Children in the Net:

The Use of Technology and the Internet in the Classroom

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Abstract

This paper examines the use of Internet technology in the 21st century classroom. While many students make extensive use of technology in their personal lives; they are not using computers or technology extensively in the classroom. A review of the literature showed that in the United States the majority of schools have been equipped with the ability to connect with the Internet and World Wide Web; however there are still multiple issues which have negatively impacted both student's and teacher's abilities to utilize this technology to its fullest educational potential. National standards which address and define technological literacy for students have yet to be codified and implemented. The disparity between individuals who have the ability to access and use technology and those who do not, had decreased but remained a significant impediment to the effective integration of computer technology in the schools. Teachers, both seasoned professionals and pre-service candidates reported a lack of confidence with technological applications, as well as a lack of preparation and/or professional development opportunities to effectively integrate technologies in their curriculums and classrooms. The conclusions of these studies were varied, however a majority indicated a critical component for technological advancement in education was increased funding dedicated to modernization of an aged school infrastructure and recognized the crucial need for professional development specifically targeted toward technology use and application in the classroom.

Preface

This project has been part of an ongoing and concerted effort and was accomplished with the assistance and support of many individuals. I would like to extend my thanks to Dr. Masao Sugiyama- his patience, help and support throughout this process has been invaluable-thank you. I would like to thank my family for their continued support; without you I wouldn't have been able to attempt nor complete this adventure-you guys are the best. Finally, I would like to thank the members of my Evergreen cohort for their peer editing, creative perspectives, insights, and sustained encouragement both inside the classroom and out-you all made this process a little easier and a little more fun-you have my thanks and gratitude.

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CHAPTER ONE: INTRODUCTION

Introduction

Over the last few decades technology has progressed rapidly. Monthly, impressive technological breakthroughs are publicized. The human genome project announced that it had successfully mapped the human DNA sequence (Travis, 2003). Currently, significant research and development is focused on Green Technologies: solar, wind, wave and fuel cell applications intent on producing energy which is both efficient and affordable (Berry, 2008). All of these advances require the ability to store, analyze, and interpret data through the rapid manipulation of information.

Through the transistor revolution and electrically engineered innovation, microelectronic designs have produced rapid digital communication and given rise to the information age. Micro-technology continues to advance rapidly; microprocessors improve process times to a fraction of that used even a few months ago. More information is condensed into smaller platforms, and data storage once requiring entire rooms of computers is now available on portable drives that hang from key chains. As Western society progresses, it demands information, access, and entertainment that keep pace with the speed and agility of computer advancements.

Today's students are continuously surrounded by technologic application and innovation; many children and teenagers spend numerous hours each week involved in online internet access, text messaging, games, or various applications of one sort or another. This paper investigates technological

literacy, the digital divide, the issue of school internet connectivity, technology in teacher preparation and impacts of technology in the classroom.

Definition of Terms

Digital Divide: The gap between those individuals who have the necessary skills and ability to access to information technology, and those individuals who through a variety of reasons do not have the skills and abilities to access information technologies.

Internet: A worldwide network of interconnected computers.

NTIA: National Telecommunications and Information Administration

PITAC: The President's Information Technology Advisory Committee

Interactive Technology: technology that involves more than one computer; networks that allow individuals to interact with other computers over distances; software that allows individual interaction with applications to achieve specific goals.

World Wide Web: The graphical interface applied for Internet connection.

Rationale

The United States is a nation captivated by its technology. The cell phone, instant messages, electronic mail, Internet access for everything from academic research to shopping dominates the technological landscape (Kelty, 2002). Children are virtually weaned on technological advancements and the instant gratification that these advancements engender. Computer applications are designed around speed and adaptability, and children today spend surprising

amounts of time in front of the computer, on the X-Box, on the Internet, or with hand held devices (Ribble, Bailey, and Ross, 2004).

Technological literacy is a requirement for individuals who wish to fully participate in the twenty-first century (Thomas, 2007). Schools and educators must provide educational experiences that integrate technology into the total curriculum (Jacobsen, Clifford, & Friesen, 2002; Oberlander & Talbert-Johnson, 2007). To be prepared, students need knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals (Johnson-Hummell, Lipton, Morrow, Streichler, & Zuga, 2007). Technology instruction and information become imperative as students are required to participate in a global community that communicates through interface and data manipulation at virtually instantaneous speeds. Today's teacher is faced with increased need to create effective educational experiences which are integrative across disciplines and encourage students to willingly participate with the excitement, creativity and dedication they exhibit to their extracurricular activities (Oberlander & Talbert-Johnson, 2007).

Other Considerations

There are those in both education and in the private sector however, who feel that there is little positive intrinsic value to technology in the classroom: it is expensive; budget shortfalls and rising educational costs force the closure of schools; parents, boards and administrations are hesitant to assign the capital investments required to bring schools up to current technologic standards (Young, 2004). As states focus on implementation of educational standards and

students' abilities to achieve and exceed those standards, greater attention is focused on form and content (Young). Instruction, some argue, ought to provide students the information they need to answer test questions in a way that shows their academic achievement. Internet access and computer education are time-consuming diversions that waste children's time and energy, promote ill health, violence and social maladjustment (Shields & Behrman, 2000; Openheimer, 2003). To minimize the risk of ill health or repetitive injury from disproportionate computer use, the American Academy of Pediatrics advised parents to restrict the time children spent with computers, video games and other digital media, and to emphasize alternative activities such as sports or imaginative play (American Academy of Pediatrics , 1999). Other factors discussed in the research include disenfranchisement due to socioeconomic constraints, the re-enforcement of privileged consumers, the digital divide, and the suggestion that certain applications promote isolationism (Postman, 2007).

Conclusion

Attempts to integrate computers into the curriculum have been part of the educational landscape since the 1980's (Morris, 2002). There is a place for innovative technology in the classroom; computers used as a tool will engage children's ability to learn in a variety of ways, and will facilitate creativity in the classroom (Lovely, 2000). Educators and students must think about how to best interpret and apply the technological culture that is shaping their lives and the world around them.

CHAPTER TWO: HISTORICAL BACKGROUND

Introduction

The evolution of humans is marked by innovation and invention. Human development has long been linked with technological progress. Whether due to progressive evolution or to invention, the improvements of technical methods are the direct result of a combined collective experience which is continuously being accumulated and advanced (Dumas, 1968).

During the seventeenth and eighteenth centuries the majority of technology was invention-based. Innovators guided by exceptional insight, trial and error and the recorded experiences of those who came before, developed the method and means of scientific and cultural advancement. Beginning in this period and continuing on into the nineteenth and twentieth centuries the primary force for human advancement was scientific discovery and understanding (Lederman, 2008).

As societies adapt and change to embrace technology, human cultures and experiences change. Lederman (2008) stated: “The drive to understand the world around us has led to technologic advancement; greater technological advancement led to even greater scientific exploration and discovery, a cyclical process that even today at the dawn of the twenty-first century influences new technologies, and applications” (p. 36). The flow from basic scientific principles and the cycle of discovery continue at an accelerated rate, the pace of science-driven change is so quick that what used to evolve over a period of fifty years can now take place in ten years (Lederman). As Western culture has evolved over

the past 60 or 70 years, scientists and engineers developed the transistor and then the microprocessor key components to development of the information age and the computer, an essential tool for everyday life in the twenty-first century. The modern technological revolution had its foundation in the early twentieth century with the International Business Machine Co. (IBM) (Lesisko & Wright, 2007).

The need for rapid, accurate mathematical calculations of large and complex systems of numbers drove the development of the modern day computer. In the 1920's experimental data generated from atomic research required new mathematical and scientific ideas, designated quantum theory. When applied to movement of electrons in metals and conductors, quantum theory led to innovative advancements in electrical engineering and, subsequently, the revolutionary design of the transistor (Lederman, 2008).

In 1936 Konrad Zues, a German construction engineer working for Henshel Aircraft Company in Berlin, designed and constructed a binary mechanical device to aid him with intricate and lengthy engineering computations. In the United States in 1939 two men an Iowa State College, John Vincent Atanasoff and Clifford Berry constructed the Atanasoff-Berry Computer, the ABC. While this small binary digital calculator was built but never finished, its designed purpose was for the resolution of systems of linear equations (Ifrah, 2001).

The first significant break through in the field of electrically operated binary analytical calculators was achieved just before the end of the Second World War

at the British Code and Cipher School at Bletchley Park, in Great Britain. A team lead by M.H.A. Newman and T.H. Flowers built a powerful binary analytical calculator designed to solve logical problems, and provide the British with English printouts of ciphers, codes used by the Germans. The machine provided the information necessary to reconstruct the encryption processes as well as provide the code keys attached to each cipher (Ifrah, 2001).

Research carried out during World War II, at the Moore School of Electrical Engineering at the University of Pennsylvania created the first commercially successful electronic computer. This mega-machine consumed 200 kilowatts of power per hour when in operation. All of its programming was external to the system. Punch cards contained all of the informational data, which was scanned by the machine at the rate of one hundred and twenty cards per minute (Ifrah, 2001). Forty years later Steve Wozniak and Bill Fernandez built a computer with an internal chip design out of spare parts, as part of their undergraduate requirement and introduced the prototype personal computer (Lesisko & Wright, 2007)

The advent of quantum theory and the subsequent design and implementation of the transistor revolutionized electronic engineering and gave birth to microelectronic innovation. The application of advancements in engineering and microchip designs and development of high speed digital processors facilitated the computer and information age, a technologic era where information is a power source, and computer instruction programs and computer

literacy are necessary to prepare and train the millions of tomorrow's individuals who will live and work in a technologic universe (Barker 1993).

To many the classroom technology campaign is a relatively new idea; the reality, however, is that the crusade to revolutionize schools through mechanical devices of one form or another has been part of the education system for almost as long as the system of public education has been at work in the United States (Spring, 2008). First attempts at classroom computer integration occurred at the start of the 1970's with programs like Programmed Logic for Automatic Teaching Operations (PLATO). PLATO, and other starter interactive programs were limited dial-up blackboard systems, which allowed up to one thousand students access at a time. These programs failed due to the limited student access, expense, and expertise required to operate them (Lesisko, & Wright, 2007).

Conclusion

With each new technological advance, the drive to implement change has increased in its size and scope. Great hopes, faster implementation, more experimentation, greater expectations on the part of the public, the educators, and the politicians provide a backdrop for future technological advancement in the classroom (Oppenheimer, 2003). For technological awareness to be a reality for educators and students, technology must be available and actively utilized.

Billions of dollars, both public and private, have been spent to provide children access in schools, at home and in the community (Yooders, 2006). Computers are fast becoming integrated into nearly every aspect of human existence. In general there is agreement that for children to participate socially,

economically, and politically in this new and different world they are required to acquire a level of comfort and competence with technology (Shields & Berman, 2000). Chapter three will critically review research on technological literacy, the digital divide, school internet connectivity, technology in teacher preparation, and technology in the classroom. Chapter four will address recommendations for technology integration and application for teacher and student success.

CHAPTER THREE: A LITERATURE REVIEW

Introduction

Technology is described in many ways. From one aspect technology is related to things: automated machines, or computers. At the same time technology is associated with ideas—words such as dilemma, innovate, change or advancement. Then there are those for whom technology is a special skill set, or knowledge base. However technology is not the equivalent of objects, associations of words or the application of skills and ideas. It is greater than the sum of its parts, and human invention and activity becomes the principal motivational mechanism (Buric, 1993).

Western society has entered an age where information is a power. Data storage, analysis, and retrieval have become an integral part of a complex global economy (Sheilds & Behrman, 2002). The integration of technology into society has altered the nature of interaction in virtually every field of endeavor (Thomas, 2007). The capabilities of microprocessors to move and store data continue to increase, offering an abundance of information available to those who have access and the skills and abilities to use it.

There are few in schools today who would maintain that computers are just another fad, an educational device which will end up in a district warehouse, as many previous innovations have done (Barker, 1993). Classrooms have moved beyond the boundaries of four walls and a chalkboard; as global interconnections and high speed communication become a part of the enlarged educational landscape through media and the Internet. Multiple perspectives are

a very real part of the world and become part of the wealth of information available to students on a daily basis. Diversity of belief is not a problem which require solutions; they need not be eliminated nor ignored (Jacobsen, Clifford & Friesen, 2002). While many students are using technology in their personal lives in a wide variety of ways; they are not using computers extensively in the classroom. The gap between how students apply technology at home and how they are allowed to apply technology in schools is increasing (Jacobson, Clifford & Friesen, 2002). Therefore it is imperative that educators and students become aware of the broad range of uses for innovative technologies and that a concerted effort is made to facilitate aptitude and foster technological literacy from the very start of a child's education. Twenty-first century literacy demands the ability to use technology, including audio and visual segments, to enhance personal learning and communicate with others over digital devices (Crawford, 2006).

