerful tools for educational purposes; (b) student motivation was positively influenced when using this technology; (c) students' on-task behaviors increased when using these types of resources; and (d) students were reported to have "fun" when learning with computers and multimedia.

Respondents believed that positive outcomes were achieved through the use of these media. Although the beliefs held by respondents motivated the use or development of multimedia, relatedness was also a theme that influenced motivation. The following section will review the theme of relatedness in order to better understand the phenomenon of motivation.

Theme II: Relatedness

Relatedness refers to an interpersonal connection that occurs within a social setting (Vallerand, 1997). For the purpose of this study, relatedness is defined according to the definition of Vallerand; however, a description of meaningful relationship has been included in order to describe the significance of this phenomenon. The term meaningful relationship refers to a connection or a bond that occurs between the teacher and the student. This connection or bond is difficult to describe in words but for anyone who has experienced this connection with students, it is powerful, motivating, moving, and magical. A review of the category referred to as teacher perceptions, located on pages 101-104, describes events in which respondents may have experienced relatedness. In

addition, the quotations included below reiterate the importance of relatedness within the educational setting.

> It made me feel great, I could make the presentation and they wanted to know who made it [relationship between what the teacher feels and what the students think]. They liked it and they have made their own. They say, "Wow I can do this!"

> . . . I have a very good response with my children; they enjoy and you can hear the little yell, yeah I got it right! or hum when they miss it sometimes and those are the things I enjoy watching.

> Well, when they're having fun, I'm having fun and having fun is important in my room . . . I did not go into teaching because I wanted to make money. I wanted to teach . . . because I love the kids so when they're happy, I'm happy!

Based on a review of the category referred to as teacher perceptions, the preceding quotations, and a synthesis of the transcripts, respondents were motivated to use multimedia when any of the following events occurred: (a) personal satisfaction was experienced by teachers when students appeared to be motivated to learn, and (b) students' level of self-esteem was enhanced through the learning experience.

Although the beliefs held by respondents motivated the use or development of multimedia, relevance was also a theme that influenced motivation. The following section will review the theme of relevance in order to better understand motivation.

Theme III: Relevance

Relevance, for this study, refers to the concept that an event or occurrence possesses a purpose that is perceived as important to the individual. These events or occurrences may relate to curriculum, students, or community. A summary of the representational quotations contained within the categories of classroom issues located on pages 80-84, student issues pages 98-101, and community pages 84-89: describes responses related to the concept of relevance. Further, the following statements support the importance of relevance to motivation.

> Whatever I'm working on that week I look to see what . . . if anything we have on computer that we can work with. . . . But mostly it [selection of media] depends on what I'm working on in the classroom, what skills I'm working on.

> Sometimes I use the teacher's guide. . . . Sometimes I decide [the media I use in the classroom] just by seeing what we're doing in class. Sometimes I decide depending on their skill and their weaknesses and their strengths and sometimes I decide simply because I want them to feel like school is fun . . .

Judging on the information I get back on [tests] assessments, usually they will try to diagram or sketch something and quite often the diagram or sketch relate to . . . graphs or charts or information they've seen on the screen.

. . . If you don't strike something in your classroom occasionally that has that type of visual stimulation, you're going to lose them. I mean they're conditioned to respond to that [graphics and multimedia].

Later on today we're going to be talking about storms and flooding and things like that and so I will use the Internet to go to the weather site . . .

The best way for me to learn is if you put me in front of something and tell me to do it, rather than talk to me for 40 minutes . . . Those kind of workshops do better. . . . I remember when we actually went into . . . Internet site, we did it together . . . we did work in the Internet site, we took a test in the Internet site. I like that better. It was together. It was hands-on.

. . . My first year the main computer person came to my classroom during class time during my break time . . . showing me different things on the computer . . .

Preceding statements and a synopsis of transcripts revealed that respondents were motivated to utilize computer technology including multimedia when respondents perceived that relevance existed. Based on a summary of the findings, respondents were motivated to use multimedia resources when (a) they effectively supported the curriculum and facilitated learning; (b) they met the needs of the students including learning style; (c) they helped simplify management within the classroom setting; and (d) the use of the media was supported through comprehensive long term training programs.

In addition to beliefs, relatedness, and relevance, value was also a theme that emerged through this analysis process. The next section of this study defines value and describes the concept as it relates to motivation.

Theme IV: Value

Value refers to the concept that an event or occurrence possesses a purpose that is perceived as important to the individual. For the purpose of this study, value relates to the personal value the teacher places on the use of computer technology including multimedia. The representational quotations contained within the previous sections of this chapter, as well as the following statements, relate to the personal value expressed by the respondents.

> As far as learning (computers) I was self-taught. . . . even when I went to college . . . I had already figured out how to do what they were having us do. . . . I've always enjoyed just figuring them out, I'm not afraid of them. I guess I don't care to push the button and see what will happen . . .

