THE CHALLENGES OF THE EMERGING USE OF TECHNOLOGY IN SCHOOLS: AN
ANALYSIS OF A SELECTED URBAN SCHOOL SYSTEM IN GEORGIA

by

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A DISSERTATION

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ABSTRACT

This study analyzed how technology leadership and technology integration impact technology literacy by analyzing technology scores of selected eighth grade students from selected Atlanta City Schools. Because levels of technology proficiency for eighth grade students is a mandated expectation at national and state levels, this study focused on the expectations and improvement aspects of technology literacy for students. The major purpose of this mixed methods study was to reflectively analyze and describe the technology initiatives undertaken by the selected schools and students under study.

The research design and approach were, in part, case study oriented but considered more descriptive in nature with quantitative analysis of data an essential aspect. A population of eight schools, 106 teachers, eight media specialists, and five technology specialists responded to surveys based on technology integration and/or technology leadership. Five years of standardized eighth grade technology literacy data along with qualitative and quantitative survey data provide findings that could prove useful for district and individual school analysis.

In addition to a summary and discussion of findings from the research, an action plan was created to further aid the district in improving teacher and student technology competence. Resources were identified and recommended for use as a means to continue academic achievement in the area of technology literacy for eighth grade students.
DEDICATION

This dissertation is dedicated to the stakeholders of Atlanta Public Schools. The instructional technology specialists, media specialists, teachers, and students were instrumental in completing this study. Their commitment and persistence exemplifies the definition of teamwork and dedication.

Additionally, I would like to dedicate this project to my family and friends who encouraged me and helped me throughout this process. The sacrifices that my family and I have made to see this project through were monumental. The patience that my family and friends have exhibited has not gone unnoticed. This dissertation is dedicated to all of you, for your time, consideration, and commitment.
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My wife and children were motivational figures for me as I endured this journey. I could not have made it to this point without the support of my wife and her understanding of my goal.
to finish the doctoral program. My children were also instrumental in this process. They encouraged me throughout the days, months, and years that it took me to finish the program.

I am the most thankful to my God, Jesus Christ. Thank you Lord for keeping me safe throughout my travels to and from school. I know that it is because of you that I am who I am, spiritually and mentally. I am in the position to create change in a positive manner. Thank you for blessing me and guiding me throughout this journey.
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Access to the Emerging Technologies

School Technology Leadership

Visionary Leadership

Digital-Age Learning Culture

Excellence in Professional Practice

Systemic Improvement

Digital Citizenship

Planning for Technology

Teachers and Educational Technology

Facilitate and Inspire Student Learning and Creativity

Design and Develop Digital-age Learning Experiences and Assessments

Model Digital-age Work and Learning

Promote and Model Digital Citizenship and Responsibility

Engage in Professional Growth and Leadership

Technology Integration

Literacy in America

Traditional Literacies

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Information Literacy

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CHAPTER 1
INTRODUCTION

School districts across the country have not historically had uniform or even systematic approaches to developing and advancing the emerging technologies administratively and instructionally within their systems and within individual schools (Picciano, 2002; Williamson & Redish, 2009). It was not until the late 1990’s that technology plans were even mandated as a part of the accreditation process. Over the years, systems have been somewhat at the mercy of political whim, competing technologies, and user limitations. As a result, clearly defined technology planning and related applications were seldom at the forefront of any strategic changes. The emerging technologies and their effective usage, have for the most part, only recently come into their own as viable teaching and learning tools for school and classroom use (EETT, 2001).

It was not until the end of President Bill Clinton’s first term that a national agenda for technology literacy was even on the drawing board (America’s Technology Literacy Challenge, 1996). Technology in the final years of the 20th Century was more specifically becoming thought of as a singular activity in the vast array of technological innovations such as computing and computer skills development. A national partnership of federal, state and private entities was forming that was attempting to put computers connected to the Internet, good software, and well-trained teachers in every classroom in America. Other nations and their governments’ were also taking similar steps to prepare their students for exposure to technology and technology literacy (Leu, Kinzer, Coiro, & Cammack, 2004).
The influx of technology equipment through government funding, and in recent years support from foundations, into public schools for educational technology purposes has created a platform for making decisions regarding technology (Nance, 2003). The No Child Left Behind (NCLB) Act of 2001 detailed the performance expectations for eighth grade students in regard to technology (U.S. Department of Education, 2006). The goal of the Enhancing Education through Technology Act (EETTA) of 2001, a component of NCLB, was to ensure 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. This goal provides the primary justification for the current study. This study serves as a data-based assessment of the status of an urban school system in the southeastern region of the United States in striving to meet this goal. Developing indications are that command of technological literacy as explored in this research effort may be equivalent, or possibly more important, than the command of the more traditional literacy areas.

The Enhancing Education through Technology Act (EETA, 2001) along with the technology standards (for teachers and administrators) emphasized the increasing importance of technology integration, technology education, and technology leadership in schools. Considering the fact that the emerging technologies are still not accepted norms to all educators within schooling, principals and other key stakeholders must respect, embrace and promote technology and its effective usage as called for by the recently updated National Educational Technology Standards for Administrators (NETS-A) (International Society for Technology in Education [ISTE], 2009).