Technological Literacy

Technological literacy is a requirement for individuals who wish to participate in the twenty-first century. There are large discrepancies in technology based programs from state to state (Reed, 2007). As a result many students are ill prepared to live or work in a globally based technologically driven society and economy (Thomas, 2007). Educational progress dictates that schools and teachers provide educational experiences that integrate technology into the total curriculum (Bursic, 1993), programs designed to extend literacy beyond accepted basics and incorporate technological literacy into academic

curriculum. Students' ability to use technology effectively enhances their educational experience, and is an important skill to attain as we shift from an industrial society to an informational society (Thomas, 2007).

Literacy Standards for content areas such as reading, writing, science and math slowly surfaced as states began to conform to the No Child Left Behind Act of 2001(NCLB) (Barron, Kemker, Harmes, & Kalaydjian, 2003). Title II part D of NCLB, the Enhancing Education Through Technology Act of 2001stipulated that school districts which applied for Title II grants, would; "assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location or disability" (Title II Part D, §-2403). In response states either designed their own standards, or aligned with standards proposed by the International Society for Technology in Education (ISTE) (Barron et al.). Barron et al. reported that as of March 2003 thirty states had adopted or aligned themselves to the 1998 standards outlined by the ISTE. Because of the accelerated pace of technology innovation and diffusion into the classroom Barron et al. asked if teachers across grade levels had integrated technology into their classrooms, and how that integration allied to the ISTE National Educational Technology Standards for Students (NETS).

In order to investigate educators' use of technology in the classroom, Barron et al. (2003) designed a survey, which they sent to all the teachers of a large South-Eastern school district. The survey, sent across schools and grade levels, generated a response rate of thirty five percent (n = 2156). Respondents,

83% female and 17% male represented a range of educational and cultural backgrounds as well as years of experience in the classroom; sixty-one percent of teachers had ten or more years of classroom experience. (Barron et al).

The authors found that access to computers remained an issue in effective integration. Thirty-nine percent of teachers did not have access to a computer lab for their students. Teachers reported computer stations in classrooms varied greatly, from zero to twenty. The survey found thirteen percent of respondents lacked a computer in their classroom. Twenty-six percent of teachers in this survey reported only one computer per classroom, with an average class size of twenty-two students; the largest class size in this study was sixty students (Barron et al., 2003).

In order to collect data on the NETS components the survey included items directly related to four NETS modes for students; technology as a research tool, a production tool, a problem-solving tool or a tool for communication. Barron et al. (2003) found computers were used more in science than in any other content area. When used as a tool for problem solving science teachers were three times more likely, to incorporate technology for problem solving as English teachers. Science teachers were three times as likely math teachers and twice as likely as English teachers to integrate computers into their curricula as a research tool. Similarly social studies teachers integrated technology for research twice as often as math teachers. Elementary school teachers were shown twice as likely use computers as a communication tool than were high school teachers.

All grade levels reported similar integration for productivity-word documents, or spreadsheets-in classrooms (Barron et al.).

Barron et al. (2003) concluded teachers have begun to implement computer technology for research and communication, production as well as problem-solving; which conformed to the NETS; however integration across all grade levels and contents was incomplete. They stated that the proportion of teachers who applied computers consistently as a classroom tool ranged from 20% in the high school to almost 60% in the elementary schools. The authors posited that some of the increased usage by elementary schools would be explained by the flexibility elementary school teachers have in classroom schedules.

One limitation of this piece of research was that it studied only one school district that offers supports for its professional development. Other school districts which have different levels of access and resources would produce different results. In addition, because responses are self reported, teachers who volunteer for response might have a higher interest level in technology in the classroom.

This study addresses two issues; standards and access. NCLB established federal mandates with regard to student technological literacy, and states had begun to align to the NETS standards, or use NETS standard to construct state guidelines. However, inadequate access to computer technology has impacted consistent usage across subjects and grade-bands.

Technological literacy is knowledge of what technology is, how it works what purposes it serves, how it is used efficiently and successfully to achieve explicit goals (Johnson-Hummell, Lipton, Morrow, Streichler & Zuga, 2007).

In their article on a National Curriculum for Technological Literacy, Johnson-Hummell et al. (2007) considered the merits of implementing a national curriculum for enhancing technological literacy. Opinions expressed in favor of a national technology curriculum included the potential to eliminate the technological discrepancies between school districts, to tighten the gap between how school systems define techno-literacy and consolidate what school systems use to reinforce and apply technologic standards for their student bodies.

Streichler (Johnson-Hummell et al , 2007), was in favor of national literacy standards. His position was that innovation was integral to economic strength and technology standards were a way to ensure continued national progress. He recommended a national clearing house which would develop and manage a national curriculum. Dr. Streichler suggested the International Technology Education Association (ITEA) because of its “proven record of success and respected position in certain governmental circles” (p. 33) be entrusted to form The National Clearinghouse for Technology Capabilities and Literacy (CTCL). The CTCL through committee action would research and develop an integrative literacy curriculum, and “promulgate easily adaptable instructional materials.” (p. 33). He advocated a program which included comprehensive instructional materials which would enrich educational experience and connect to technology

literacy for students. The CTCL would provide the support and guidance necessary to apply and evaluate a national program.

Morrow (Johnson-Hummell et al , 2007), went on to say that currently across the nation the dearth of standards is hampering attempts to produce a nationally technologically literate student population. Integrated technological education produces a techno-skill based population, this population then had the ability to participate economically in a global market economy. With positive impacts on global markets through technologic innovation, the United States would be in the position to compete economically, capitalize on its techno-literacy and positively contribute to the world's continued technological development. These authors agreed that an increasingly important requirement in student education is fluid technologic literacy. Student's exposure, knowledge, usage and ultimate efficacy of technologic resource is a prerequisite for later life.

However, Zuga and Lipton (Johnson-Hummell et al , 2007) felt that any nationalized curriculum would prove ineffective for a variety of reasons. Constitutional authority and bureaucratic inefficiencies as well as content control over a one size fits all prepackaged program, and qualified assessment ability were a few of the concerns they expressed. Lipton, in opposition stated that organization and oversight of a national program of education is an almost impossible task. Oversight of any project or program on a national scale has proven historically to be a monumental endeavor. Dr. Lipton argued that successful oversight and management of a national project, as fluid as

technology and technologic innovation could prove impossible for the inflexible structures that accompany the national bureaucracy.

Zuga (Johnson-Hummell et al , 2007), opposed a national technology curriculum based on control of content. She asked If the federal government were to be able to successfully implement and support a national curriculum, which agencies would have input into content of that curriculum; who would control the value and belief systems conveyed through a national program. She argued that given the nature of politics and administrations to track to financial concerns, it is conceivably individuals, or special interest groups which controlled political and/or financial interests could in fact direct educational content. Educational content should not be directed by those who champion specific ideas, only to have the ideas change as those with power change. In order for any program to be effective, form and content must be student oriented and therefore be controlled locally (Bergen, 2000). Only through collaboration with students and peers can teachers produce an applicable enriched educational experience (Dewey,1938). The arguments for and against national controls versus local controls has a long history across many issues. The current movement towards standards based, assessment driven education motivated discussion of how information is organized and presented, and who has input into curricular content. Policies for educational focus and direction, standards and content are predicated upon the informed opinion of educators involved in the national debate.

Nevertheless, technological literacy is an important requirement for students today. The practice of studying technology within general education has a long history; nonetheless, the process of actively pursuing a technological literacy program or application of educational standards for technological literacy is still underrepresented nationally, and is reflected in the national digital divide (Reed, 2007)

The Digital Divide

Each year, being digitally connected becomes ever more critical to economic and educational advancement and community participation (NTIA, 2000). The digital divide is a term used to describe the disparity in access to and usage of current Internet technology. It is a sociological occurrence which reflects broader related factors in social, economic, cultural and educational inequalities (Ba et al, 2001). Put simply, the digital divide is the separation between those who have access to and can effectively use information technology, and those who do not have access to or cannot effectively use information technology (Pearson, 2001).

Ba et al. (2001) reported income level is a determining factor in computer and Internet access. Families with higher incomes are more likely to own a computer and be connected to the Internet, while households with lower incomes generally remain without technology and/or access. Similarly, economically depressed rural and inner city communities lacked the same level of access to technologies as the largely white, middle-class suburban communities in the United States of America. The authors suggested that the problems associated

with the digital divide are embedded in cultural and economic conditions, reinforced in underserved communities by factors such as economic opportunities, educational disparities and geographic location (Ba et al.).

The individual student's ability to access technology and apply information becomes increasingly important for success socially, educationally and economically (Postman, 2007). Achievement differences among economically disadvantaged and minority children when compared to their middle class counterparts are entrenched.

Ba et al. (2001) reported that the digital divide between blacks and whites had decreased over the years between 1989 and 2001; however; there was still a disparity between access to the Internet in schools and at home for black students and white students. The author stated concerns over the quality of hardware and software available to minority students, as well as the disparity between the actual time allotments that students are given on computer systems.

Postman (2004) cited a Department of Education study which found that 45.3 percent of black students age five to seventeen had access to the Internet either in school or home, as opposed to sixty-seven percent of white students in this age group which had Internet access. Students who have access to Internet connections and the World Wide Web do better academically than those who do not. Those students who have access to computers and the Web from home have an even greater advantage over those who do not; information access, e-mail, report writing, help with homework assignments, and increased scores on placement tests for colleges are a few of the advantages (Postman).

The goal of digital equality is to ensure that all students have access to information and communication technologies for education, regardless of socioeconomic status, gender, race, physical abilities or other characteristics linked with disparate treatment (Judge, Puckett & Cabuk, 2004). Equitable access to technology resources, high quality culturally relevant content and, effective use of technology for teaching and learning are additional dimensions intrinsic to digital equality. As technology becomes increasingly prevalent in society, concerns over the digital divide and equitable management of resource becomes an important issue for children who benefit from technological innovation and those left behind (Judge et al.)

In a study of early childhood education and access to digital resources, Judge et al. (2004) sought to describe young children's access to computers in schools and the varied conditions that affected how students experienced computer technology. The National Center for Education Statistics sponsored the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K); a nationally representative study on children's education from kindergarten to first grade. This study gathered information on some twenty-two thousand public and private school children form more than twelve-hundred kindergarten programs nationwide. Judge et al. employed a subsample of the ECLS-K data on public school children who attended kindergarten and first grade. The subsample consisted of 9,840 children in 669 public schools; these schools were classified by their concentration of low-income children. Of this sample, 61.9% attended lower poverty schools (n = 6,093) and 38.1% (n = 3,747) attended

higher poverty schools. Criteria for low poverty versus high poverty schools were determined by the number of students which qualified for free or reduced lunch programs. The authors collected data through teacher and school administrator hard copy questionnaires and parent interviews. A series of one-way MANOVAs were conducted with school poverty concentration as the independent variable and computer system attributes, using CD ROM, LAN or Internet access and computer resource access, as the dependent variables. Significant effects, tested with Wilks' lambda were followed with univariate ANOVAs to assess data reliability (Judge et al.).

Judge et al. (2004) found a variety of results in the extent of progress towards digital equality for children in kindergarten and first grade. The authors stated that while the majority of students had access to computers and information technology at school there was a disparity between socioeconomic levels and home use. The authors also found that there was a disparity between adequacy of computer labs and technical supports across schools. Schools that represented higher poverty levels reported computer labs with more equipment, smaller ratios of students to computers and technical support than lower poverty schools. Children in kindergarten in lower poverty schools had greater access to computers and the Internet at home than students in high poverty schools. These findings did not change significantly from kindergarten to the first grade. The authors found that at least 85% of children in both kindergarten and first grade who used computers at home used them to learn skills or played educational games. Of the kindergartners who used home computers, seventy eight percent

used them for art; only one point two percent used them for Internet access (Judge et al.).

The authors found that the majority of computer usage in classrooms was limited to reading, spelling, and math facts. Comparisons revealed that higher poverty schools used computers more for instructional purposes during kindergarten than lower poverty schools. In first grade, higher poverty schools were found to use computers more for instructional purposes strengthening math, reading and spelling illiteracies, where lower poverty schools used computers significantly more for entertainment activities. The least frequent use of computers in kindergarten and the first grade was Internet access (Judge et al. 2004).

Judge et al. (2004) concluded that there had been progress in schools which served predominantly low-income students. Nearly all young children had computers available at school. Lower and higher poverty schools were about equally likely to have computers in the classroom. And even though the availability of computer resources at school increased from kindergarten to first grade, higher poverty schools had significantly fewer computers and software programs. In addition, continued professional development opportunities for educators with respect to technology applications and integration further impact the divide. Kindergarten and first grade children had access to computers which offered limited experiences to enhance learning specifically in literacy and math skills, but those instructional uses varied across the schools. Finally the authors postulated that teachers who are prepared to integrate technology into curriculum

are more likely to demand access to and implement computers and educational software in schools despite the schools socioeconomic profile, which served to further reduce the digital divide.