> . . . I find it satisfying because it [the Internet] opens more doors and makes more things possible for you.
>
> What motivates me to use it [CD-ROMs] . . . less grading papers and a lot less running for me and the lessons are readily available . . . for example Speedway Math it will give them ten problems . . . rather than you sitting down and making up the ten problems . . . they're at your fingertips, it's immediate.
>
> I have fun on the computer. . . . I do all my grades . . . then when I'm done with that I read my email . . . I play FreeCell . . . *Carmen San Diego* . . . I have fun doing it and so that's why I think the computer is so important . . .

Although several respondents described how they used computer technology for personal use, not all respondents described their personal usage of computers or multimedia. Overall, the summary of findings obtained through a review of categories and a synthesis of transcripts suggested that respondents who valued the computer for personal usage were motivated to use multimedia resources when (a) the technology effectively met the personal needs of the respondent and (b) the respondent received personal pleasure from the use of the computer including multimedia.

SUMMARY OF FINDINGS

In summary, the primary findings of this study fall into two categories: findings regarding the utilization of multimedia by 46 Oneida teachers, and findings about the factors that motivated a sub-sample of 5 teachers to use multimedia within the classroom setting. Those two sets of findings have been summarized in the following section of this chapter.

Teacher utilization of multimedia

- CD-ROM software was the most frequently used multimedia resource.
- Forty-seven percent of the respondents reported using the Internet.
- Simulation software was used by approximately 8% of the respondents 16 or more times during the time period investigated.
- Self-created resources were used far less than multimedia resources developed by other groups or individuals.

Factors motivating teachers to use multimedia

- Extrinsic motivators positively influenced teachers to use multimedia for instructional purposes. Students' success, increased student motivation, and student happiness were among these extrinsic factors.
- Intrinsic motivators [satisfaction, beliefs, personal pleasure, enjoyment, fun] motivated respondents to use multimedia within the classroom setting.

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

INTRODUCTION

The purposes of this study were as follows: (a) to describe the use of multimedia within the participating population, and (b) to identify factors that motivate teachers to use multimedia within the educational setting. The teachers of the Oneida Special School District were invited to participate in this study.

A total of 46 teachers participated in Phase I of this study. Five of the 46 teachers also participated in the interview portion of this study.

CONCLUSIONS

The study was conducted using the four questions described within this section. Question 1, 2, and 3 were answered using the questionnaire data collected during Phase I. Question 4 was answered using narrative information collected during the Phase II interviews.

1. What types of multimedia are this population currently using?

Overall, each type of multimedia investigated in this study had been used by at least some of the respondents. The use of multimedia ranged between a high of 64% for edutainment software to a low of 11% for WebQuests or ThinkQuests. However, 52% of

the population not participating in this study may well have used the Internet or other types of multimedia resources more frequently than the volunteer teachers responding to the Phase I questionnaire.

2. Which type of multimedia is most frequently used?

The volunteer respondents reported that edutainment software and the Internet were the two types of multimedia used most frequently within the classroom setting. This conclusion cannot be generalized to the entire Oneida teacher population, because the respondents were limited to the 48% who volunteered to participate in Phase I of this study.

3. To what degree are teachers developing their own multimedia?

Relatively few teachers in the study were developing their own multimedia. Multimedia resources developed by other groups, individuals, or commercially were used far more frequently then self-created multimedia resources.

4. What motivates teachers to use multimedia within the educational setting?

The factors motivating the five teachers interviewed in this study were both intrinsic and extrinsic. Further, extrinsic motivators were shown to have a positive impact on intrinsic motivation. This conclusion supports the research of Vallerand and Bissonnette (1992) who have indicated that extrinsic motivators can positively influence intrinsic motivation. Teachers reported the following extrinsic motivators related to student attitudes and behaviors: being happy when students were happy, experiencing enjoyment

when students were successful, positive feeling when students were learning, having "fun" when students were having fun. An important relationship appeared to exist between teacher satisfaction and student level of success, joy, happiness, or enthusiasm. These findings support other research in which student success had a positive influence on teacher motivation (Sederberg & Clark, 1990).

In addition, the following student behaviors positively influenced respondents: students' attention span increased, on-task behavior improved, or achievement increased. The student behaviors described by these respondents were consistent with the research findings of Din (1996). He reported that when computer-assisted instruction was used with students, their on-task behavior and achievement improved (Din).

Teachers also reported that one or more of the following extrinsic factors motivated them to use multimedia in the classroom setting: to meet the individual needs of students, to motivate students, to maintain students interest, to facilitate cooperative learning, and to promote active learning. Their actions appeared to be directly related to student learning and needs.

Teachers also reported other positive extrinsic motivators in their particular setting that influenced them to use multimedia and they were as follows: availability of technology, training, and on-site support. Four of the five teachers believed that the administration supported the integration of technology for educational purposes. These findings support previous research that indicates that administrative support positively

influences the use of computer technology (Becker, 1994; Hoffman, 1997; OTA, 1995; Zammit, 1992).