The first standard in the NETS-A is visionary leadership. Within and throughout this standard, educational administrators are encouraged to be leaders of technology in their
respective school buildings by developing and implementing a shared vision that promotes technology integration and helps transform the teaching and learning cycle.

Educational administrators are the leaders of K-12 public schools in the United States. They will need to rise to the occasion as they have in dealing with past challenges that have come to the “schoolhouse door” from a technology leadership perspective, if success is to be obtained through system and school-level school technology initiatives. Without the appropriate leadership and decision making from the district level, technology may continue to go underutilized and serve little purpose in preparing students for the 21st century workforce. Without the appropriate leadership at the school level, technology may not be implemented and/or integrated into the curriculum appropriately to impact student learning and achievement. As implied throughout the Anderson and Dexter study (2005) which provides a point of departure for the current study, it seems to be less about the technology and access to it, but more about the leadership and the decisions made to impact the effective uses of technology in schools (Eren & Kurt, 2010).

For decades, the concept of leadership has been studied and categorized as a social practice aimed at gathering the support of others to accomplish a common goal or task (Gil, 2006). Leadership types, styles and theories have all been used to classify leaders and suggest the impact of how leaders and leadership behavior have affected organizations. In particular, educational researchers have laid a significant foundation to be considered by leaders in public education for what leaders do. However, only a limited amount of research attention has focused on the need for increased technology leadership related abilities and skills. Leadership at the school level typically starts with the principal. Principal leadership is viewed as the most influential of any school based personnel (Hallinger & Heck, 1996, 1998; Leithwood & Riehl,
The aforementioned cited researchers contend that without buy-in or commitment from the principal, many school-led initiatives are not fully supported. Various behaviors and/or skills of leadership are needed and necessary in today’s K-12 environment. Academic initiatives involving standards-based education and student achievement on standardized assessments, influenced primarily by NCLB expectations, have focused upon student learning in the basic content areas and the need for instructional leadership from the principal. The traditional instructional leadership role that could routinely be handled from a management perspective has become more complex and challenging. Progressively that role now requires principals to understand twenty-first century skills and the curriculum needs of teachers and students at a level that connects all subject areas to real life situations (Rotherham & Willingham, 2009).

Regardless of what type of leadership is exhibited or practiced in organizations, leadership comes down to the issue of decision-making. The decisions that leaders make typically “steer” the direction of the organization’s following and the organizational unit or lack thereof. The previously referenced updated ISTE framework provided a guide for decisions that must be made in moving in the direction of effective technology integration, administratively, and instructionally (NETS-A, 2009). According to the CEO of ISTE, Knezek (2009), administrators must become comfortable collaborating as co-learners with colleagues and students to lead and sustain a culture that supports digital-age learning. Although administrators have technology standards provided by ISTE, without administrators having an understanding of the technology standards that are required of teachers and students, a “disconnect” among administrators, teachers, and students will remain.
The reasons for technology not being fully utilized and integrated in schools are well documented in recent and past literature:

- Lack of access to computers in the classroom and usage of various relevant software (Becker, 2000b),
- Lack of administrative leadership and support for technology initiatives, in particular from the principal (Dawson & Rakes, 2003),
- Teachers inaccurate perceptions of technology integration (Mills & Tincher, 2003),
- Teachers limited technological knowledge (Hofer & Swan, 2008),
- Teachers attitudes and beliefs about using technology (Palak & Walls, 2009), and
- How technology use in classrooms has been conceptualized and supported (Harris, Mishra, & Koehler, 2009).

These authors recognize that dealing with the emerging technologies is an aspect of leadership that principals have to embrace due to the changing needs of the global workforce and how students must be equipped to operate successfully in today’s society. The emerging technologies have changed how business is conducted globally and have impacted teaching and learning. Email, text, video-conferencing, and other forms of technology provide instant communication. Today’s students are digital natives that not only communicate using these digital tools but also learn using them (Spires, Lee, Turner, & Johnson, 2008; SpeakUp, 2007). Teachers have to realize that their job now consists of teaching other skills besides basic literacy (three Rs) and American citizenship and start utilizing the emerging technologies as communications and learning tools in doing so.

There was a time when being able to master the three R’s (Reading, wRiting and aRithmetic) demonstrated basic literacy that could lead to satisfactory employment experiences and a reasonably comfortable life. This was evident when America moved through the Agricultural and Industrial Eras. However, the 21st century with its transformation into the
Information Era calls for different skills if students are to be prepared for the 21st century workforce (Clifford, Friesen, & Lock, 2005; Dede, Korte, Nelson, Valdez, & Ward, 2005;). Concerns reflected by those authors were further supported by positions taken in the Partnership for 21st Century Skills (2009), more recently. The Partnership advanced the following list, starting with and emphasizing the continuing importance of the “three Rs” as the lead item:

- The three Rs in core subjects
- Creativity and innovation
- Critical thinking and problem solving
- Communication and collaboration
- Information Literacy
- Media Literacy
- Information and Communications Technology (ICT) Literacy
- Life and career skills

Three of those listed, information literacy, media literacy, and ICT literacy, are directly related to the need being addressed in this study in meeting the challenges of the emerging technologies educationally at all levels. As noted by Tony Wagner (2010), in a book entitled, *Closing the Global Achievement Gap*, a similar list of skill areas has been requested by business leaders and have been incorporated into many non-traditional schools that are led by advocates for a better public education. Wagner laid out seven survival skills that parallel, to a degree, the Partnership list, which will be needed by students as they move further into the 21st century:

1. Critical Thinking and Problem Solving
2. Collaboration Across Networks and Leading by Influence
3. Agility and Adaptability
4. Initiative and Entrepreneurialism
5. Effective Oral and Written Communication
6. Assessing and Analyzing Information
7. Curiosity and Imagination
Wagner’s skill area of “accessing and analyzing information” can be summarized as the ability to effectively and efficiently access and evaluate information from different sources (Wagner, 2010).