A significant limitation of Judge et al.'s (2004) study was the lack of specific information on the quality of children's computer use or specific software used in school and at home. Teacher survey questionnaires were narrow in scope, and the questions in the survey were not specifically designed around poverty and computer use. Computer usage was compared over the academic school years kindergarten and first grade; differences reported between the two grades could have been due to changes in grade, or the fluxuation of computer resources from one year to another.

A survey conducted by the United States federal government outlined a list of the one hundred poorest counties in the nation. Sixteen percent of those counties were located in the state of Mississippi, and half of those were in the Delta region (Thomas, 2007). These 16 counties and the other eighty-four counties of the study have an ongoing cycle of poverty entrenched with in their communities. The study determined the way to end the restrictive socioeconomic cycle was to increase the quality of education. The way to achieve a better quality of education was to provide and use technological innovation and the Internet to its fullest extent (Thomas). The author stated that schools are the means to close the achievement gap, enhance economic opportunity and to reduce the digital divide. The caution however was that while schools present the opportunity for student's exposure to technology it requires more than research

and keyboard time to affect sustainable changes that positively affect economic viability (Thomas).

The digital divide is a socioeconomic issue which has a direct impact on the academic opportunity and advancement of each student. Early childhood education establishes the academic foundation for students lives. Technological aptitude and computer usage are an increasingly important requirement for students, regardless of the economic profile of the educational system they are involved with; and are often viewed as the means for sustained community growth and prosperity.

In a study of Internet access, the Department of Commerce measured the extent of computer and Internet connection among U.S. households (NCES, 2005). The data obtained through Bureau of the Census statistics and interviews with more than forty-eight thousand households showed that as of August 2000 the digital divide in the U.S. had decreased. This report stated that between December of 1998 and August of 2000 American households with computers had risen by some 21%; and since 1997 computer diffusion had risen to 40%. According to the study, 43.6 million households or forty-one point five percent of all households surveyed had Internet access The rapid increase in Internet usage was perhaps best shown by the expanded percentage of homes with computers or other devices which connected to the Internet. In 1997 little more than one half of households with computers had Internet access, by 2000 that figure had increased to eighty percent or four out of five homes (NCES).

In looking at these figures it would appear that the digital divide had decreased. The uptake of new technologies occurred among most groups of Americans regardless of a variety of factors including; race, age gender, income and rural versus urban dwellers. However, the digital divide does remain and the factors listed above affect the accessibility of technology and information. Income, race and education are among of the most significant determinants which affect it (NTIA, 2000).

This survey, administered by the National Telecommunications and Information Administration (NTIA, 2000) reported that the gap had narrowed, however certain minority groups such as, Asian Americans and Pacific Islanders had higher than average levels of computer ownership, and Internet access. At the same time, Hispanics and Blacks and others with lower income and education levels which showed significant statistical gains, started at a disadvantage. Homes with different ethnic and racial backgrounds had unequal rates of computer ownership. Large gaps for Blacks and Hispanic remained and increased when measured against increased national averages. The study reported individuals with disabilities are half as likely to have ready access to the Internet as those without disabilities. Technology offers enormous potential to increased rates of computer and Internet use among people with disabilities. However it can also be a barrier if innovations are not designed to be accessible (NTIA, 2000). It is not simply enough for an individual or family to own a computer.

Between 1998 and 2001, computer ownership by minority households increased, but the gap in Internet access between whites and minorities had in fact widened (Ba et al, 2001; NTIA, 2000*).* The NTIA study showed gains nationwide in both computer owner ship and Internet access. The report reinforces the conception that education and income were interrelated factors for both computer ownership and Internet access and usage. This study however only focused on in home computer usage and Internet connection. It does not address requirements for job usage, or usage through schools.

Schools in the United States have scrambled to provide the technological infrastructure required to connect students digitally. Yoders (2006) stated that statistics gathered from the National Center for Education showed that enrollment in United States public school system will continue to increase through the year 2012. Due to the increase in K-12 student populations school boards all over the nation are struggling with providing buildings and classrooms to meet increased demands. Some forty-five percent of buildings and infrastructure for schools in this country were built between 1950 and 1969 (Yoders). The nation is faced with a system of school buildings that are forty to sixty years old and are ill equipped to deal with the technological needs of the twenty-first century student population (Yoders).

Throughout the country school systems are re-thinking and re-designing school buildings. School boards are requiring design teams to provide buildings which supply high technology interconnectedness with flexible classroom and

meeting spaces. Communities require designs which also have a high degree of sustainability and reflect green thinking and building practices (Yoders, 2006).

There are school districts which are now involved with the construction and operation of schools which have been designed and constructed with integrated technological innovations through the building (Yoders, 2006). WiFi connections, video conferencing, LCD projectors, and smart boards, enclosed audio/video cabinetry for the classrooms are part of the basic school design (Zappier, 2005). Microsoft Corporation has partnered with the Philadelphia School District to create a school of the future, at a cost of $63 million (Yoders, 2006).

Creating infrastructure is a time consuming and costly endeavor. It is apparent that the current infrastructures of schools built forty to fifty years ago require renovation. However at with costs at $63 million and more, smaller school districts and rural schools which face constant budget shortfalls and the increased costs of education could view the investments required as inaccessible (Yoders, 2006). The purchase of computers and software in disadvantaged school districts consumes resources that are in short supply; capital which could be applied to strengthen overall programs (Natriello, 2001).

School Internet Connection

This generation of students represents the first generation to grow up surrounded by digital media (Crawford, 2007). The computer has always been in their lives; they feel more comfortable with computers than most of their parents and teachers (Brace, 2001). They play, learn, and create with computers on a

regular basis. These students are a generation of information seekers; their access to the mass amounts of information presented on the Internet allows them to deal with information for their own education (Brace). Subsequently students have greater interest in how technology works, and how they can best apply what they know to generate what they need. Implications for education include the possibility that education will shift from the more direct instruction-teachers in front of classrooms dispensing information-to interactive education; a more discovery oriented learner-centered approach facilitated by information technology (Brace). However, access is not universal. One of the most significant factors which affects student's access to and usage of technologies is economic (Pearson, 2001). Use of technology to educate is more important than having students learn about technology (PITAC, 2000).

The National Center for Education Statistics, began a Fast Response Survey System (FRSS) to establish a comparative analysis which tracked students access to information technology in schools and classrooms (NCES, 2005). Conducted over a ten year period, the survey was modified annually to reflect developing issues; computer availability in schools, enhanced connectivity, professional development on technology in the classroom and access by students to material considered to be inappropriate.

The authors mailed the survey to a representative sample of one thousand 205 public schools in the 50 states and the District of Columbia. The sample was chosen from the Public Elementary/Secondary School Universe File, part of the NCES, Common Core of Data. The frame included a sampling of about eighty-

five thousand regular elementary and secondary schools, which decreased to an estimated 83,000 when some of the schools were determined to have been closed or merged with other schools. Survey findings were analyzed by specific characteristics which included instructional level, elementary school or secondary school, the school's student enrollment, socioeconomic factors of students, minority enrollment and school locality-rural verses urban location.

The types of Internet access and the speed with which computers communicate have evolved over time. Dialup connections, which were common in 1994 at the start of the survey, have given way to narrowband and broadband connections for the majority of schools. As of the fall of 2005 nearly 100% of public schools in the United States had instructional rooms with access to the Internet, as compared to 35% of schools which had instructional rooms with Internet access in 1994 (NCES, 2005). The report stated that broadband connections were the prevalent means of connection for both large and small schools; however, larger schools and urban school systems were more likely to have broadband wireless connections in their computer centers. The surveys also measured student access to computers and access to the Internet.

Over the intervening years the ratio of students to computers with Internet access had decreased from roughly twelve to one in 1998 to a ratio of three point eight to one in 2005 (NCES, 2005). The ratio of students to computers was calculated by dividing to total number of students in all public schools by the total number of instructional computers in all public schools; including schools which had no Internet access. However this method of computation skewed distribution

of students per computer per school. Small schools showed fewer students per computer than medium or large schools, and schools with the lowest levels of minority enrollment showed fewer students per computer than schools with elevated minority enrollment.

In her paper on access to technology and minority students, Pearson (2001) stated that minority and poor children are less likely to have access to computers and the Internet at home and at school, and their parents were shown less likely to have access at work. She reported that schools with higher percentages of minorities and/or lower socioeconomic status consistently had higher ratios of students to computers, which peaked at one point at thirty two to one. Students without access to high quality computer experiences at home or school are not provided with opportunities they need to be successful in society (Pearson).

Internet connections have grown to national coverage over the last decades. Statistics show that in the United States steps have been taken to provide that all schools have access to the Internet with advancement in speed and connectivity; however rapid access to information is not the sole issue. Student to computer ratios while improved over time have a basis in socioeconomic factors and remain a significant factor in broad based classroom implementation.

Ultimately however, the ratio of students to computers in public schools had steadily decreased as school districts updated and equipped schools for Internet access. As greater numbers of students gained access to the broad

range of information on the Internet, parents and educators expressed concerns over student access to inappropriate materials (NCES, 2006).

The Presidential Information and Technology Advisory Committee (PITAC, 2000) reported on The Universal Service Fund for Schools and Libraries or E-rate program, which was instituted in 1996 through the Federal Communications Commission (FCC). The program established up to 2.25 billion dollars annually in subsidies to make telecommunication services, internal connections and Internet access available to schools and libraries at discounted rates based on a variety of community and socioeconomic variables (PITAC,). Public Law 106-554 The Children's Internet Protection Act (CIPA), mandated no school receive the education rate (E-rate) discount unless it certified that it enforced an Internet safety policy which included blocking technology or procedures to prevent students access to inappropriate material on the Internet (PITAC; NCES, 2006).

FRSS Surveys from 2002, 2003 and 2005 asked schools about methods employed to limit student access to inappropriate information on the Internet. By 2005 across all schools characteristics, ninety nine to one hundred percent of schools used some form of blocking software, or filter software and ninety-six percent of schools also employed some form of teacher monitor program to oversee information diffusion to students. This study reported ninety-five percent of public schools which used technologies or procedures to prevent student access to inappropriate material on the Internet, indicated that they routinely distributed information about policies and procedures to parents and students.

Schools also reported reinforcing the schools policies for students with updated notices to parents, written contractual agreements, and honor codes between students and school (Wells & Lewis, 2005).

As schools provide students computer space, and safe internet access teachers are faced with ensuring that instructional technology is implemented and supported properly (Lesisko & Wright, 2007). In 1999 approximately one-half of public school teachers reported they used the Internet for instruction and/or assigned Internet research for their students (Smerdon et al, 2000). By 2005, NCES reported that eighty nine percent of schools had integrated the Internet into school programs to provide data, individualize instruction, and support educational resources-such as digital libraries (Wells and Lewis, 2006). The NCES study showed limited differences in the use of the Internet by schools based on framed characteristics. For example, secondary schools were more likely to offer online professional development to teachers, while rural schools generally offered greater access for distance learning than urban schools (Wells & Lewis, 2006). While the study provided a longitudinal perspective and the sample size was drawn from around the country, the comparisons were incomplete. Certain types of schools were not represented in the study; vocational schools, schools which meet special education needs, or alternative programs were excluded. While the data represents a fraction of the overall population, the exclusion of these programs characterizes a chronic oversight in large scale governmental and institutional driven survies, data retrieval and

analysis. Marginalized communities and programs which fall outside of the educational mainstream, are consistently underrepresented.

As school systems across the nation provide assess, increased attention is focused on access to age/grade appropriate materials. Governmental programs, school districts and parental organizations have established guidelines and procedures for students and teachers alike. Individual guidelines impacted by distribution of federal dollars, district policies and community values affects the implementation of the technology in school districts and across grade bands.

Teacher Preparation

School systems are actively purchasing and implementing hardware and software packages into their daily operations. Instruction and education are impacted by the programs which are chosen and implemented within the school system (Lacina, 2006). With an increased emphasis on critical thinking skills and the integration of technology, the need for teachers who can incorporate technology into their curriculum becomes vital (Oberlander & Talbert-Johnson, 2007). Children should begin their academic introduction to technology with instructors who can model proper treatment of both the hardware and software in the classroom and provide instruction on the proper protocol in computer usage and sharing (Lovely, 2001). Teachers themselves must become proficient in the use and incorporation of current and emerging technologies into instruction. It is only through competent usage and integration they become role models for their students (Ireh & Bell, 2002). Preparing teacher candidates to integrate technology in support of instruction for education can be complex (Oberlander &

Talbert-Johnson, 2007). Nevertheless, it is important to realize that the ultimate goal of technology instruction in teacher education should focus on actual use of technology in instruction (Negishi, Elder, Hamil & Brunette 2003).