Contextual factors such as lack of time (Becker, 1994); safety issues, and unreliability of the Internet have also proven to be negative motivators. Lack of time appeared to be a factor for several of the teachers in this study. Safety concerns regarding student access to offensive materials on the Internet motivated teachers to log into sites, approve resources, and limit independent student exploration of the Internet. Further, unreliable access to the Internet interfered with the integration of this multimedia resource into the classroom setting.

Intrinsic motivators for these teachers included their beliefs, perceptions of curriculum relevance, self-efficacy, confidence, and pride. Beliefs expressed by the teachers indicated that learning should be a positive process "fun," "happy," "laughing," "yeah," or "they love it" were among the expressions used to describe successful events. These findings support research that suggests that teachers' beliefs play an important role in the integration of technology within the field of education (Hinostroza & Mellar, 2000; Honey & Moeller, 1990; Rogers, 2000).

Relevance was also an important factor that motivated respondents to use multimedia for instructional purposes. Respondents reported that they selected multimedia resources when the resources were capable of supporting the curriculum. CD-ROMs were used to facilitate instruction when the resources were identified as

relevant. Phonics, time, science, math, social studies, area, perimeter, and reading were among the curriculum topics supported through the use of multimedia. The importance of perceived relevance in this study supports the findings of Marcinkiewicz (1995) in which perceived relevance was identified as a motivating factor for student teachers' use of computer technology. Overall, the five respondents indicated that they selected multimedia according to one or more of the following criteria: whether the media supported the curriculum, whether the media would clarify or support a particular skill, and whether the media could meet the needs of the student. Relevance also was a significant factor influencing the selection of computer-based resources within the educational setting. These findings support past research that indicates teachers perceived computer-based resources to be relevant when they support, enhance, or reinforce curriculum (Ertmer et al., 1999). Further, Honey's research (1990) has indicated that opportunities must be provided for teachers to experience computer technology in ways that are relevant.

Relatedness was a third theme that emerged during this study. Relatedness refers to the interpersonal relationships or bonds that are formed between the teacher and the student. Vallerand (1997) has indicated that relatedness acts as a mediator to influence motivation. The strength of this bond appears to play a role in motivating teachers to use multimedia within the classroom. Respondents reported a feeling of satisfaction when students achieved success in reading or other academics. One teacher experienced personal satisfaction when students admired a teacher-created multimedia resource. Students said "Wow" and the teacher reported personal pride in the accomplishment.

IMPLICATIONS FOR EDUCATIONAL SETTINGS

The emergence of four themes among interviewees in this study have implications for those interested in furthering the use of multimedia and other technologies by classroom teachers. The following paragraphs present those implications.

Beliefs about the learning process emerged during the analysis of the transcripts. Multimedia was believed to be a potentially powerful tool for the learning process. Several respondents reported that multimedia was important to the instructional process because they believed that prior learning experiences were influenced by very graphic, colorful, 3D visuals, or animation. One respondent referred to the phenomena as "The Big Bird Syndrome." Beliefs appeared in this study to play a significant role in the selection and use of multimedia. Given the importance of beliefs, faculty and staff involved in computer technology training courses need to evaluate, reassess, and organize course material in order to address philosophical beliefs held by pre-service and in-service teachers. It is essential that pre-service and in-service teachers believe in the potential value of the computer and multimedia within the instructional process in order to facilitate the integration of computer technology.

Relevance was described as an important factor in the selection of resources. Each of the five interview respondents reported selecting media that supported the curriculum and met the individual needs of the students. Respondents reported using a wide variety of media within the classroom setting. Print media, magazines, newspapers,

cassettes, television, manipulatives, and multimedia resources were among the varieties of media used for instructional purposes. Since relevance has been shown by this and other studies to be a factor in the use of multimedia, faculty, and staff responsible for coordinating computer technology courses should consider providing pre-service and in-service teachers opportunities to actively participate in the planning and implementation of relevant training programs. Computer technology training could incorporate experiences that demonstrate the capabilities of computer technology and resources that are relevant to the curriculum, the teacher, and student needs.

Relatedness has been reported as a mediator of social factors that influence behavior (Vallerand, 1997). When a teacher and student have a bond, the interactions between them become motivators. The process of developing interpersonal bonds or relatedness can be facilitated through positive one-to-one interactions between the teacher and the student. The development of this bond or relatedness requires time to evolve. Perhaps educational institutions could provide the teachers opportunities to enhance interpersonal classroom relationships through the following: (a) reduce teacher student ratio to allow teachers more time for building interpersonal relationships, (b) schedule events outside the classroom setting so students and teachers have opportunities to interact in other environments, and (c) provide workshops that facilitate the design of positive classroom environments.

Value was also a theme that emerged through an analysis of the interview transcripts. Value, for the purpose of this study, refers to the value placed on the use of

computer technology, including personal use of multimedia. The values for the technology expressed by interviewees varied too much to draw a conclusion about common values, but value was a prominent feature of interview responses.