Some items from the two skill lists are not totally new to educators as they have been utilized for some time in support of movement in student-centered and inquiry-oriented teaching and learning classrooms. However, driven by the influx of federal and foundation funding, the emerging technologies facing today’s classroom teachers has to be an “eye-opening” experience when teaching students who have more “gadgets” than the teacher. This epiphany has more than likely contributed to technology literacy of students.

The concept of technology literacy in reference to the emerging technologies brings needed attention to a new area of student performance. Technology literacy is becoming, in a real sense, a necessary basic literacy component of the 21st century. The challenges to and the implications for the American educational system from such rapidly driven technological developments are so evident that the call for action and change is inevitable. Too often initiatives of this magnitude take many years to transpire, but the recent funding attention to infrastructure needs was a timely and necessary step. The ability of the schools to appropriately utilize the new technological equipment, and to guard against the underused capabilities that were experienced with the overabundance of audio-visual (AV) equipment in the AV era, presents a significant leadership challenge at the system, school and classroom levels. It appears that computer literacy (along with other literacies) as explored in this research effort may be just as needed and warranted as the traditional literacy (three Rs) areas as we move forward in the 21st century.

Anderson and Dexter were among the first educational researchers who began to have an interest in these developments over 15 years ago, long before the stimulus provided by the
NCLB Act (Anderson & Dexter, 2005). Their focused attention on school technology leadership grew out of their research which explored a full range of topics from infrastructure to staff development as reported in a summary article (Anderson & Dexter, 2005). The current study was influenced primarily by the information in that article in developing assessment instruments as screens through which the initiatives in the urban school system might be reviewed.

In examining the findings of Anderson and Becker (2005), there is a strong indication that technology leadership at the school potentially has greater leverage on technology outcomes than technology infrastructure. Their findings indicate that key school administrators must become more actively involved with technology to improve technology outcomes. One such outcome, technology integration, has been taken on primarily by teachers in an effort to improve technology literacy and academic achievement. In acknowledging the key role that classroom teachers play in successful technology integration efforts, a component of the study will also assess the perceptions and attitudes of currently employed teachers. Special attention will be given to teachers who have been in their current position with the respective schools during the five years covered by the study.

In addition to exploring school technology integration, another component of this study will explore school technology leadership, attitudes and degrees of comfort of teachers and technology literacy levels of students at the middle school level in the urban school system. These relationships will be analyzed in an attempt to discover possible trends and relationships in the data, which might prove useful from a continuous improvement perspective in the system and in the respective middle schools.
The State Context

The southeastern state in the study has committed to the implementation of the mandates of the No Child Left Behind (NCLB) Act and Enhancing Education through Technology (EETT) Act as evidenced by the technology plan for the State. This plan details how school districts will meet many of the expectations of the NCLB act by improving student academic achievement through the use of technology. The EETT program implies that through teacher professional development, technology integration will lead to student technology literacy and student achievement will improve. The state department of education (SDOE) has taken a number of steps in an effort to provide support to LEAs in meeting the challenging demands of the emerging technologies. The department has:

1. Established levels for determining student competence in the use of computers as an area of academic learning.

2. Adopted the National Educational Technology Standards (NETS) for students, teachers and administrators as a baseline for expectations that lead to the development of curriculum materials, learning experiences and performance outcomes across the levels of schooling.

3. Adopted a standardized technology assessment that is free to all middle schools in the State that report Eighth Grade Technology Assessment results to the (SDOE).

4. Provided the option for LEAs to develop their own assessment process with all systems expected to establish a local proficiency score and to report the results to the SDOE and give LEAs the option for middle school personnel to assess selected students in the eighth grade.

5. Established reporting procedures that require LEAs to forward certain infrastructure data and assessment results to the department separate from the Adequate Yearly Progress (AYP) data required by NCLB.

6. Assigned staff development responsibilities to the several regional in-service centers around the state or directly to the larger LEAs.

The SDOE has taken similar measures to boost technology awareness and computer literacy primarily with educators in the past. Educators were mandated by the State Professional
Standards Commission (SPSC) to meet the State’s Technology requirement before July 2006. This mandate required that before any certified personnel receive a clear and renewable certificate that the individual must demonstrate computer skill competency through a computer skill competency assessment, completion of a technology integration course (InTech) or a specific computer course taken at the collegiate level.

Presently, the State department may not have provided enough standardization on the technology literacy criteria to truly assess, which schools/systems are making satisfactory progress. LEAs are allowed to define technology literacy and proficiency for selected eighth grade students based on their definition, criteria and assessment measure. Despite the procedures that may be in place based on federal programs and national/state technology plans, the reoccurring issue remains the comfort and/or discomfort teachers have in successfully integrating the emerging technologies into their lesson plans.