Many pre-service programs have sought to improve preparation of new teachers to use technology as an effective instructional tool. However, educators and school administrators realized that technology instruction alone did not generate an effective technology using teacher. The personal beliefs and attitudes of teachers directly related to successful integration of technologies in the classroom (Vannatta & Fordham, 2004).

Vannatta and Fordham (2004) sought to identify which combination of factors would best predict classroom technology use for kindergarten through twelfth grade classrooms. The instrument measured a variety of teacher attributes such as; teacher philosophy, self-efficacy, flexibility for change, professional development time, professional commitment, and years in the classroom. To measure the targeted characteristics the researchers constructed a seventy one item survey; the Teacher Attribute Survey (TAS). The TAS was distributed to two-hundred and forty five teachers from six schools in a Northwestern Ohio school district; four elementary and two high schools. The schools were culturally diverse, rural and sub-urban, and small to mid-range in size. After elimination of incomplete surveys and outliers teacher responders numbered one-hundred and seventy (n=170) (Vannatta & Fordham).

The authors reported that classroom technology use was low. In general teacher usage was higher than students. E-mail, word-processing, and Internet

research were the only applications used with any frequency. Student's usage was limited to word-processing and Internet research once or twice a semester.

The study showed participating teachers demonstrated slightly above average self-efficiency, expressed a willingness to change their educational approach; and leaned toward student-centered constructivist classrooms. Teachers were found to have averaged sixteen years in the classroom; with more than forty hours of professional development time with nineteen hours of actual technology training. Vannatta and Fordham (2004) found respondents spent on average between six and fifteen hours a week, beyond contracted time requirements on preparation.

Vannatta and Fordham (2004) concluded teacher education in technology is an important factor in producing technology using teachers. Educators professional commitment and openness to change combined with the amount of technology instruction time were found to be significant predictors of teachers willingness to integrate their classrooms. Technology is a dynamic innovation; as the role of technology in society and education emerges adequate preparation of teachers in educational technology is integral to effective application in the education and learning of children (Vannatta & Fordham).

This research survey failed to look at how technology was used, self-efficacy was defined as belief in affecting student's performance. The survey incorporated only one school districts' teachers small sample size; elementary schools were represented two to one and no middle school teachers surveyed.

The integration of tools into classroom curriculum and routine is predicated on instructors' facility and comfort with them. Studies which report information gathered about educators own attitudes and belief on implementation of technology in the classroom represents an important component for consideration. Negishi, Elder, Hamil and Brunette (2003) conducted a study across three classes of undergraduate seniors who majored in elementary education. The study investigated factors which affected student teachers' integration of technology into instruction during field placements. The researchers collected data following completion of the students' field placement service. They asked teacher candidates to participate in a Likert scale survey on a variety of topics related to implementation of technology into instruction during field placement. Factors included; the pre-service teachers' beliefs about the intrinsic motivation for students in classroom technology, pre-service teacher's general comfort with technology, the availability of technology at the placement sights and the student teachers mentors' use of technology during field placement service. According to the study multiple regression was chosen to identify the degree and character of the relationship between dependent and independent variables. The dependent variable, integration was measured against four independent variables proficiency, belief, availability, and mentor modeling. As each variable was measured against integration; analysis showed that classroom availability had the greatest impact; however, general proficiency, and mentor monitoring were significant predictors of implementation of technology during the student teaching experience. Student teachers tended to

integrate a higher degree of technology into their instruction when more technology was available in the classroom and when mentor teachers used technology more frequently while instructing (Negishiet al.,). Proficient students who felt more comfortable with technology reported they were more prepared to integrate technologies than those student teachers with fewer technological skills. Results indicated that the teacher candidate's belief that technology possessed intrinsic motivation for their classroom students was not found to be a significant motivator (Negishiet al.).

Integration of technology in classrooms is a complicated process (Negishiet al., 2003). Predictors such as availability, proficiency, and modeling while essential do not explain the process fully; there are other factors which impact teacher's use of technology which should be explored (Negishi et al.). It was concluded that technology instruction in teacher education positively affected attitudes and proficiency. In addition, it was important that teacher education programs not only demonstrate how to use technology, but how to integrate technology into the curriculum. (Negishi et al.). This small study appears unsophisticated. The study's findings reflected an almost intuitive response to technology integration in the classroom: availability of, and proficiency with technologies, increase the likelihood of use in the classroom.

Technology is a fixture in the twenty first century classroom. This study highlights the importance of instruction and mentor modeling for student teachers in usage and application of technologies in the classroom. School districts and classrooms across the nation stand to benefit from college and universities which

recognize and actively incorporate technological literacy into their educational training programs.

A teacher may be comfortable with his or her own computer; however it does not mean he or she will integrate use of technology into the classroom (Kelty, 2002). Generally instructors use the tools available to them; however not all educators feel they are prepared to use technology or to integrate it into the classroom (Kelty,2002).

In a study, Kelty (2002) reported that as many as seventy percent of educators in schools fell into a hesitant category when it came to computers and other new technologies. Kelty described the reluctant teacher as one who has not embraced new technologies or had not blended technologies into the classroom. Educators felt underprepared to integrate classrooms. While many teachers were familiar with some of the basic software and functions of personal computers (e.g. e-mail, spreadsheets, or word processing) few teachers used technology in education such as presentations or student file management. Kelty reported that teachers felt they needed support for skill development for broader classroom application. The decision to employ educational technology in the classroom is multifaceted.

Efforts to increase involvement by educators require an equally multifaceted approach to be successful (Ebersole & Vorndam, 2002). The effective use of computers in the classroom requires increased opportunities for educators to learn how to use technology. In a study of faculty members at a regional university, Ebersole and Vorndam collected and analyzed data designed

to discover and identify barriers and incentives associated with the adoption of educational technologies in the classroom. The authors posited that once barriers to change are identified it became possible to remove them or provide teachers the resources needed to overcome them. Teachers responded to a series of inquiries on their use of educational technology. Items were designed to access information on faculty application of technology: how often they employed it, what they employed most in their instruction and what factors influenced their usage and application of technology.

Ebersole and Vorndam (2002) grouped barriers to the adoption of educational technology into three categories: time; integrated technology support, including hardware and finance; and perceived usefulness to education. Faculty time constraints--time to prepare and the time required to learn software and hardware applications-- inhibited faculty members the most. The second issue reported involved financial resources. The lack of funds correlated to a lack of support in hardware and other technical services which reduced access and negatively impacted classroom implementation. Finally, there were concerns that educational technology failed in its potential, and its usefulness was still at issue. Ebersole and Vorndam concluded that the barriers to classroom diffusion; time management and negative perceptions could be addressed through peer modeling, incentive programs and professional development. The mediation of the third barrier; fiscal constraints would be dependent on independent financial grants and increased institutional supports (Ebersole & Vorndam).

Jacobsen, Clifford and Friesen (2002) found many classroom teachers and faculty members lacked confidence in their own ability to think broadly with technology. Conventional models of professional development have not been overtly successful in support of educators to find ways to integrate technology for learning. Prevalent curriculum models and assessment agendas tended to stress course delivery and information transfer rather than authentic learning experience and knowledge creation. School districts look to new teachers to tighten the gap between technology presence and use in the classroom. Teachers must consider and plan and carefully infuse technology into classroom instruction (Jacobsen et al.).

The application of new tools into the classroom can be a challenge; computer applications and technology represent a continuing concern. The idea that some educators feel that they are unprepared or under-prepared to apply technology to its full benefit in classrooms is echoed though a multitude of studies. Teachers who are insecure with applications and operations are hesitant to exploit the educational potential that current technologies have been shown to offer.

The Classroom

Educational technologies can enhance learning for all students in a variety of academic environments (Oberlander & Talbert-Johnson, 2007). Children require an active engaged environment. They form their basis for formal learning and problem solving in the first few years of instruction. To understand

computers and work with technology is an important portion of a student's initial education (Lovely, 2001).

Students have become increasingly adapted to the digital world around them. The manner in which information and communication technologies are being used suggests that children today create understanding and knowledge in new and different ways. Students bring with them significant knowledge and abilities with technology and now have the opportunity to learn in ways different than those employed with previous generations. Educators are currently engaged in discourse on how to effectively incorporate new innovations into educational programs; however student's perspectives are absent from the discussion (Spires, Turner &Johnson, 2008).

Spires, Turner and Johnson (2008) were specifically interested student perceptions on what was needed to be engaged and to achieve in a school environment. The authors designed and conducted a survey of middle school students who were members of a statewide after school program. Questionnaires were divided into two separate surveys to reduce participant fatigue and establish reliability. A stratified random sample was taken from the total twelve-thousand participants. Four thousand sixth, seventh and eighth grade students were selected across gender, geographic region, race, family socioeconomic status, and grade level. The authors reported that eighty-five percent of these students scored at or above grade levels on state standardized math and reading exams; and sixty-nine percent qualified for free or reduced lunch programs (Spires et al.).

Spires et al. (2008) reported students use technology significantly more outside of school; digital media is an authentic integral part of their lives. As many as ninety-percent of students reported using some form of digital device or computer technology on a consistent basis in their personal lives However what is available to students inside schools by comparison is limited and restricted. The authors posited there was little relevance between student's actual technological usage for life in the twenty first century and what they were exposed to in schools. Students expressed the desire to have more technologies in school to engage with; however teachers failed to understand the significance of technology to student's engagement. This study found students acquired most of the basic computer skills through school applications; word processing, page formats, file access and management and limited spread sheet applications. The authors further stated that students considered these basic skills as important to academic productivity, and future job preparation. The authors found that the technology needs of the high frequency users had not been met; these students wanted more creative and ubiquitous use in schools. When asked about research; Spires et al. stated students were more likely to access the Internet than to seek out a text books for information.

Spires et al. (2008) concluded students wanted schools to reflect the world they live in. Students wanted aesthetically designed schools, which incorporated modern technologic interfaces and allowed for more freedom of movement. Students wanted access to technology in schools which reflected their usage outside of schools; technologies which engaged their attention, and

inspired continued investigation. Students wanted more freedom with what technologies were available through schools; and how those tools are applied. Finally the authors stated that students wanted to bring their technology experiences as part of a social network outside of school into school to increase academic engagement. Students wanted authentic experiences in the classroom which reflect the lives they lead in the digital world. Input from student perspectives is an important aspect as educators designed agendas for the twenty-first century (Spires et al.).

A few of the limiting factors for this study were that the statewide survey targeted a specific group of children; it really can't be generalized; focus groups were based on individuals who were interested in technology. Because of the age of the participants (11, 12 , and 13 years) and their desire to please the researchers answers could reflect what the students thought the researchers were looking for (referred to as the Hawthorne effect).

Student interaction with digital media and information technology in their experiences outside the classroom surpasses their usage inside the classroom. Spires et al.'s (2008) research showed that students are actively engaged with current technology and are interested in the expansion of technology in schools and the classroom to foster an engaged atmosphere and enhance their educational experiences. Research which offers student opinion on what makes compelling education should be considered when defining educational policies and practices in the classroom. The Main Learning Technology Initiative (MLTI) was established in 2001as a means to provide technological innovation to

classrooms. In the fall of 2002 more than seventeen thousand seventh graders and their teachers in two hundred and forty three middle schools across the state were furnished with lap top computers. Each system contained word processing software, Internet browser, e-mail/bulletin board software and a reference book software package. Individual districts were left to design and implement policies on acceptable use, insurance, and inclusion of any additional software programs. Part of the states' initiative was to renovate each school which participated for wireless Internet access, as well as provision for limited professional development opportunities (Garthwait & Weller, 2005).

Given the ubiquitous nature of the technology in these schools, Garthwait and Weller (2005) examined how the introduction of one-to-one computing affected the instruction and planning of two teachers. Specifically the researchers sought to identify facilitators and barriers for teachers who had laptops in the classroom. The authors stated that teacher's integration of computer technology in their teaching was based on a variety of factors which included; access to properly functioning technology, professional development, and professional commitment-the educators readiness to work beyond weekly contractual agreements (Garthwait & Weller, 2005, Vannatta & Fordham, 2004).

Over a period of seven months the Garthwait and Weller (2005) conducted a case study of two middle school math/science teachers- one male and one female- in a small rural school. The authors collected data through transcripted interviews, classroom observation and documentation; e-mail, teacher generated handouts, and Web pages. The studies validity was

addressed in two ways; triangulation of data through multiple gathering techniques, and what the authors called methodological integrity; the participants authenticated preliminary findings.