While all respondents expressed value for the use of the computer within the classroom setting for educational purposes, two respondents described using the technology to meet their own needs. One respondent described experiences with the computer as "fun." This respondent used the computer to personally communicate with other individuals via email and reported using software to play games that were fun, entertaining, and educational. A second respondent viewed the computer to be worthwhile. Previous experiences had motivated this individual to learn how to use the computer prior to any formal training. This respondent described using the Internet daily and working on the computer until late in the night, in spite of the fact that a great deal of time was required to access relevant sites. For this respondent, the Internet was viewed as (a) a means with which to "open the doors of the world" and (b) an effective tool with which to communicate with peers, friends, and associates via e-mail. This individual reported that the personal use of the Internet was a satisfying experience.

Other findings from this study also have implications for those interested in fostering the use of technology within the educational setting. Teachers interviewed in this study expressed concerns about availability of time. Clearly, the limitation of time is a concern for teachers. If the integration of technology is important for education, it would seem that teachers need release time for computer training, planning, and development of relevant resources.

Successful experiences of teachers and students were shown to facilitate, unsuccessful experiences were shown to limit the use of multimedia within the educational setting. This finding suggests that successful experiences should be incorporated into all computer-training courses in order to facilitate learning. Past research has also shown that positive experiences can enhance self-esteem and promote self-efficacy for the student and teacher (Bandura).

The issues and problems encountered and the training needed to successfully integrate multimedia into the instructional process suggest that universities and the surrounding school systems could collaboratively work to develop multimedia resources that are relevant to both P-12 teachers and students. Classroom teachers, principals, and other P-12 educators and students in the university setting can work together to develop resources that are based on the needs of individual teachers and students.

RECOMMENDATIONS FOR FUTURE RESEARCH

The use of a phenomenological research methodology in this study provided insights into the perceptions of the interview respondents. This study sought the following: (a) to identify the multimedia used by teachers within a particular population, and (b) to better understand the factors that motivate teachers to use or develop multimedia. The findings of this study may suggest future research. Suggestions regarding possible future research are provided in the following paragraphs.

1. It is recommended that future research regarding teacher motivation be designed using the process of triangulation. Through this process, data could be collected through the use of a questionnaire in addition to the interview process. The use of a questionnaire based on the categories and themes identified through this study could be used to collect data from a larger group of teachers. The questionnaire data could then be compared with narrative information from interviews to provide a broader understanding regarding the complex phenomenon of teacher motivation.

2. This study was limited to the investigation of teacher motivation and the use of multimedia. No data were collected regarding the use of computers for the following instructional uses: (a) word-processing, (b) database analysis, (c) desktop publishing, (d) video productions, (e) student authoring programs, (f) telecommunications, or (g) videoconferencing. Future research should focus on a more comprehensive investigation of computer technology.

3. This study was limited to a school system located in a rural area of East Tennessee. Research has indicated that teacher motivation is influenced by the setting and organization of the system (Davis & Wilson). Therefore, the factors that motivate teachers may vary from community to community, school system to school system. If teacher motivation is to be better understood and support systems are to be designed to promote technology integration, information regarding teacher motivation must be obtained from a wide variety of populations.

4. The participants in both the quantitative and qualitative process were limited in number. Additional research on teacher motivation should be conducted using a larger population or using multiple studies with smaller samples. This increase in number of respondents might support the current findings or provide insight into additional factors that motivate teachers to use or create multimedia.

5. The review of literature revealed that simulation software in many cases promoted student understanding of complex processes. However, research on simulations has been limited; additional research on simulation software could provide valuable information regarding the proper application of this software within the educational setting.

6. Additional research on teacher motivation and the use of multimedia in the classroom environment could be conducted using case methodology. Case methods could be used to observe and collect information regarding the actual integration of technology within a single classroom setting or school, and these observations could be used to better understand teacher motivation and the actual use of computer-based technology within the real world setting (Bintz & Counts, 1996).

7. To obtain more comprehensive data regarding the integration of technology within the Oneida population, additional studies over time are recommended. These future studies should be designed to include the following types of computer programs: word-processing, database programs, student authoring, telecommunications, Internet usage, educational software, as well as the use of videodiscs. The data collected through this

longitudinal research could focus the following: (a) how the computer-based resources are used within the classroom setting rather than the frequency of use, (b) how further training impacts technology use, and (c) how student achievement is affected.

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APPENDICES

APPENDIX A

INTRODUCTION LETTER FOR ADMINISTRATOR

Graduate Student Katrina T. Toth
Advisor: Dr. Edward L Counts
The University of Tennessee Instructional Technology, Curriculum, and Evaluation
442 Claxton Complex
Knoxville , TN 37996

Dear Superintendent _____:

My name is Katrina Toth and I am a graduate student currently working on a doctoral dissertation at the University of Tennessee in Knoxville. The degree that I am pursuing is an Ed. D. in Education with emphasis in Instructional Technology.