Hofer and Swan (2008) state that there are three types of knowledge which need to be evident for the technology integration model to be done correctly: content knowledge, pedagogical knowledge, and technological knowledge. Apparently with an awareness of those continuing umbrella knowledge and performance needs and remaining challenges, the State set the following technology goals for 2007-2012 as a guide to a more productive technological future in public education in the State:

1. Increase broad-based community support for the State’s vision to infuse 21st century technology skills into the State curriculum.

2. Increase educators’ proficiency to use technology effectively in classrooms and administrative offices.

3. Increase effective instructional uses of technology in order to incorporate 21st century technology and thinking skills into the State curriculum.
4. Increase access for students, educators, parents, school board representatives, and other community members to technology resources that can enhance student learning.

These goals for the technology integration movement in the State provide a degree of operational targets and guidance for LEAS in meeting accreditation guidelines that continue to address the technology area and the State’s expectations as well. At this point, the State is moving toward the end of the fifth year of the established goals. The results of the current study should prove informative in one urban school system as to where it is in meeting them.

The Urban School System Context

The current study was conducted in an urban school system in the southeastern region of the United States. This urban school district is considered small to medium in size for student population. The district is also divided into four regions with elementary, middle schools, and secondary school clusters for administrative purposes. There are 15 middle schools in the system in which 8 serve as the population of schools for the study.

The urban school system is one of the wealthiest districts in the state and has made significant investments in support of meeting the challenges of the emerging technologies. Two system initiatives integral to the interests of the current study were the establishment of technology coordinators for the individual schools, starting the system in a technology leadership team direction, and the early adoption of the recommended standardized assessment instruments that have been used for the primary 5-year period of the study. The system was one of only three systems in the state that made the adoption when it became available. It should be noted that LEAs had to fund the standardized testing option for the first 3 years with the state assuming the cost for the last 2 years.
Statement of the Problem

As suggested by Anderson and others and documented in a review of the literature since the publication of their summary document in 2005, there has been little recent research that explored, in a coordinated way, the efforts to assess the success or lack of success in dealing effectively with the emerging technologies at the system and individual school levels. The urban public school system in which the current research was conducted, while responding in multiple ways to the challenges of the emerging technologies, has not systematically attempted to document and evaluate the success, or lack thereof, of the efforts in a comprehensive manner over time. Motivated by the lengthy research by Anderson and others under the umbrella of technology integration, the current study took an action research look at the technology integration movement in the system, reflectively and historically, and extended the research in exploring the possible relationships among school technology leadership, school technology outcomes, teacher attitudes and technology integration, and student literacy performance as mandated by No Child Left Behind (NCLB) legislation and as recommended by Anderson and others. Utilizing the information generated through this action research study, a set of recommendations are presented for consideration in the development of a data-based improvement plan. This plan may be used to enhance the system’s ability to continue to move successfully forward from a technology integration perspective at the system and individual school level.

Significance of the Study

This exploratory and descriptive action research study was pursued in an effort to reflectively describe and update the initiatives undertaken by an urban school system at the
system and middle school levels. The action research study will help ensure that the school district is in compliance with the expectations of the NCLB legislation, specifically, and to move the system in the direction of successful technology integration in responding educationally to the ever-emerging technologies. The study will contribute to the limited body of research that has explored the relationships between school technology integration, school technology leadership, school technology outcomes, teacher attitudes, and technology literacy performance of students.

Additionally, participation in the study should prove to be a valuable professional growth experience for the middle school participants: the technology coordinators, the teachers and the principal investigator from an action research/data-based school improvement perspective. The ability to look at the eight middle schools through the data screens generated by the study should also be useful in supporting technology literacy initiatives in the interest of enhanced curriculum and instructional technology integration in the respective schools and in the system. While limited to one urban school system and to a convenience sample of eight middle schools in the system, the exploratory and descriptive results of the study should be useful for consideration by similar urban systems as they develop their educational responses to the emerging technologies and NCLB legislation.

Purpose of the Study

This exploratory and descriptive action research study was conducted in an effort to reflectively describe and update the initiatives undertaken by an urban school system at the system and school levels to comply with the expectations of the NCLB legislation. Furthermore, the study may serve to assist in moving the system in the direction of successful technology
integration in dealing with the emerging technologies educationally. Utilizing the information generated through this action research study, a set of recommendations will be presented for consideration in the development of a data-based improvement plan. This plan will be used to enhance the system’s ability to continue to move successfully forward from a technology integration perspective at the system and individual school level.

Research Questions

1. How do the school technology literacy scores vary across schools and across the 5 years covered by the study?

2. Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and the teachers’ technology integration school scores as measured by the Teachers Technology Integration Survey?

3. Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and school scores as measured by the technology literacy assessments’ of eighth grade students in the individual middle schools?

4. Is there a significant difference in the teachers’ technology integration scores among the teacher groups by discipline?

Definition of Terms

Access--Use of technology by students for educational purposes during instructional and non-instructional time.

Computer technology--Computer hardware, software, or devices that connect to or interact with computers.
Educational technology--The application of technology for learning (ISTE, 2009).

Emerging technologies--The use of technologies that have emerged in schools.

Information and communication technology (ICT)--A phrase used in place of the word technology when referring to skills or standards for technology use (ISTE, 2009).