Garthwait and Weller (2005) found that at the end of the first year of the MLTI program both teachers held a optimistic image of the educational potential for laptops in the classroom. Both felt that the technology engaged and motivated their students to learn. Computers fostered greater independent thought and action for students; even students who had disengaged from the classroom community. However, from the start of the year to the end of the year there were large differences in the time devoted to laptop integration in the classroom. Some of these differences were attributed to the instructor's philosophy of education. The extent of their professional development for technology expansion and usage was shown to have strongly impacted their classroom planning and integration.

Garthwait and Weller (2005) found that student skill development was unequal; content time had to be redirected for technical instruction as students were shown how to access information through the server. Instructors lost core instructional time to addressing technical issues, as well as school district policies. The district required students to complete unfinished work for the day at home in the evening; however school guidelines for home usage of laptops were not in place until half way through the year; this disparity negatively impacted the scope of projects and assignments. Garthwait and Weller found that there were issues of equipment safety and responsibility as well; several parents rejected

laptops at home for their children which further negatively impacted the instructor's ability and inclination to plan for and integrate laptops into their programs. One instructor felt that the time that was required to research and implement appropriate activities was disproportionate to the advantages of one to one usage (Garthwait & Weller). The author's research indicated that access to technology did not automatically shift instructional styles from teacher centered to student centered pedagogy. Educator's attitudes on best practices, as well as professional development and experience with technology strongly influenced classroom integration (Garthwait & Weller).

There are multiple limits to this study; research focused on only two teachers with such a small group the results would not necessarily generalize to the populations as a whole. While the study did focus on the teachers there was no student input on classroom impact. Another contributing limitation would be that both teachers were in support of the project; but there was a large difference in the educational professional development of the instructors; one had a Masters in Instructional Technology while the other had one postgraduate course on Technology for math teachers. Parental limitations factor in here as well; Teachers are hampered by parents who reject technology for a variety of reasons; equality of usage can be impacted by internal factors as well.

Technology is ubiquitous; students have come to expect some form of technology in their schools and curriculum. Schools nationwide have been shown to have access to internet technologies; however adequate access to computers and teacher preparation remains an issue. The question of laptops in

the hands of each student, and the positive and negative aspects of such policies becomes a viable question when examining the issue of technology and it application in the classroom.

Teachers possess many skills that they use daily in the process of student education. Clark (2000) posited that for teachers to use computers as essential tools in instruction educators needed to change the concept of a teacher's role in the classroom. Traditional educational programs had teachers as the only source of information and order. The author went on to say that when information technology was introduced the role of the teacher changed; from independent source for information to facilitator of the information. The failure of new technologies in the classroom was related to the teacher's inability to adapt new innovations to his or her teaching style. The growth of technology as an instructional tool was dependant on teacher's attitudes about technology and the ability to effectively use it for instruction (Clark).

In this study Clark (2000) investigated teachers' perspectives of instructional technology, their knowledge of the innovations, their feelings on the support structures associated with the equipment, and whether the technologies introduced alignment with educational goals and objectives. Sixty six teachers in a large, economically disadvantaged urban middle school were surveyed through volunteer basis, the researcher ultimately received a forty two percent response rate (n = 28). Respondents ranged from 24 to 61 years of age and had between 1 and 30 years classroom experience; all had achieved bachelor's degrees, and

a few had achieved post graduate degrees. Respondents represented a cultural cross section which reflected the multicultural composition of the school.

Clark (2000) collected data, coded and correlated it to four focal categories. The study's validity and triangulation were addressed through a matrix designed to compare coded information with that of other studies related to teacher's attitudes on technology.

Clark (2000) found that the majority of respondents felt proficient in the use of technology in the classroom. All the respondents had access to computers in the classroom, and seventy five percent had computers at home. Only 29% percent of the respondents indicated the need for more general professional development. However male respondents were less likely to see the need for more professional development. Conversely 69% of respondents felt that subject specific technology training was required. Clark found 82% of teachers indicated that they used technology in instructional circumstances. Instructors used the technology as a tool to engage students, as well as to help manage individual academic instructional level.

Clark (2000) found that technology was extremely useful for routine administrative tasks; 64% of teachers used the electronic grade books, while 49% of teachers used electronic lesson plans. Teachers indicated that these two tools were assets and were implemented frequently to attend administrative chores. However the usefulness of technology in the classroom was not solely predicated on the number of routine tasks which could be performed; student's needs must be addressed. Clark found that while teachers had access to

computers there needed to be more continuity between computers and programs in the classroom. And students required more computer time.

Clark (2000) concluded that middle school teachers felt that technology was an integral part of the process of student education; and these educators felt confident in their ability to use technology. Research indicated some educators saw the need for greater professional development opportunities; however more emphasis was needed on subject specific development opportunities.

Legislative mandates such as the No Child Left Behind Act (NCLB) increased the demand for school districts to provide every child access to high quality education in order to close the achievement gap. Subsequent legislative mandates sought to leverage the power of technology across kindergarten through twelfth education in ways which positively impacted the quality of instruction and learning. Regardless of the ambitious objective, students who came from low socioeconomic or minority backgrounds often suffered from lack of access to technology and poor utilization of innovation. In response to the disproportion several school districts in the United States committed to laptop technology programs as a means to improve access to digital resource, improve educational opportunities and prepare students for participation in the twenty first century workforce (Mouza, 2008).

Mouza's (2008) study investigated the ways that laptop computers were implemented into two primary grade classrooms in a predominantly low-income minority school. The study examined the impact of technology integration on student educational experiences as compared to classrooms where one-to-one

laptops had not been employed. Mouza posited that the implementation of laptop computers in predominantly low-income and minority schools had the potential to bridge the digital and instructive divide and support students with enriched educational opportunities both inside and outside of school (Mouza).

This research was conducted over the 2002-2003 academic school year. Four classrooms in a large urban school district were chosen. One third grade classroom and one fourth grade classroom with 22 and 28 students respectively, employed a one to one laptop program were compared with similar classrooms which did not have one-to-one computers for each student. The classrooms without ubiquitous computer usage had two computers available; the typical number found in the rest of the school. The classrooms studied were similar in size, as well as the standardized achievement scores for each student-all students met or exceeded standards for language arts, and math skills. All four of the teachers had a bachelors and masters degree within the field of education, and all of the instructors had participated in a yearlong research-based professional development program on the use of technology. Qualitative and quantitative data from both sets of classrooms was collected throughout the academic school year; data sources included a series classroom observation, teacher transcripted interviews, and student questionnaires, generated through student focus groups (Mouza, 2008).

Mouza (2008 completed an analysis of each individual teacher and compared the data with those of the other teachers to identify similarities and differences among comparison teachers. A total of 100 students completed the

student questionnaires in April and May of 2003. All surveys were fully completed by participating student focus groups; and yielded usable data. The author used classroom artifacts, teacher's interviews and observations as well as excerpts from student focus groups to triangulate data and establish validity.

Mouza (2008) found the use of technology created meaningful learning activities which engaged students in complex authentic tasks across subject areas. The technology was used as a part of an instructional model which emphasized the construction of knowledge founded on project-based instruction. To accommodate the use of technology in the classroom instructors designed blocks of time for students to work on projects which integrated laptop use; as part of the process teachers implemented greater peer collaboration and cooperative work to encourage exploration through the use of technology. The author stated that in the process students were forced to explain or defend their ideas and thus developed a better conceptual understanding of the issues before them. Students from the comparison classrooms were found to have limited engagement collaboratively with peers, and looked to the teacher as the main source of information in the classroom (Mouza).

Mouza (2008) also found that computer use in the other classrooms to be limited. Data revealed that comparison teachers used technology for mundane instructional tasks; word processing and limited Internet research. Further, she found computers were at times used as a classroom management device. Students, who failed to complete assigned tasks or were uncooperative, were occasionally restricted from computer time. On the other hand some students

were rewarded with computer time for completion of classroom tasks or exceptional performance. Teachers reported limited access to hardware, software, technical and instructional support were key factors which inhibited greater classroom use. Mouza found that the use of computers for word processing and Internet research in comparison classrooms did not alter the instructional practices of the teacher or the nature of the classroom environment and instructors were unable to observe clear benefits to their students.

Findings from student focus groups indicated that all students perceived computers to be important tools; computers served as an information resource, the skills were integral to future employment and the technology assisted in the learning process. Mouza (2008) found that laptop students emphasized the importance of using computers for collaboration, exploration and learning, while the comparison students placed more emphasis on the advantages of computer use as an information resource or for gainful employment. Mouza found both sets of students; those with a laptop and those with out were enthusiastic about computer use for games, Web surfing, or access to music files. However those students who had access to laptops went further in exploration of the technology. These students spent time at home for increased personal proficiencies; learning applications and skill to use and share with classmates and instructors. Mouza found that all students preferred word-processing documents rather than hand written documents. Handwritten documents were time consuming and were labor intensive; computers made it easier to identify mistakes in spelling and grammar,

and produced neat, easily read products that students were more readily willing to share with teachers and peers.

Mouza (2008) concluded that low-income minority students rarely have opportunities to work on computers extended periods of time to improve their academic achievements. The use of laptops improved student motivation and positively impacted classroom interaction through increased peer-peer and teacher-student collaboration. Ubiquitous technology in the classroom provided academic gains in both writing and mathematics. Software applications allowed students greater awareness of the mechanics of writing. Word processing facilitated real time feedback and editing; subsequently students were more willing to rework and complete written assignments. Extensive use of spreadsheets and mathematics software reinforced student understanding of mathematical concepts which fostered an appreciation for math as students enhanced knowledge of data manipulation and analysis. The author stated that through laptop programs historically underserved student populations have access to more challenging curricula and activities which emphasized problem solving and critical thinking. In the hands of well prepared instructors outcomes can enhance the effectiveness of one-to-one programs and provide students with enriched, authentic learning experiences and skills, which helped to ensure equality of digital opportunities among less advantaged students (Mouza).

Contributing limitations included; this survey is conducted in a single school. The majority of students were from low-income minority homes with limited access to technology at home. Therefore the results of this study may not

represent a larger population with a broader demographic characteristic and greater access to technology at home. Neither teachers nor students were randomly selected; the laptop teachers had demonstrated their commitment to one-to-one integration. Students represented a homogeneous population of students who had met or exceeded standards for math and language arts.

Lin (2006) affirmed that research over the last ten years indicated that many pre-service teachers were not adequately prepared in the use of educational technology. While some had personal competency with computer use they were still unprepared to effectively integrate technology into their educational instruction. The author posited two hypothesis; pre-service teachers who receive web-based instruction on mathematics instruction have a more positive attitude toward technological integration than those who do not receive specific instruction, and there is a positive correlate between competency with technology and attitudes on instructional integration. The difference in attitudes and effective pre-service education are crucial to technology and integration for classrooms (Lin).

In a study of a pre-service elementary program Lin (2006) investigated the effects of web-based mathematical instruction as it related to pre-service teachers competencies in computer and Internet usage, and their attitudes toward computer usage and Internet resources in mathematics instruction. Ninety-seven students were enrolled in a mathematics methods course which offered lesson development which was inquiry-based, purposeful, offered authentic learning experiences that were appropriate for elementary level

mathematics instruction. These pre-service students were divided into two groups; one control group of 50 students and the treatment group of 47 students. The researcher designed two questionnaires each utilized a Likert-type scale, one which assessed the attitudes of the students and the other the competencies of the students. Lin administered the questionnaires at the end of instructional periods, over a five week period to both the control and the experiment groups. The researcher gave instructions to the experimental group on web-based technology as well as web sites to research, critique and align mini-lessons to. Lin provided the control group the course lectures, and materials but were not exposed to information technology research and implementation.

Lin (2008) found that technology instruction aided pre-service teachers to be less apprehensive, and increased confidence on using information technology resources in mathematics education. Specifically students in the experimental group felt they had greater confidence with less anxiety about mathematics instruction with computers and the Internet. The author found a positive correlate between student's attitudes and the confidence they felt when implementing computers and Internet resources in elementary mathematics. Lin concluded that the implementation of technology increased academic achievement for students in mathematics. That work-shops and instruction on web-based inquiry foster greater implementation of computer technology in the classroom, and programs and faculties which are responsible for the education of pre-service teachers should encourage the integration of computers and information

technology into classrooms as an effective tool for elementary mathematics education (Lin).

Lin's (2008) study was limited in scope of what information was accessed and used. Data for web-search was limited to geometry and data analysis. Participants were from one institution, one program, and only one instrument was implemented. The surveys were administered over a short amount of time (five-weeks) as opposed to an academic semester or year. The student number (n = 97) is relatively small, a larger number would allow for greater generalization to the population as a whole.