At this time I am contacting you to determine whether you would be interested in having Oneida Special School District participate in this proposed study. The proceeding paragraphs provide a description of the proposed study, an overview of the information to be provided to the prospective participants, and the safeguards that will be used to maintain confidentiality.

The purposes of this research project are: (1) to identify the types of interactive multimedia that are currently being used, (2) to determine the type of interactive multimedia that is most frequently used, (3) to discover whether teachers are developing their own multimedia, and (4) to determine the factors that motivate teachers to use multimedia within an educational setting.

The findings of this study will 1) describe the use and development of multimedia within your school district, and 2) identify factors that motivate teachers to use multimedia. These findings may provide information necessary to develop, design, and establish support systems that can facilitate the use of interactive multimedia within the educational setting. In addition, research regarding interactive multimedia is limited and these findings will contribute to the existing knowledge base.

The proposed research is divided into two phases. Phase I. is designed to collect data using a questionnaire and Phase II is designed to collect narrative information through interviews.

Phase I.

1. All k-12 teachers will be invited to participate in the survey portion of this research. As a prospective participant they will be asked to read the Informed Consent Statements that will be provided in a survey packet. If they are willing

to participate in this survey each participant will be asked to initial, sign, and date one of the enclosed Informed Consent Statements. An instruction sheet will be provided that will instruct willing informed participants where to initial, sign, and date the Informed Consent Statement. Willing participants will then be asked to complete the enclosed questionnaire. The questionnaire will take approximately 15 minutes to complete. Once the questionnaire is completed each participant will be asked to enclose the initialed, signed, and dated Informed Consent Statement, and the completed questionnaire in the enclosed stamped self-addressed envelope. One Informed Consent statement will be kept by each Each willing informed participant will retain the second Informed Consent Statement for their own personal records.

2. During this phase of the study no audiotapes, interviews, or experimental procedures will be conducted.

   a. The questionnaire used in the survey portion of this study asks questions related to the types of interactive multimedia used, the frequency of use, and whether teacher created interactive multimedia has been used.

   b. The principal investigator will assign an unidentifiable code to each questionnaire. The code will be used to 1) identify non-responders and 2) randomly select five participants for the interview portion of this study. Please be assured that no identifiable information will be placed on the questionnaire. Also, only the principal investigator will review the questionnaires. Data collected through this survey process will be compiled in a summary form and no individually identifiable information will be disclosed or published. The questionnaires will be kept in a secure location at the principal investigator's home; and the signed Informed Consent Statement will be kept in a secure location at the University of Tennessee in Knoxville for a period of three years.

3. Non-participants will be provided a second opportunity to participate in the survey process. One week after the first survey is due to be returned. A second survey packet will be delivered to non-participants.

Phase II

1. Five teachers will be randomly selected from the top 15 survey participants who reported the most frequent usage of multimedia. Each of the five participants will be provided an Information Sheet that explains the interview portion of this study. If the prospective participant is interested in participating in this phase of the study two Informed Consent Statements will be provided to the participant prior to the interview process. If they are willing to participate in the interview process they will write their initials in the lower left hand corner of page 1 and page 2, of the Informed Consent Statement and they will need to sign and date the Consent section. Each participant will keep an Informed Consent Statement for his or her own records.

2. During this phase of the study each of five randomly selected participants will be interviewed individually. Each interview will last one hour and the interview will be

audio taped in order to accurately document narrative responses. Each interview will be scheduled at a time that is convenient for the participant and the principal investigator will be responsible to travel to the interview location.

a. The principal investigator will transcribe the audiotape recordings and will destroy each audiotape once the transcription is complete. The identity of each participant will be confidential and the transcripts will not contain any identifying information. The transcripts will be kept in a secure location at the home of the principal investigator and will be destroyed once the research project is completed.

b. Prior to the interview process each prospective participant will be informed of his or her rights regarding human subject research and two written Informed Consent Statements will be provided. One Informed Consent Statement will be for their own personal record. The second signed Informed Consent Statement will be for the purpose of conducting the interview and this document will be kept in a secure location at the University of Tennessee in Knoxville for a period of three years.

c. The findings of the interview process will be presented in a summary form. No individually identifiable information will be disclosed or published. The principal investigator will maintain confidentiality throughout the process, transcriptions will have no identifiable information, there will be no identifiable information in the research publication, and audiotapes will be destroyed once the transcript is completed. Quotations may be used in order to demonstrate or clarify a concept being discussed in the published dissertation. However the individual participants will not be identified.

Compensation:

I would sincerely appreciate your consideration in this matter.

Sincerely,

Katrina Toth
A.B.D. Doctoral Candidate

APPENDIX B

INSTRUCTION SHEET

Motivation and the use of Multimedia

Instruction Sheet

1. Please read this Information Sheet.

2. If you are willing to participate in this survey please read and sign the yellow enclosed Informed Consent Statement.
    - Place your initials on page 1 (lower left corner)
    - Sign and date the Consent Statement on page 2.