NetUse--A measure of the extent to which teachers’ and others in the school use e-mail and the Web for a variety of purposes (Anderson & Becker, 2005).

Student tool use--Measures of the extent to which students use computers during the school year to do academic work, using CD-ROMS, the World Wide Web, and other computer resources (Anderson & Becker, 2005).

Technology--Any device (hardware) or computer application (software) that is used as a tool to solve a problem or facilitate a purpose (Brusic, Fales, & Kuetemeyer, 2004).


Technology integration--The usage of technology hardware and/or software to create, embellish, and demonstrate or research information within any given subject area (Barron, Kemker, Harmes, & Kalaydjian, 2003).

Technology leadership--Technology leadership is a variable that measures school technology leadership. It represents the organizational decisions, policies, or actions that facilitate effective utilization of information technology throughout the school. The technology leadership variable is the sum of eight other indicators: budget, district support, grants, intellectual property policy, principal days, principal e-mail, staff development policy, and technology committee (Anderson & Dexter, 2005).
Technology literacy--The ability to use, manage, understand, and evaluate technology (http://www.iteea.org/TAA/PDFs/GlossaryTerms.pdf).

Technology Outcomes--Technology results based off of technology indicators such as technology integration, eighth grade technology assessments (within a school or school district), teacher and staff use of computers for email and other administrative functions and student use of computers to complete academic assignments (Anderson & Dexter, 2005).

Limitations of the Study

1. The study was conducted with middle schools in an urban school district in the southeastern region of the United States.

2. A convenience sample of the eight middle schools in the urban school district participated in the study, which yielded a maximum of 8 responses from the participating media specialists, 8 responses from the participating technology specialists, and 106 teacher responses.

3. The researcher was only allowed to conduct the study on eight middle schools despite asking for permission to conduct the study on all middle schools in the district.

4. The primary focus of the study was limited to the 5 years in which the urban school system had assessed the performance of eighth grade students on the recommended standardized assessment measures and had secure, archived data available for analysis purposes.

5. Findings from this study may not be representative of schools outside of this district or beyond the southern region that this district is located in.
Assumptions of the Study

1. The media specialists, technology specialists, and teachers participated in the study in an informed and professionally accountable manner.

2. The principal investigator was able to maintain a professional balance between his employment in the system as a technology specialist and his role as doctoral student/researcher.

Organization of the Study

Chapter 1 included an introduction to the study and context-setting statements relative to the situation related to the technology integration movements in the state and the urban school system. The problem statement and significance of the study are included along with a list of exploratory research questions that give direction to the study. Limitations and assumptions relative to the study are also listed. Attention was given to the organization of the study at the end of the chapter.

Chapter 2 includes a review of the literature with attention given to research focused upon the umbrella topic technology integration and related subtopics of school technology leadership, and outcomes. Particular attention was given to the concept of technology literacy as a basic literacy need of the 21st century and research efforts to assess it as a desired technology outcome. Specific attention was given to any identified research that has built upon the previous work of Anderson and Dexter (2005) and their recommendations.

Chapter 3 includes the research methodology with a detailed description of how the study was conducted. A brief introduction to the study will lead into a restatement of the problem with subsequent consideration of the research design, research questions, instrumentation, populations, and data collection in this chapter.
Chapter 4 includes an analysis of the data and presentation of the results of the study.

Chapter 5 includes a discussion of the findings from the study along with any conclusions and recommendations for consideration by the system as it continues its movement in the technology integration direction. Possible implications for other urban school systems will be shared along with any recommendations for further research.
CHAPTER 2
REVIEW OF THE LITERATURE

Preview

At the proposal stage of this research effort, the focus was viewed as a “duplication of an extension of” the earlier research by Anderson and Dexter (2005) in an attempt to establish possible relationships among school technology leadership as measured in their earlier works. The intended study would be a modified replication of the Anderson and Becker study with the addition of technology literacy performance scores of eighth-grade students in an urban school system. As revised in light of the developments within the school system, the focus of the study was expanded into “An Action Research Review assessment of the responses of an urban school system in the southeast to the developing interest in and mandates relative to technological literacy.” The Anderson and Dexter (2005) study is now just one “entry way into generating data as a screen in looking at the responses of the school system, particularly at the middle school level.

The context of this literature review will begin with a brief description of technology and how it has become important in education. Policies regarding uses of technology and access to technology are key components to the integration of technology in schools. National standards regarding educational technology from the administrator, teacher, and student perspective are also addressed in an effort to show the significance of technology literacy in public schools. Two major components of the literature review include sections on technology leadership and technology integration. Subtopics regarding literacy, 21st century education, and other
educational technology components are included to provide substance and foundational knowledge in light of the technology movement that has taken place in schools. Some of the information mentioned in Chapter 1 is reiterated in this chapter for the purpose of reestablishing foundational points. Furthermore, these foundational points exemplify and help present a complete review of the research and practice literature from a historical point of view.

Introduction

In past years, television was the most powerful information delivery mechanism, supplanting newspapers, magazines, and other material (Picciano, 2002). Computer technology has rapidly gained the same claim, but not just with computers. Cell phones, Personal Digital Assistants (PDAs), and Internet technology are major contributors to information being disseminated throughout the world. One major difference in the television and computer technology is that computer technology requires competency to manipulate and use the information at some level whereas a television does not.