Although computers are commonplace in daily life, integration in schools is less ordinary. While access and preparation are diminished barriers, teachers have yet to consistently embed computers into their pedagogy (Park & Ertmer, 2007). Park and Ertmer reported eighty percent of teachers used computers primarily for e-mail, thirty-five percent of educators used computers for student individual enrichment, and only five percent used computer technology to facilitate student to student interaction. Barriers to technological integration of classrooms are intrinsic and extrinsic to educators. Limited access to hardware and software, lack of developmental opportunities and limited technical support were shown to be among the extrinsic factors which precluded classroom use. Personal comfort, preferred instructional methods, willingness to make changes in classroom practices, and personal belief in the value of technology as a teaching tool were the intrinsic factors that prevented teachers from classroom integration of technology (Park & Ertmer). These researchers sought to examine

whether the use of problem-based learning (PBL) would impact teachers intrinsic barriers to technology use.

In a study of forty-eight teachers enrolled in a one credit course on technology in education, Park and Ertmer (2007) implemented a quasi-experimental research design which used pre- and post surveys and lesson plans to investigate the impact PBL had on educator's beliefs of technology use. The experiment group (n = 28) was exposed to two digital interviews via the Web in which school administrators explained the districts vision for education and the attributes that they sought in new instructors. The problem presented became "What did it take to be a successful teacher who integrated technology into the classroom?" (p. 249) Researchers formed small collaborative groups of two or three within the experimental group to produce a series of lesson plans which addressed specific issues such as; goals, targeted learners, assessment methods, and resources. Each collaborative group also created artifacts in their content areas that related to skills, knowledge and attitudes required to be a technology using teacher. Groups prepared lesson plans which were then compared over the course of the semester to examine how teacher's intentions to use technology changed over time. The participants in the control group (n = 20) reviewed different multimedia programs used in kindergarten through twelfth grade curriculum and evaluated them with a software evaluation from, not based on PBL. The class instructor delivered the course content and two lesson plan projects using Web resources were completed by each individual. Each

small collaborative group completed one digital video development project, with in the control group.

Park and Ertmer (2007) used data from the pre and post surveys to investigate the impact of PBL in regard to technology use. The researchers examined teacher's beliefs (n = 48)via a 54 item survey using a seven point Likert scale which correlated to the intrinsic factors listed above. The researchers analyzed pre and post course lesson plans against a developed rubric and multiple analyses of variance(MANOVA (7, 38)= 3.5, p= .0054, ^ sup 2 ^ = 36) to determine the overall impact PBL had on intended teaching practices.

Park and Ertmer, (2007) found that overall there were no significant differences between the two groups when it came to teachers pedagogical beliefs on technology integration in the classroom, or the perceived value of computers for instructional purposes. However, lesson plans from the PBL group (n = 28) showed larger movement from a teacher-centered instructional approach to a student centered instructional approach than the control group (n = 20). Results revealed that PBL participants described student's roles in relation to classroom participation and engagement in a more student-centered way following the PBL treatment. Park and Ertmer also found that over the period of the study the PBL group organized a greater variety of tasks, implemented more student collaborative assignments, and increased technology usage for student learning..

Park and Ertmer, (2007) concluded that when teachers actively participated in the PBL process, instructional methodologies shifted from a

teacher-centered approach to a student centered approach. Problem based learning offered teachers the opportunity to examine their pedagogical beliefs about students and technology in the classroom. Changes in beliefs followed rather than preceded teachers instructional practices; by helping teachers adopt new practices which were successful, the beliefs which were associated with those practices may have also changed.

Limitations: Because of the small size (n = 48) and the fact the teachers were taking a course in technology implementation it may not generalize to the population. The comparison of data, Lesson plans and surveys.

Integration of technology tools into the classroom curriculum has become an inseparable part of good teaching. Park and Ertmer's research found that accomplished technology using educators not only spent significant personal time working with computers bur had more extensive computer education and teaching experience, as well as high levels of innovation and efficacy with technology. Teachers who felt they could apply the technology to address individual student needs and were more willing to shift the educational focus toward activities that were student-centered. Pierson (2001) stated that in general these professionals were part of an educational team which used computers for meaningful activities and enjoyed greater district supports for technology use..

Pierson's (2001) research was based on case studies of three in-service educators who represented different teaching abilities and technology use abilities. Pierson constructed a framework that loosely intersected levels of

teaching expertise with levels of technical ability to provide a basic relationship between educational skill and technological capability. Pierson collected data through interviews, observation and teacher generated artifacts over the academic school year. Field notes of observations were transcribed post observation, this information along with the teacher generated artifacts and interviews was analyzed and correlated into related categories. Participants also provided reviews of material in order to validate representational data.

Pierson (2001) found that technology use was determined by the teacher's personal definitions of technology integration. Each individual instructor held a different conceptual framework for what technology integration was, which directly reflected personal efficacy with technology use and integration. Data collected on the teachers in this study revealed a relationship between the ways they managed and monitored student's use of and access to computers and their individual definitions of technology integration. He posited that instructors altered planning for technology use in instruction based on confidence levels in educational capabilities and technological proficiencies. He further stated that the methods teachers employed to teach with and about technology reflected the individual instructors own best learning strategies. Subsequently technology remained a separate activity with regards to management planning and assessment and was not connected in an academically sound way to other learning opportunities.

Pierson (2001) concluded that schools did not simply need teachers who know how to use a computer; classroom integration is more than having the

technology in the classroom and turning it on. Unless a teacher viewed technology use as an integral part of the learning process it remained an ancillary part of students' instruction. True integration could only be accomplished when viewed as the intersection of multiple pedagogies. Necessity dictated that teachers look beyond more technological investments, to focus efforts on establishment of classroom environments which are conducive to a student-driven learning environment. Educators should be encouraged to make conscious decisions to alter established curriculum; based on professional judgments which guide student choices in learning activities and promote various collaborative designs.

Limitations: Very small (n = 3) study. Because of the case study approach based on observations the data is empirical more interpretive in nature and lacks statistical reliability.

At a time of nationwide emphasis on school improvement, the role of educational technology continues as a topic of debate in schools, school districts and at the state level. Initiation of one-to-one laptop programs increased in frequency in K-12 schools in the United States and overseas. Many schools nationwide are now in the process of implementing projects that place laptop computers in the hands of each student and teacher. However, research has shown that successful implementation of new modalities is dependent on the concerns of the individuals responsible for classroom innovation; the teachers (Donovan, Hartley, & Strudler, 2007).

Donovan et al. (2007) reported that research over the last five years found that, among other things, technology enhanced student achievement; however strategies which measured and improved technology integration were irregular. Nonetheless the impact of technology was greatest when integrated into a curriculum that contained measurable objectives. The authors postulated that the introduction of computers into the educational experience was a mechanism for educational change toward a modern instructional environment. In response the authors chose to examine one-to-one computer access in a middle school setting from the perspective of the teacher.

The purpose of this study was to ascertain teacher's apprehension during the introduction of a one-to-one computer imitative in a middle school setting. The school, located in the Southwestern United States was part of a federal grant program. The GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) provided funding for a one-to-one initiative; which included dollars for teacher professional development. The school's population was considered at risk in that eighty-four percent of the students qualified for free or reduced lunch programs and a fifty-five percent of the student population was English language learners. Participants in the study were all volunteer; seventeen (n = 17) seventh grade teachers- who taught core subjects and were part of the GEAR UP project. The Concerns-Based Adoption Model (CBAM) provided a research-supported framework for valid reliable data collection. The authors found that The Stages of Concern (SoC), dimension of the CBAM was most relevant to the study. The SoC utilized three data collection tools to identify

individual and group concerns about innovation. Researchers identified concerns through open-ended statements, informal interviews and a SoC Questionnaire (SoCQ). Researchers collected data collection for the study in two stages; the first stage teachers were asked to complete SoCQ. The authors described the SoCQ as a combination of a Likert scale profile related to specific stages of individual concern and open ended questions designed to ascertain individual teacher's feelings at the start of the one-to-one initiative during the professional development and training phase of the program. Brief interviews with the teachers involved over a two month period provided the basis for the second stage of the study. Researchers analyzed and correlated through spreadsheet applications and the raw data was then analyzed correlated and converted to percentage scores.

Donovan et al. (2007) found that as a group teacher concerns were predominantly about the innovations' impact on them as individuals; apprehension centered on readiness for instruction in the one-to-one environment. However smaller percentages were concerned about technology utilization for maximum educational effectiveness. The study found that teachers were uncomfortable as they attempted to blend their traditional pedagogies with the requirements for education in a one-to-one situation. The authors posited that these teachers were uncomfortable with the prospect of adjustments to accessible practices and making educational accommodations. Researchers found through observations, that these educators were primarily using laptops for word processing and other teacher-centered activities. The authors found some

of the bigger concerns were in relation to preparation and maintenance of curricular goals and objectives. The authors reported that teachers who expressed management concerns in the interviews and open ended statements were observed to be those teachers who made the greatest efforts to incorporate the laptops into daily routines, lesson plans and student activities.

Donovan et al. (2007) concluded that in general participants concerns were largely personal in nature. In essence teachers whose classrooms were more traditional were being asked to adopt two advancements- the one-to-one computing environment, and a shift to a more student-centered classroom. The use of technology encouraged a more constructivist pedagogy, and teachers struggled with how to accommodate a teacher-centered classroom that is populated with student-centered tools.

Limitations: The school site was one of a very large school district that was part of a federal grant program, The student population was reported by teachers to be less motivated in general to use computers, in comparison to other seventh grade students. The number of participants was remarkably small and may not generalize to the population at large. The study examined teacher concerns during the initial implementation of a one-to-one initiative, and does not track concerns that may have changed over the course of the academic school year.

Rochelle, Pea, Headley, Gordin and Means (2002) postulated that technology supported learning in a variety of ways; the tools themselves encouraged rapid interaction and response. Students were able to access and

interpret information faster and received feedback more quickly. Computer tools engaged children individually or in small groups for extended periods; which allowed instructors the opportunity to provide individualized instruction to other members of the learning community. For some conditions, computers could be used to gather and analyze information on student progress and achievements (Rochelle et al.).

The authors purported technology improved on what children learned because it provided exposure to ideas and experiences which would be inaccessible for many children without it. Projects such as KidSat through NASA or the GLOBE program established by the federal government allowed children to link via the Internet to other students and scientists outside of the classroom (Rochelle et al., 2000). Social needs stimulated children's learning; shared intellectual activities were a powerful motivator and led to better education (Rochelle et al., 2000; Wertsch, 1985). The use of interactive technology allowed students to actively learn.

Lovely (2000) said technology in the classroom began with incremental steps. It was a progression which moved from teacher modeling, through proper usage of software and hardware; to student's assessment of programs, and collaborative partnerships which solved problems. Student use of technology needed to be based in routines that started small and work up to greater and greater challenges. (Lovely).

In many classrooms however, computers were used as an activity when the primary learning objectives were met, systems used for math drills and

vocabulary exercises; Internet resources were underutilized. (Bergen, 2000; Lanahan, 2002). The Internet dominates current development of information and communication technology. In the field of education, the Internet is a valuable enhancement to classroom instruction (Nah, Guru, & Hain, 2000).

In the study on how educators in elementary and middle schools integrate classrooms Morris (2002) found that while educators used technology in their classrooms; videos, overhead projectors, or laser discs many found that the Internet motivated and captivated their students more. Significant factors which inhibited classroom infusion in this study, reflected issues reported in other research. Lack of professional development and socioeconomic hardships in rural and intercity districts impacted the school's abilities to provide current technologies. Teachers reported that distribution of hardware was inequitable and subsequently uncomplicated access was difficult. There were times when multiple instructors needed equipment for classroom use. Obligatory flexibility wasn't always easy to accommodate, and did not facilitate integration of technology into a curriculum on a regular basis (Morris, 2002).

Nevertheless Morris (2002) found that teachers were likely to integrate computers into their instructional plans when computers and software were available in the classroom. Students responded to instruction with greater interest and increased computer time promoted increased student achievement. Teachers reported that their computer use for Kindergarten and first grade were somewhat rudimentary-limited to assisted learning software or videos which reinforced basic skills. In second grades teachers implemented keyboarding

software and experimented with limited Internet usage. Students were asked to find topics or images related to a specific letter of the alphabet; for example O for Olympics (Morris, 2002). As the grades advanced the complexity of requirements for students increased; fourth grade students accessed the Internet for math, science, and social studies sites which correlated with outlined instructional objectives. Sixth graders used the Internet and presentation software to produce and report on assigned research projects. Morris (2002) reported some teachers noted that the Internet contained a plethora of sites which seemed applicable to classroom usage, however without adequate time to review possible options it was difficult to find reliable relevant sites which supported content and objectives.

As with other studies Morris (2002) concluded that the lack of current technology in the classrooms negatively impacted integration into the curriculum in a systematic and sustainable way. Educators required professional development opportunities; teachers were interested in development and expansion of a repertoire which promoted learning, but it required time and collaboration to adequately organize and address issues (Morris).