3. Two Informed Consent Statements have been provided. The yellow signed Informed Consent Statement is to be returned in the stamped self-addressed envelope. The second Informed Consent Statement is provided for your own record.

4. Please complete the yellow enclosed questionnaire
    - Please do not put your name on the questionnaire.
    - Refer to the enclosed resource sheet to help define terms and categorize software programs that you have used.

5. Please enclose the yellow initialed, signed, and dated Informed Consent Statement and the yellow completed questionnaire in the enclosed stamped addressed envelope.

6. Please mail these documents by February 1, 2002.

I sincerely appreciate your participation.
Thank you,

Katrina T. Toth

APPENDIX C

INFORMATION SHEET FOR SURVEY

Information Sheet for Survey

Graduate student: Katrina Toth
Advisor: Dr. Edward L Counts
The University of Tennessee Instructional Technology, Curriculum, and Evaluation
442 Claxton Complex
Knoxville , TN 37996

Dear Participant:

My name is Katrina Toth and I am a graduate student currently working on a doctoral dissertation at the University of Tennessee in Knoxville. The degree that I am pursuing is an Ed. D. in Education with emphasis in Instructional Technology.

The purposes of this research project are: (1) to identify the types of interactive multimedia that are currently being used, (2) to determine the type of interactive multimedia that is most frequently used, (3) to discover whether teachers are developing their own multimedia, and (4) to determine the factors that motivate teachers to use multimedia within an educational setting.

The findings of this study will 1) describe the use of multimedia within your school district, and 2) identify factors that motivate teachers to use multimedia. These findings may provide information necessary to develop, design, and establish support systems that can facilitate the use of interactive multimedia within the educational setting. In addition, research regarding multimedia is limited and these findings will contribute to the existing knowledge base.

This research is divided into two phases. Phase I. of this study has been designed to survey teachers. The survey instrument will be a self-reporting questionnaire. All k-12 teachers are invited to participate in this survey portion of the research. Phase II. Has been designed to collect narrative information through an interview process using a tape recorder. Five teachers will be randomly selected from 15 respondents that report the most frequent use of multimedia. Please be aware that completing the enclosed questionnaire does not obligate you to participate in the interview process.

You are invited to participate in Phase I. of this research project. As a participant you are asked to complete the enclosed questionnaire, once you have read and signed the Informed Consent Statements. The questionnaire will take approximately 15 minutes to complete. Please be assured that no identifiable information will be placed on the questionnaire, only the principal investigator will review this document, data collected through the use of this questionnaire will be compiled in a summary form, no individually identifiable information will be disclosed or published, and the questionnaire will be kept in a secure location at the University of Tennessee in Knoxville. The signed Informed Consent Statement will also be kept in a secure location at the University of Tennessee in Knoxville for the period of three years.

Your participation in this study is important to the findings. However, participation in this study is voluntary. In addition, a participant has the right to withdraw from participation in this study at any time without penalty.

By signing an enclosed Informed Consent Statement, you are consenting to the use of your responses as grouped data for research purposes only. Please mail the completed enclosed questionnaire and return one signed Informed Consent Statement in the self-addressed stamped envelope by February 1st, 2002.

You may request a copy of the research results by contacting Dr. Counts at the University of Tennessee in Knoxville. If you have any questions concerning this study, please contact Dr. Edward Counts at 1-865-974-4246 or by e-mail at ecounts1@utk.edu.

Thank you for your cooperation in this matter.
Katrina Toth
A.B.D. Doctoral Candidate

APPENDIX D

QUESTIONNAIRE

Questionnaire

Directions: Please circle the number that best describes your answer to each of the questions below. Please answer part a & b of each question.

- A resource sheet has been attached in order to identify different types of software.

1.	Since November 1st I have required students to use Reference software for in-class research ____ times.					
	a. Commercial software	0	1-2	3-10	11-15	16 or >
	b. Software I created	0	1-2	3-10	11-15	16 or >
2.	Since November 1st I have required students to use Simulation software individually or in collaborative groups ____ times.					
	a. Commercial software	0	1-2	3-10	11-15	16 or >
	b. Software I created	0	1-2	3-10	11-15	16 or >
3.	Since November 1st I have required students to use Documentary software for in-class activities ____ times.					
	a. Commercial software	0	1-2	3-10	11-15	16 or >
	b. Software I created	0	1-2	3-10	11-15	16 or >
4.	Since November 1st I have required students to independently use Edutainment software ___ times. (Edutainment Software is defined as software that is both educational and entertaining for the user.)					
	a. Commercial software	0	1-2	3-10	11-15	16 or >
	b. Software I created	0	1-2	3-10	11-15	16 or >
5.	Since November 1st I have required students to independently use the Internet for research or review of information ___ times.					
	a. Web pages created by other individuals or groups	0	1-2	3-10	11-15	16 or >
	b. Web pages I created	0	1-2	3-10	11-15	16 or >
6.	Since November 1st I have required students to use Web Quests or Think Quests to complete tasks independently or in small groups ___ times.					
	a. Web Quests or Think Quests created by other individuals or groups	0	1-2	3-10	11-15	16 or >
	b. Web Quests or Think Quests I created	0	1-2	3-10	11-15	16 or >
7.	Since November 1st I have required students to use Videodiscs independently or in collaborative groups ___ times.					
	a. Commercial videodiscs	0	1-2	3-10	11-15	16 or >
	b. Videodiscs I created	0	1-2	3-10	11-15	16 or >