Technology (even when not isolated to just computers) covers a wide range of devices, tools, hardware, and software. Typically, there are two types of technologies that cover the technology spectrum: simple technology and complex technology. Simple technologies such as scissors, thermometers, pliers, scales, etc. are tools that are used to make basic processes and procedures easier (Brusic et al., 2004). Complex technologies, as implied by past and recent literature on technology, involve electrical devices such as calculators and computers that are used to accomplish and perform routine matters in extraordinary manners. Technology in its simplest and most complex form helps solve problems and makes tedious tasks routine. For this
study, technology will be defined as any device (hardware) or computer application (software) that is used as a tool to solve a problem or facilitate a purpose (Brusic et al., 2004).

Because of advancements in technology, we now live in a digital age dominated by technology and mobile devices that provide information easily and on demand. Emerging technologies allow commerce, communication, and virtual interaction with various entities. Without a doubt, technology literacy—like knowing how to read, write, and do arithmetic—is a necessity in today’s schools and wired/wireless world. Nonetheless, America’s public schools have been slow to embrace the idea of utilizing a curriculum that prepares students for the 21st century (Wagner, 2010). Federal government mandates technology training, and state governments offer technology grants, yet LEAs and schools still are not enforcing technology proficiency of students because it is not a requirement of high stakes testing. Unlike core subject areas, state technology exams do not require adequate yearly progress (AYP) or penalization of students who fail technology exams.

Despite not having a uniform technology curriculum, the idea of educating students through the use of technology has become a priority in the United States based on federal legislation and funding for public schools (http://www.ed.gov/policy/elsec/leg/esea02/pg34.html#sec2401). Given the impact that technology continues to have on businesses and other worldly affairs, it’s not a surprise to learn that technology has become a part of the curriculum in education. Technology has been touted as the most cost effective strategy to improve student learning in education (Milken Exchange Study, 1997). Conversely, there are also data that exist stating that technology competency is perceived by students as having little impact on their academic success (Selwny & Husen, 2010). In a study on the educational benefits of technology competency, an investigation of students’ perceptions (Selwny & Husen, 2010), student
perceptions of using new technology and having technology competence and its positive impact on academic success at school reflected low values for multiple demographic groups (i.e., gender, social economic status, and ethnicity). Educational reform in public schools is being transformed by emerging technologies. Decision-making by technology leaders is warranted based on the kind of teaching and learning that is happening in classrooms through technology. The field of education has a multitude of technologies that have the potential to improve teaching and learning and appear to be the learning tools of choice by students (SpeakUp, 2007; Spires et al., 2008).

The emergent technology that is most prevalent at the school level is computer technology. Computer technology, of all the emerging technologies, is popular because it improves communication, research, and productivity primarily through the use of the Internet (Davidson, Goldberg, & Jones, 2010). The Internet is a major reason for computer technology becoming relevant and essential in schools. Computer technology is a major part of how states’ educational technology programs are evaluated in terms of access to instructional technology (Technology Counts, 2007). Without up-to-date technology, public school districts would appear antiquated in doing business and preparing students for the digital age.

National Technology Legislation

A national technology plan was enacted in 2005 to address how schools would meet academic standards through the use of technology (USDOE, 2004). The first step in this movement was to provide an infrastructure that could allow continued access to technology. Federal legislation required states to explain their long-term strategy regarding how they would
finance technology in their school districts given federal funding (Sustainability Challenge, 2003).

States, LEAs, and schools have benefited from the technology financing that they were awarded from the federal government. Through grants, Acts, and other federal programs, schools across America have computer technology in every functioning school. One Act, the No Child Left Behind (NCLB) Act (2001), has a section dedicated to technology known as the Enhancing Education Through Technology program (EETT program Title II, Part D). This program has three major goals: (1) improve student achievement in Grades K-12 through the use of technology, (2) assist every student in crossing the digital divide by ensuring that every student is technology literate by the end of the eighth grade, and (3) encourage technology integration through teacher professional development. These three goals tie into a larger goal, which is to help students meet the challenges of the 21st century so that students become productive citizens in the global workforce. Leaders of organizations outside of public education have taken the initiative to create classrooms and environments that aid 21st century learning and skill development to better prepare students for today’s workforce (Wagner, 2010). Technology is a major part of this learning and skill development as evidenced by the goals of the EETT program and the National Technology Plan (USDOE, 2004). Movement toward these challenging goals must begin with access to the emerging technologies for teachers and students in the classrooms across America.

Access to the Emerging Technologies

A quality technology infrastructure along with resources must be accessible for effective use of technology in regard to teaching, learning, and leadership (ISTE, 2009). The
implementation of technology in public schools has been done with “access” to technology as the first initiative in improving technology literacy of students. In past years, technology cost impacted teacher and student access to educational technology because school districts could not afford the hardware. Recently, billions of dollars have been allocated and utilized to improve educational technology programs in public schools. Government programs have funded school districts across the nation to ensure that all students have the opportunity to utilize computer technology. Federally funded programs such as E-rate and EETT have provided computers, software, and high speed Internet access for every public school in America (SETDA, 2010). This technology initiative is considered to be an investment in America’s future (OECD, 2005).