Young (2004) reported that when asked about technological integration in the classroom students from across 300 college programs reported some dissatisfaction. Students complained instructors' mismanaged limited class time when they spent time troubleshooting equipment. Students criticized instructors for over reliance on presentation software; a kind of PowerPoint abuse. Young stated good presentations increased communication between students and

instructors; it organized and clarified lectures. However students reported some teachers simply posted class notes into PowerPoint slides and read from the screen, and offered no other insights which resulted in student's disengagement from the class. Another criticism related to the perception that instructors tacked on or added tech components as a course afterthought. Online discussions forums required as part of course work, went unmonitored by instructors or were never incorporated into classroom discussions. As a result many students viewed it as busy work, and student's participation in electronic forums was limited or incomplete. Young (2004) concluded that the majority of students felt that technology was a positive factor in education. When managed properly it provided increased communication and instruction which benefited students. But for technologies to fulfill their educational promise faculty professional development was required. Teachers needed to investigate the proper usage and implementation of technologies and develop their courses accordingly.

In an article on integrated curriculum, Satchwell and Loepp (2002) defined an intradisciplinary curriculum is one that focuses on the integration of different content areas within one discipline; for example a science program which integrates physics with chemistry. While interdisciplinary curriculum was described as one that focused on content within one field, the authors went on to characterize and integrated curriculum as one which assimilates concepts from more than one discipline. Satchwell and Loepp designed and constructed a standards based integrated mathematics, science and technology (IMaST) program for implementation in middle school curriculum.

In a case study of 539 students from eight urban middle schools the authors sought to identify some of the benefits and barriers as applied their designed integrated curriculum IMaST. Researchers divided middle school students. into sub-groups; two hundred and ninety-three students (n=293) were engaged in the IMaST, while two hundred and forty-six students (n=246) represented the control group in a classrooms which utilized a standard curriculum.

Stachwell and Loepp (2002) found that the treatment group engaged in the IMAsT program scored somewhat higher on mathematics and science tests than those students in the traditional curriculum classroom. The authors reported that across standardized mathematics and science tests specifically Third International Mathematics and Science Study (TIMSS) the students engaged in the IMAsT averaged 1.4 points higher than the students in the non-integrated classrooms. For example; students in the IMAsT group scored 17.72 to the control groups 16.32 on the TIMSS mathematics procedures sub-test. On the knowing science sub section of the test, IMaST students scored 17.31 to the 16.39 for traditional classrooms. While these score differences appeared minimal they represented a consistent higher achievement scores by students evolved in an integrated classroom (Satchwell & Loepp, 2002).

Satchwell and Loepp (2002) noted that teacher attitudes had a significant impact on the implementation of the IMaST curriculum. Some educators were enthusiastic about integrated education programs while others were resistant to the change in curriculum. In addition the authors found that schools which faced

academic challenges; probation or declining test scores showed reluctance to implement an integrated program. However, the authors maintained that students engaged in participatory integrated activities do score better than those students engaged in more traditional educational programs

Satchwell and Loepp (2002) concluded that development of any standards based integrated curriculum was difficult. Educators must consider on only one educational standard but multiple standards of achievement which must then be conjoined. Since few professionals have the background to use more than one set of standards the development process required cooperation between each discipline represented. Educators must be prepared to work together collaboratively to develop and implement an effective program. The authors also noted that many schools did not have enough access to technology for all students to have a sustained experience at each grade level. In order for students to progress it was essential for teachers to provide the required technological support. Nevertheless, the authors pointed to the benefits of students collaboration across content areas to construct greater functional relationship between content areas; which resulted in some increase in achievement scores.

Some of the limitations of Stachwell and Loepp's (2002) study was the lack of statistical analysis of the study. Limited information was provided on the methods and explanations of data analysis. The researchers had a vested interest in the outcome of this study; having been the major force behind the

design, construction and implementation of the IMaST curriculum, a curriculum which was published for commercial educational consumption.

Conclusion

Across the nation, the student population in kindergarten through twelfth grade is increasing (Yoders, 2006). One objective of education is to provide technologically current, ergonomic, sustainable environments for children to learn. Bring the innovation into the classroom, and provide the teachers and students the tools to access and use the technology to their own best advantage. Student's ability to use technology effectively enhances their educational experience, and is an important skill to attain as we shift from a industrial society to an informational society (PITAC, 2000).

Within a technological society, technological literacy is a necessary skill students and teachers alike to have to fully participate in a global community. Technology literacy is an understanding of what technology is, how hardware and software work, and how these tools can be effectively, successfully applied. Technological literacy for students engendered questions of national standards. Advocates for a national curriculum said that the lack of standards was hampering educational progress. Application of national criteria for technology would tighten the gap which existed between school systems definitions of techno-literacy. Unity of literacy standards would ensure a techno-literate population and produce national progress in global market economy. Student knowledge of computers and other technology is significantly impacted by their socioeconomic status. Opponents argued that the national bureaucracy was too inflexible to effectively administer programs which addressed issues which were as fluid as technology, and technology literacy. Other opposition stated related to

content and content control. If the federal government could successfully implement and support a national curriculum, which department would control the content conveyed through a national program. Given the nature of politics and administrations to it is conceivably groups which controlled political and/or financial interests could in fact direct educational content. Educational content should not be directed by those who champion specific ideas, only to have the ideas change as administrations change.

Since early in this century, various new educational technologies have been adopted and integrated into the curriculum with varied degrees of success (Baltaci-Goktalay & Ocak, 2006). Computers and Internet technologies have been integrated into school districts with varied degrees of success. Disparities were found between those with access and ability to use technology and information and those who lacked skills and ability to access those same innovations. The digital divide is a term used to describe the disparity between those who have access to technological innovation and those who do not. Reported income level is a determining factor in computer and Internet access. Families with higher incomes were found more likely to own a computer and be connected to the Internet. Similarly economically depressed rural and inner city communities lacked the same level of access to technologies as the largely white, middle-class America. One of the most significant factors which affects student's access to and usage of technologies is economic (Pearson, 2001).

The National Telecommunications and Information Administration (NTIA) issued a report which stated that the national digital divide had reduced. Greater

numbers of households had acquired computers or other devices which accessed Internet connections. The report stated that minority households had shown gains on the national average for computer ownership and internet access at home. However, homes with different ethnic and racial backgrounds had unequal rates of computer ownership originally. Large gaps for Blacks and Hispanic remained and increased when measured against current increased national averages. Students who are socioeconomically disadvantaged will have greater difficulty attaining quality education; lack of adequate exposure to available technology impacts what they bring to the classroom (Alcorn, 1986).

School districts across the nation have scrambled to renovate and accommodate innovations in technology .The country is faced with an aging infrastructure of school buildings that are forty to sixty years old and are ill equipped to deal with the technological needs of the twenty-first century. However with costs which could reach into millions of dollars, smaller school districts and rural schools which face constant budget shortfalls and increased costs of education could view the investments required as inaccessible (Yoders, 2006). Nevertheless, the National Center for Educational Statistics (NCES) reported that as of the fall of 2005 nearly 100 percent of public schools in the United States had at least one instructional room with access to the Internet, as compared to 35% of schools which had instructional rooms with Internet access in 1994 (NCES). While school's reported being connected there were still disparities-sometimes large disparities-in the number of students and the numbers of computers available at schools.

School systems are actively purchasing and implementing hardware and software packages into their daily routines. There were however, a number of barriers which existed between acquisition and effective implementation. Indicators showed that there were factors which negatively impacted classroom integration. Professional development opportunities for student-teachers and professionals in the field were deficient. Socioeconomic hardships in rural and intercity districts impacted the school's abilities to provide current technologies and classroom integration. Distribution of hardware was at times inequitable and subsequently easy access was problematic. Nevertheless educators were likely to integrate computers into their instructional plans when computers and software were available in the classroom. They found students responded to instruction with greater interest and enthusiasm; and increased computer time expanded student achievement.

This generation of students represents the first to grow up surrounded by digital media (Crawford, 2007). The computer has always been in their lives; they feel more comfortable with computers than most of their parents and teachers (Bruce, 2001). They play, learn, and create with computers on a regular basis. These students are a cohort of information seekers; their access to the mass amounts of information presented on the Internet allows them to deal with information, to help form and shape their own education. It is essential to understand that the use of technology in the classroom is more than application of tools. Educators and schools must consider the process of how students learn, and the impact on concepts for how they are taught.

CHAPTER FOUR: RECCOMENDATIONS

Introduction

Computer technology has had a profound effect on education and the economy of the United States.(U.S). The changes have brought societal transformations as significant as the Industrial revolution. In general the public agrees that for children to fully participate in this new society they require a certain level of computer competence (Shields & Behrman, 2007).

As a result, increased numbers of parents and caregivers have provided access to computers at home. (NCES, 2005). Schools have established digital connections and attempted to provide equitable access for student populations. However there are factors which have inhibited the infusion of technology into schools and classrooms; inequitable distribution of hardware and software, lack of professional development opportunities, and ineffective classroom integration had negatively impacted implementation.

Technological Literacy

Technological literacy is an understanding of what technology is, how it works what function is can serve, how it can be used efficiently and effectively to achieve explicit goals (Johnson-Hummell et al., 2007). One of the goals of Title II part D of the No Child Left Behind Act of 2001 (NCLB) was to ensure that every student is technologically literate by the time they finished the eighth grade regardless of a variety of factors which included; race, socioeconomic status, familial status, or gender; however defining technologic literacy was left to each state (OSPI, 2005).

Technology is fluid emerging innovation and applications will continually change and influence education. Its integration and more importantly usage will impact the literacy of the students exposed to it. (Reed, 2007). Asking teachers to implement another component into already overcrowded curriculum is problematic. Many educators in the classroom felt themselves underprepared to fully integrate technology into their everyday practices, let alone design a curriculum module. The National Science Foundation (NSF), The National Science Teachers Association (NSTA) and The National Council of Teachers of Mathematics (NCTM) have published handbooks with information and resources for teachers which could be connected to curriculum development and technological literacy (Reed, 2007). Exposure, application and practice facilitate literacy; whether the subject is math, science or reading. Students with access to the hardware and software, instruction on language and usage, and time to explore some of the potential available to them with the aid of technologies will strengthen their skills and abilities moving them toward technological literacy (Natriello, 2001, Reed, 2007).

The Digital Divide

The digital divide as with many inequities, has its foundation in economic disadvantage. It describes the disparity between those individuals who have the skills and ability to access digital technology and those individuals who lack the skills and ability to access digital technology (Pearson, 2001). The rural poor, central urban poor, and single parent households were the least likely to be digitally connected (NTIA, 2000). Socioeconomic weakness is perhaps the most

significant factor which effects availability and access, for both individual homes and communities (NTIA, 2000).

In its report to the president, the President's Information Technology Advisory Committee (PITAC) outlined several suggestions for reduction of the digital divide in the United States. The report stated that community relevance and community involvement is significant to the process of reducing the divide (PITAC, 2000). The Internet is one of the cornerstones of the information age (Ribble et al., 2004). Underrepresented groups must be encouraged to adjust some belief systems in order to accept and use technology to obtain educational and economic parity (PITAC, 2000). Perhaps the single most effective governmental tool accessible to reduce the digital divide, is money.

The E-rate program, administered through the Federal Communications Commission oversees distribution of billions of dollars annually in subsidies to make telecommunication services, internal connections and Internet access available to schools and libraries at discounted rates (PITAC, 2000). The advisory committee's recommendations included expansion of grant programs like the Technology Opportunity Program (TOP) or Technology Challenge grants. The TOP program provided matching demonstration grants to state and local governments, school districts, libraries, public safety associations and other non-profit organizations-rural and urban-to aid with the development and service of information infrastructures. Technology Challenge grants distributed $300 million in matching grants for community partnerships with schools to expand inventive responses to the necessities of the Information Age. The committee also

recommended that the grants application process be streamlined for easier access, and that technical assistance be offered for swifter completion of application process. Other recommendations centered on greater opportunities for establishment of minority owned and run information-technology business and organizations, as well as provision for increased access and incentives to minority students in the fields of engineering and computer/information. This committee also stressed the need for continued research, data collection and evaluation in underserved areas. Community-based innovative thinking can help eliminate the divide. The nation cannot afford to continue with a two tiered society; one tier effectively applying information and technology and the other trapped by antiquated and less effective applications.

School Connections

The NCES reported that in the United States that 100% of schools have access to the Internet (Wells & Lewis, 2006). While the schools may have access to the Internet, the difficulty arises from schools lack the hardware and software to facilitate their students usage. Disparities between student population and technical supports hamper student access to the Internet (Wells & Lewis, 2006).