Please feel free to make additional comments on the back of this survey.
Thank you for your time and cooperation.

APPENDIX E

SOFTWARE RESOURCE SHEET

Resource Sheet

Definitions

Commercial software: computer-based software programs that have been developed and created for commercial sale.

Software I created: computer based instructional modules, lessons, or units that you have designed for independent or collaborative student use. The software you have designed may have been created using PowerPoint, Director, HyperStudio, Flash, or other productivity programs.

Software Categories

Reference Software		
American Journey Chronicle Encyclopedia of History Compton's	Encarta Grolier Microsoft Bookshelf Multimedia Encyclopedias:	National Geographic World Book
Documentary Software		
Definition: Software that presents information in a way that is very much like a documentary film.		
FDR: Franklin Delano Roosevelt Critical Mass	A Passion for Art Leonardo da Vinci	
Simulation Software		
Definition: Software that provides an environment in which real world problems can be investigated, researched, and explored.		
African Trail Amazon Trail Astronomy Village by N.A.S.A Dissection Lab Geometry Sketch Pad Mayaquest Trail Second Voyage of the Mimi The Golden Door	The Nardoo River The Oregon Trail W e Shall Overcome Voyage Where In The World	**Tom Snyder Productions:** Revolutionary Wars Feudalism Colonization: Exploring the New World Ancient Emperors Town Government On the Campaign Trail Women in Science Cultural Debate
Edutainment Software		
Definition: Software that is educational, entertaining, and enables a user to select the content to be explored.		
Accelerated Reader Arthur's Math, Reading and Thinking Away We Go Bailey's Book House Busy Town Best Math Ever Chicka Chicka Boom Boom Clock Shop Consonant Blends & Digraphs Cornerstone Crayola Amazing Animals Dinosaur Safari Disney Ready Read with Pooh Essential Skills Every Child a Reader Freddi Fish, 2, 3, or 4 GeoSafari: Math - History– Science - Geography-Animals or Science Graphers Grouping and Place Value Humpty Dumpty How Many Bugs in a Box? I Spy Jump Start Reading or Math Jump Start, Pre-k, K, 1st, 2nd 3rd	Kid Phonics, 1 or 2 Let's Go Read: Island Adventure Language Arts Level A Leap Into Phonics Leap Frog Math Magic School Bus Adventures: Body-Ocean–Solar System-Rainforest-Dinosaurs Mavis Beacon Teaches Typing Math Blaster, Jr., 1, Math for the Real World Math Munchers Deluxe Math Workshop Deluxe Millie's Math House Milliken Math Sequences Money Town More Bugs in a Box Numbers Uncover Pajama Sam Phonics 2 R. Scarry's Best Math Read, Write, Type! Reading Blaster, Jr., or 2000	Reading Comprehension Reading Who? Reading You Reader Rabbit Ready to Read with Pooh School House Rock Science Blaster Jr. Sight Words Spell Spelling 1 or 2 Stckybear Super Phonics Sunbuddy Math Playhouse Spot Tommy the Time Turtle Ultimate Writing & Creativity Center Vocabulary Development Vowel: short and Long Water Worries Word Munchers Deluxe Zurk's Learning Safari

Gordonson, K., Social Studies Services, socialstudies.com

Jonassen, Peck & Wilson *Learning With Technology*

APPENDIX F

INFORMATION SHEET FOR INTERVIEW

Information Sheet for Interview

Graduate student: Katrina Toth
Advisor: Dr. Edward L Counts
The University of Tennessee Instructional Technology, Curriculum, and Evaluation
442 Claxton Complex
Knoxville , TN 37996

Dear Participant:

My name is Katrina Toth and I am a graduate student currently working on a doctoral dissertation at the University of Tennessee in Knoxville. The degree that I am pursuing is an Ed. D. in Education with emphasis in Instructional Technology.

The purposes of this research project are: (1) to identify the types of interactive multimedia that are currently being used, (2) to determine the type of interactive multimedia that is most frequently used, (3) to discover whether teachers are developing their own multimedia, and (4) to determine the factors that motivate teachers to use multimedia in the educational setting.