Student access to computers at school and experiences with ICT often depend on the number of computers available to students (OECD, 2003). However, student technology outcomes will depend on the quality of ICT usage and not necessarily the quantity of computers. Furthermore, upon reexamination of the 2000 Program for International Student Assessment (PISA) data, Bielefeldt (2005) reported findings from Fuchs and Woessmann, (2004) stating the following conclusions:

Once family background and school characteristics are extensively controlled for, the mere availability of computers at home is negatively related to student performance in math and reading, and the availability of computers at school is unrelated to student performance. By contrast, student performance is positively related to the use of computers at home for accessing e-mails and Web pages and to the availability of educational software at home. Finally, student performances show an inverted U-shaped relationship with the extent of computer and internet use at school, rising with some use but falling again with a use of several times a week. (Fuchs & Woessmann, 2004, p. 17)

Nonetheless, home access to computers has been somewhat of an unnamed driving force in accounting for students’ technology literacy. The PISA studies (2000, 2003) have also shown that there is a strong association of ICT performance with home access and usage (OCED, 2000; OCED, 2003). Web-based applications such as wikis, blogs, email, and other communication
related technologies have empowered student learning of technology skills in social networking and other technological areas. Many students learn technology skills from outside of school environments because of the limitations that schools’ have placed on students using personal technology devices in schools (Dede et al., 2005).

School limitations on personal technology usage for students have been questioned, but it is without doubt that some schools are providing technology resources that otherwise would not be available to students. Many LEAs participate in one-to-one laptop initiative programs. The one-to-one laptop program is a program in which every child in a school receives a free laptop for school and home use. Laptop initiatives of this type not only provide constant access to computer technology at home and at school, but they also motivate, engage, encourage, and raise expectations for student self-efficacy regarding technology competency (Lei & Zhao, 2008).

Even with laptops and computer technology in the hands of every student, technology integration and student technology literacy in many classrooms is dependent upon the classroom teacher. Computer technology is no different than most other instructional resources available for student use in classrooms; without structure and guidance from teachers, it (computer technology) can be viewed as just another resource (i.e., encyclopedias). Teachers and their technology literacy are of paramount importance in integrating technology into the instructional framework of 21st century learning.

Decision-makers in the educational arena realize that technology literacy in schools is dependent upon technology leadership and teachers’ comfort level with using and integrating technology (Nance, 2003). The one-to-one laptop program model was utilized in a middle school study where teachers and students were immersed in technology through the use of laptop computers (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010). Participants were
compared to their colleagues who were not a part of the one-to-one laptop initiative. The results of the study showed improved technology integration scores of teachers that utilized the technology. The study also showed that computer immersion was a pivotal reason for improved technology proficiency, technology productivity, and technology integration within classrooms. Classrooms were reportedly filled with learner-centered instruction and student activities involving technology. These conclusions were drawn based on the use of hierarchical linear modeling (HLM) to analyze longitudinal survey data over a 3-year period on teachers that were put into either the control or treatment group (Shapley et al., 2010).

This level of involvement with one-to-one computer technology does not always translate to the desired level of student engagement. Donovan, Green, and Hartley (2010) conducted a study with three populations of middle school students who participated in the one-to-one laptop initiative and the results showed that student engagement did not increase for each population. The study found that student engagement with technology is dependent on different configurations of teacher technology integration. In this study, three classroom configurations were put in place to monitor student engagement. “Configuration A” entailed the use of laptops by teachers and students as the primary tool during the lesson. “Configuration B” entailed the use of laptops as an integral part of the lesson but students who did not have their laptops were provided modifications for completing assignments without the use of their laptop. “Configuration C” entailed the use of laptops not being the primary teaching tool whereas the teacher only occasionally used the laptop and a projector to introduce the lesson. The components in the study involved teacher actions (classroom movement, discussion with students, use of whiteboards and other instructional materials), teacher/student interactions (questioning, answering, refocusing, casual conversation and initiation (student or teacher)),
student uses of laptops (basic functions, open research, free time, group work, test/quiz and guided research), and teacher uses of laptops (lectures, attendance, personal e-mail, record keeping and monitoring student activity). These components indicate that student technology literacy for this study was somewhat dependent on teachers’ providing technology access, integrating technology into their daily lesson, and being technology leaders in their classrooms.

School Technology Leadership

The International Society for Technology in Education (ISTE) has been the leading organization in providing global support for technology in schools (www.iste.org). ISTE is globally recognized as the premier partner in advancing educational excellence through innovative learning, teaching, and leadership. Founded in 1979, ISTE is responsible for the national educational technology standards utilized in these times of ICT in the digital age.

Originally known as Technology Standards for School Administrators (TSSA), the new standards for technology leaders known as the National Educational Technology Standards for Administrators (NETS-A) are widely regarded as effective school leadership guidelines for comprehensive and appropriate use of technology in schools (ISTE, 2009). Technology standards for teachers and administrators also provide insight for school personnel that need assistance with integrating technology into the curriculum. The NETS have been adapted for use around the world and gone through transformations over the years being integrated into the ISTE NETS in 2002 and refreshed in 2009. The latest revision of the NETS-A is broken down into five categories opposed to six as seen in previous years. The five categories are the following (1) visionary leadership, (2) digital-age learning culture, (3) excellence in professional practice, (4) systemic Improvement, and (5) digital citizenship. Each category has three to five standards that
help define what administrators should do to promote the use of technology in schools.