One to one laptop programs have been initiated with limited success across the United States (Donovan et al., 2007). School boards must decide on what the best allocation of educational dollars for students would be. However, many school districts are economically challenged and face underfunded

programs. These districts are ill-equipped to provide current text books let alone laptops to their student populations (Donovan et al., 2007).

Teacher Preparation

Jacobsen et al. (2002) found many classroom teachers and faculty members lack confidence in their own ability to think broadly with technology. Conventional models of professional development have not been overtly successful in support of educators to integrate technology for learning. Technology has the potential to provide the impetus, tools and new structures to transform the pedagogy of teaching (Johnson, Schwab & Foa, 1999) Schools have been shown to have access to computers and information technology; however teachers reported that limited preparation and lack of professional development have hampered integration into the classroom.

Ireh and Bell (2002) suggested that integration of technology into the nations classrooms began with teacher certification programs. Winston-Salem State University, North Carolina organized and instituted the Technology Infusion Program (TIP). This program was designed to enhance the use and integration of technologies in teacher education. It was intended to ensure the effective use of technology in the classroom, with integration across the curriculum. Student workshops focused what was termed a product-based approach. With this process students moved beyond the simple knowledge of how software applications worked, to produce and develop materials and resources which could directly enhance or improve classroom instruction .

Successful integration of technology into teacher education hinges on the willingness of faculty to move beyond rudimentary technologies which they are most comfortable with, and into the more complex multifaceted information technologies. Technology instruction must be about teaching with technology not about technology itself (Ireh & Bell, 2007).

Technology mentoring by faculty instructors and practicing teachers had a positive impact on student-teachers, who tended to integrate a higher degree of technology into their instruction when mentor teachers used technology more frequently while instructing (Negishi et al. 2003). A teacher may be comfortable with his or her own computer, however it does not mean he or she will integrate use of technology into the classroom (Kelty, 2002). Time management and negative perceptions could be addressed through peer modeling, incentive programs and professional development (Eberson & Vorndam, 2002). Morris (2002) found that many educators were willing to expand the range of techniques, but many felt that the need for greater information; districts needed to provide workshops on integration strategies. Professionals wanted an effective way to disperse available ides which promoted student learning, and the means to network with other educators in the field to share information, and strategies. In order to get teachers trained, the skills and attitude necessary for the meaningful application of computer technology in their classrooms are essential. Flexible curricula and increased effort on systematic preparation and instruction in curricular design and implementation are important (ChanLi, 2007)

Educators and pre-service teachers requireeducational opportunities to prepare for effective technology integration. School districts must afford professional development opportunities for educators which allow for instruction on how hardware and software applications can be fully utilized for instruction and education. Information must be explored and produced on effective curriculum development and implementation, and teachers must network with other educators from around the nation to organize resources and information on effective integration of technologies into classroom programs.

The Classroom

Rochelle et al. (2002) provided evidence that indicated that computer use is linked to better academic performance. They suggested that technology supported learning in a variety of ways; the tools themselves encouraged rapid interaction and response. Students were able to access and interpret information faster and received feedback more rapidly. Computer tools which engaged children singularly or in small group's allowed instructors the opportunity to provide individualized instruction to other members of the learning community..

The use of technology does not guarantee that learning will occur. However when used appropriately technology can connect teachers, students, and instructional knowledge in ways which enhance the experience (Dvorak & Buchanan, 2002). Information becomes available in a variety of ways; enabling a variety of learning styles.

Some theories of education state that to enhance learning more attention should be given to the active engagement of students in the learning process.

Curricular frameworks expect students to take an active role in information analysis, communication, and problem resolution (Rochelle et al., 2000). Forming collaborative partnerships with teachers and other students enhances student learning opportunities and enriches the educational experience (King, 2003). In a study of elementary school students and teachers. King found that the use of a WebQuest strategy provided an excellent means of engagement in inquiry-based educational process. WebQuests have been designed for all level of students from the early elementary student to the college student. The framework outlined utilized the Internet as the medium for information compilation; students constructed their inquiry on a variety of topics which aligned with teachers curriculum requirements. Students and teachers reported that as the project developed their apprehension over the use of the technology decreased and their appreciation of the technology increased. Students do not necessarily arrive in the classroom with a complete set of skills in place. Classroom instruction is required as a precursor to the usage of the computer as an instructional tool (King, 2003).

In a case study of thirty-seven freshman students Dvorak and Buchanan (2002) found that half of the students agreed or strongly agreed that the use of technology enhanced their ability to learn course materials. Students also reported that the collaborative process, while difficult at first, improved their overall performance on the course work. The technological augmentation and collaborative partnerships helped to create a positive educational environment (Dvorak & Buchanan, 2002).

For technology to be effective in the classroom it must be used in the classroom. Instructional strategies such as the WebQuest, facilitate an inquiry-based educational approach. Students and educators are afforded necessary educational time to increase skills and literacy; and to understand how these tools can aide in their own learning processes. Paired with collaborative partnerships, inquiry-based Internet projects provide a positive classroom strategy and the means to integrate information technology into classroom curriculums.

Recommendations for Further Research

Digital technology is an increased mainstay of life in the United States. The use of digital technologies has steadily increased over time nationwide, and school systems are under increased pressure to invest in and keep pace with technological advancements. In order to understand the impact and use of technology and the Internet in curriculums and classrooms, grater resource must be focused on continued research and investigation. Longitudinal research on teacher's professional development and positive integration into classroom curriculum would clarify strengths and weaknesses in a system which is under development. In addition, greater research is needed on one-to-one laptop/computer programs; with investigations which focus on the financial ramifications for school systems, as well as the educative drawback or benefits to student populations.

Conclusion

Technological innovation is not new in human history. The social, cultural and economic progress of the United States has been predicated on the advancements of technological innovation. Now at the start of the twenty-first century the technological innovation of the past fifty years has given rise to an Information age. A period when access to information; it's storage, retrieval, and analysis connects commerce, education, social and cultural progress.

Great hopes, and increased expectations for national production and trade have brought technological advancements into the classroom. Classrooms have moved beyond the schoolroom walls, as high speed communications and digital processing expand the educational scene. Today students are required to acquire the skills and abilities to access and use informational technology. These skills become increasingly important as the world moves from an industrial based economy to information based economy. However, the lack of national standards for technological literacy has impacted efforts to create a nationally literate student population. National standards which outline recommendations for literacy specifically technological literacy would also strengthen the drive for uniformity. Students with access to the hardware and software, instruction on language and usage, and time to explore the potential available to them through technologies will strengthen their skills and abilities moving them and the nation toward technological literacy.

Computers have become an integral part of life in the United States. However there is a gap between those who have access to computers and those

who do not. Despite the increase in homes with computers and access to the Internet, The digital divide is in fact widening; as socioeconomically disadvantaged homes and communities, as well as minority populations continue to lag behind White middle class Americans who are connected. Perhaps the single most effective tool accessible to reduce the digital divide, is money. Programs administered through the Federal government are designed to distribution of billions of dollars annually in subsidies to make telecommunication services, internal connections and Internet access available to schools and libraries. Grant programs like the Technology Opportunity Program (TOP) or Technology Challenge grants offer economic incentives for communities to connect. The TOP program provides matching demonstration grants to state and local governments, school districts, and other non-profit organizations-rural and urban-to aid with the development and service of information infrastructures. Technology Challenge grants distribute $300 million in matching grants for community partnerships with schools to expand inventive responses to the necessities of the Information Age. Greater opportunities must be provided for establishment of minority owned and run information-technology business and organizations. Colleges and universities must be encouraged to actively recruit and provide incentives for minority students in the fields of engineering and computer/information. The nation cannot afford to continue with a two tiered society; one tier efficiently applying information and technology and the other trapped by obsolete and less effective applications.

National statistics report that 100% of the nation's schools have access to the Internet; either in the classroom or in dedicated computer labs on campus. While this is an impressive statistic, the difficulty arises when considering the ratio of students to computers. Generally there is not a one to one correlation between students and computers in schools. While schools may have access, the student population does not. Student to hardware ratios must be reduced.

Limited numbers of school districts around the country are implementing a one to one laptop program. Students are furnished with a lap top for use both in the classroom and at home. This innovative approach while effective in addressing student computer ratios is expensive, and many school districts which face constant budget shortfalls are ill prepared to face such a financial burden.

Dr. Nicholas Negroponte (Latham & Zuniga, 2007), founder of the Media Lab at the Massachusetts Institute of Technology is a motivating force behind the One Lap Top Per Child initiative (OLPC). Negroponte, described this plan as an educational program that was designed to provide tough, reliable multimedia devices to children in developing countries. The aim was to provide educational resources, as well as a means to reduce the world wide digital divide. These small compact devices are designed to be used as lap top computers, electronic books, televisions, gaming machines, and wireless telephones.

With volume as the primary component to reduced production costs, Negroponte stated that these tools could be produced at an average startup cost of $135-$150/unit, which would by his estimate decrease over volume and time

to $50 by 2010. Negroponte's organization, OLPC planned to distribute these laptops, directly through governments and/or educational agencies free of charge, one laptop per child. The governments of China, India, Thailand, Egypt, Nigeria, Brazil, Rwanda and Argentina had all expressed interest and had established negotiations to implement this innovative program, for children in those countries. (Latham & Zuniga, 2007).

If it is possible to distribute one laptop per child at no charge to the children of Egypt or Brazil, is it impossible to initiate this program domestically, and distribute one laptop per child to the children of the United States? Because the OLPC has the means for production in operation, distribution through the Department of Education to school systems nationwide could, for the cost of a text book, put a lap top on the desk of every child in the nation. Access in the classroom would no longer be a question of whether or not the hardware was available for student use; but how can this tool be best applied to a broad based educational pedagogy.

Putting computers on the desks of students is only part of the requirement. Teachers must be prepared to integrate computer usage and informational technologies into the classroom curricula. Studies cited in chapter three of this paper showed that many educators lack confidence in their abilities to implement technological innovations in the classroom. Predictable models of professional development are not completely successful in support of educators to integrate technology in education. Ireh and Bell (2002) suggested that integration of technology into the nations classrooms began with teacher certification

programs. Programs specifically designed to enhance the use and integration of technologies in teacher education. Education course work which required students moved beyond how software applications work, to produce and develop materials and resources which directly enhance or improve classroom instruction.

Studies show mentoring by faculty instructors and practicing teachers have a positive impact on student-teachers. Student-teachers who had mentor instructors who integrated technology into instruction tended to integrate a higher degree of technology into their instruction. Morris (2002) found that many educators were willing to expand their range of techniques, but school districts needed to provide strategies for instruction and integration. Professionals want the means to effectively network with other educators to share information, and refine strategies.

Teachers require professional development opportunities to prepare for technology integration. School districts must establish professional development criteria which supports educators in the development of a technology based curriculum. Professional Development which provides instruction on implementation of hardware and software application and information on how these tools can be fully utilized for instruction and education. Information must be researched and organized on effective curriculum development and classroom implementation. Teachers must network with other's from around the nation to categorize resources and information on successful integration of technologies into classroom programs.

The use of technology in the classroom cannot guarantee that students will learn. Nevertheless when used appropriately technology can unite teachers, students, and instructional information in ways which augment the experience. Forming collaborative partnerships with teachers and other students enhances student learning opportunities. In chapter three, Webquest is described as a educational strategy which provides the means for students to use informational technology, the Internet to support inquiry-based educational processes. This educational approach, designed to be implemented across all grade bands, employs the Internet as the medium for data accumulation; students orchestrate their own inquiry which aligns with pre-determined curriculum requirements. Through implementation of the project, students and teachers found apprehension over the use of the technology decreased and appreciation of the technology increased. Students do not bring an inclusive set of technological skills to the classroom. Instruction is required in accessing and applying informational technology. Teachers must provide guidance on how to effectively research, compile and analyze data. Instruct students on what constitutes a reliable resource, is the information relevant to the search, and how to effectively communicate the findings to other individuals. For technology to be effective in the classroom it must be used in the classroom.. Students and educators require educational time to increase technological skills and technological literacy. Together with collaborative partnerships, inquiry-based internet projects provide a positive classroom strategy and the means to integrate information technology into classroom curriculums.

The partnership between education and technology weaves its way through history. Today educational pedagogy stands at a crossroads; where accepted time honored approaches to education; face to face delivery, direct instruction and student workbooks meet with Internet access, hardware and software applications and inquiry-based student-centered learning. As this nation moves further into the twenty-first century and the Information age; the world wide web, digital media, digital libraries, and other sources have provided students and teachers access to the worlds depot of knowledge. As a result student requirements for work with technology and its applications increase. Fostering changes in teaching and learning requires environmental, social and curricular support. Through active involvement educators have the opportunity to shape the changes which affect student populations nationwide, now and in the future.

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