The findings of this study may provide information necessary to develop, design, and establish support systems that can facilitate the use of interactive multimedia within the educational setting. In addition, the research regarding interactive multimedia is limited and these findings will contribute to the existing knowledge base.

You are invited to participate in the interview portion of this research project. A total of five participants will be interviewed. Each participant will be interviewed individually and each interview will be recorded using a tape recorder. The principal investigator, Katrina T. Toth, will be responsible to conduct each interview, transcribe the audiotapes, and destroy each audiotape once the transcript is typed. The identity of each participant will be confidential and the transcripts will not contain any identifying information. Prior to the interview each of the five participants will be provided two written Informed Consent Statements. After review of these documents each participant will be asked to sign one Informed Consent Statement. Each signed Informed Consent form will be kept in a secure location at the University of Tennessee in Knoxville for a period of three years. The second Informed Consent Statement will be for the participant's personal record.

The estimated time involved in the interview process for each participant will be approximately 1 hour. Interviews will be scheduled at the convenience of each participant and the interviewer will be responsible to travel to the school location in which the interview is to be conducted. The findings of the interview process will be presented in a summary form. No individually identifiable information will be disclosed

or published. Quotations may be used in order to demonstrate or clarify a concept being discussed in the dissertation. However the individual participant will not be identified.

Your participation in this study is important to the findings. However, participation in this study is voluntary. Participation in this research may create discomfort and anxiety during the interview process but the effects should be minimal. In addition, as a participant you have the right to withdraw from participation in this study at any time without penalty.

You may request a copy of the research results by contacting Dr. Counts at the University of Tennessee in Knoxville. If you have any questions concerning this study, please contact Dr. Edward Counts at 1-865-974-4246 or by e-mail at ecounts1@utk.edu.

Sincerely,

Katrina T. Toth
A.B.D. Doctoral Candidate

APPENDIX G

INTERVIEW GUIDE

Interview Guide – Interactive Multimedia

Interviewer: You have been randomly selected from a group of 15 survey participants who have reported a high frequency of multimedia usage. A total of five participants have been selected to participate in the interview process. Before we begin the interview we need to review the Informed Consent Statement. You have been explained your rights and have signed the Informed Consent Statement. Do you have any questions before we begin?

I would like to begin taping this interview in order to accurately report your thoughts and feelings. Are you comfortable with being taped? Do you have any concerns?

1. **When you hear the term media what comes to mind?**
   Interviewer: List media

2. **Out of the list of media you identified, what type of media do you use in a typical week?**

3. **How do you select the media that you use?**
   Probe: Where do you get your information on the media?
   - Organizations
   - Recommendations from educators
   - Magazines
   - Student performance data
   - Personal evaluation

4. **Think of a time when you used a specific medium and describe student reactions.**
   Probe: Describe behaviors in measurable terms
   - Degree of learning
   - Time-on-task
   - Problem solving skills
   - Cooperative learning

a. If the interviewee's thoughts are not described by responses move to question #5
b. If thoughts are described move to question #6

5. **What are your thoughts about the student responses that you described?**

6. **We have talked about a variety of media – if I were to say computer-based interactive multimedia what comes to mind?**
   Probe: What makes good multimedia?

7. **Think back to a time when you used multimedia and describe student responses.**
    Probe: Behaviors
        - Degree of learning
        - Time-on-task
        - Problem solving
        - Cooperative learning

8. **Think of a time that you felt successful using multimedia and describe the situation.**
    Answer: Successful
        - Describe what made it successful?

9. **Think of a time that you felt unsuccessful or frustrated when using multimedia.**
    Answer: Unsuccessful or frustrated

    Probe 1: Describe what made it unsuccessful or frustrating.

    Probe 2: Describe what you think would have made it successful or less frustrating?
        - Time
        - Support system
        - Inadequate computer capabilities
        - Lack of funding

10. **What motivates you to use multimedia?**
    Probe 1: Why do you use it?

    Probe 2: Describe what makes you able to use multimedia.

Closure: Do you have anything that you would like to say? Do you have any questions, concerns or comments?

Thank you for the time that you have participated in this interview.

VITA

Katrina Theresa Tomilson Toth was born in Boston, Massachusetts, on March 23, 1949. She attended public schools in Dedham, Massachusetts and graduated from Dedham High School. She received an Associate Degree in Applied Science Nursing in 1984 from the Agricultural and Technical College at Canton, New York. In 1994, she received a Bachelor of Science degree, Summa Cum Laude, at the University of Tennessee in Knoxville, Tennessee. Then on May 1st, 1995, she was awarded a Certificate for Outstanding Achievement in Special Education Modified & Comprehensive. In May 1995 she received a Master of Science degree from the University of Tennessee in Knoxville, Tennessee.

In the year 2000, she enrolled in the graduate program within the College of Education in the Department of Instructional Technology Curriculum and Evaluation. She received her Doctor of Education degree in December of 2002.

Previous teaching experiences include K-12 instruction within the regular and special education settings, as well as instruction within the college environment.