Furthermore, essential conditions, profiles, and scenarios are referenced throughout the NETS literature to aid administrators (mainly the principal) in promoting an atmosphere of technology leadership in schools.

ISTE’s (2009) Essential Conditions identify those factors that Educational Administrators must consider as they plan for and make decisions regarding the physical, human, and financial policies related to implementation of technology-based learning opportunities and environments conducive to increased learning opportunities, creativity, innovation, and global awareness. (p. 4)

The “essential conditions” necessary to effectively leverage technology for learning are shared vision, empowered leaders, implementation planning, consistent and adequate funding, equitable access, skilled personnel, ongoing professional learning, technical support, curriculum framework, student-centered learning, assessment and evaluation, engaged communities, support policies, and supportive external context. The profiles and scenarios referenced as a part of the NETS-A provide real life, job embedded activities such as modeling the use of technology through communication and implementing policies that promote effective technology usage. These tools (profiles and scenarios) provide a foundation that administrators can use to take specific action in implementing the NETS.

**Visionary Leadership**

This standard was previously referenced by NETS-A (2002) as leadership and vision. The standard states that educational administrators should inspire change using strategic plans aligned to a shared vision through the use of digital-age resources (ISTE, 2009). Educational administrators should also promote policies, programs, and funding to support these plans and the vision. Within and throughout this standard, educational administrators are encouraged to be
leaders of technology in their respective school buildings by developing and implementing a shared vision that promotes technology integration and helps transform the teaching and learning cycle.

*Digital-Age Learning Culture*

This standard references the need for administrators to create, support and maintain a digital-age learning culture that provides an engaging education for all students (ISTE, 2009). Educational administrators can do this by providing opportunities for digital-age technologies to be used in schools across the curriculum. Educational administrators can also model technology use in school and participate in local, national, and global digital-age collaboration projects with other educators. Most importantly, educational administrators will need to ensure that emerging technologies are utilized in an instructional setting that supports technology integration.

*Excellence in Professional Practice*

This section details how educational administrators can encourage technology use of teachers and students. Professional development for teachers on how to integrate technology into the curriculum helps teachers and students become more technology literate and savvy. Educational administrators can provide professional development opportunities with technology by allocating time and resources to teachers to allow professional growth in the area of technology integration (ISTE, 2009). Educational administrators that participate in technology professional development along with teachers can stay abreast of trends and effective uses of technology. This standard also calls for educational administrators to evaluate new technologies while promoting the use of technology by staff and students. Modeling effective communication
and collaboration with stakeholders using digital-age tools is also important in achieving the standard.

**Systemic Improvement**

The systemic improvement standard calls for educational administrators to provide digital age leadership and management for the improvement of effective use of technology for the organization (ISTE, 2009). Educational administrators establish and improve an organization’s effective use of technology by maintaining a quality technology infrastructure along with recruiting personnel who understand how to improve academic and operational goals. These goals will essentially aid in the effectiveness and transformation of technology use at the system level.

**Digital Citizenship**

This section of the NETS-A standards represents the understanding of social, ethical, and legal issues that occur within a digital culture. Educational administrators must implement and promote policies that ensure equitable access to technology while ensuring that a shared cultural understanding and involvement in global issues is addressed (ISTE, 2009). Educational administrators should also model social interactions on a global level through the use of communication and collaboration tools.

**Planning For Technology**

Technology plans from the state and district levels provide a structure for what educational technology programs should look like in schools. The plan is an outline of
technological needs such as hardware, software, timelines, needs assessment, vision, strategies, objectives, and goals all pertaining to technology (Williamson & Reddish, 2009). Local board members and other political decision makers rely on such plans to understand proposed technology expenditures and ensure accountability. Technology leadership at the higher levels (state and district) along with that which is encouraged at the school level, as seen through the study of Anderson and Dexter (2005), emphasizes the importance of not only leadership but also specifically technology leadership in the K-12 environment.

Planning for technology is a fundamental step in having a successful implementation of educational technology. Technology planning also indicates a basic level of technology leadership. Staples, Pugach, and Himes (2005) did a case study, which showed that successful technology leadership will encompass a school mission that reflects the importance of technology, an alignment of technology use to the curriculum, and the empowerment of teachers to be leaders of technology in some way. Student access and utilization of technology must also be considered in the planning process of how technology will be used to impact instruction and create technology literate students. Technology infrastructure has to be in place to ensure consistent access and utilization of technology (Dickard, 2003).

Anderson, Dexter, and Becker (1998) conducted a national survey in which teachers, instructional technology specialists, and principals reported their beliefs regarding technology leadership, and technology infrastructure within their respective school districts. In 2005, Anderson and Dexter revisited the findings of this national study in an updating article and concluded that technology leadership has a greater impact on technology outcomes than does technology infrastructure (Anderson & Dexter, 2005). Technology leadership is a facet of the principalship that continues to challenge current and existing principals because of the constant
evolution of technology. Principal leadership and technology leadership entail job duties and responsibilities that call for instructional strategies and practices needed to increase technology use and improve technology outcomes in classrooms (Valdez, 2004). According to Anderson and Dexter (2005), the following key indicators make a difference regarding technology leadership: access, net use, school technology budget, intellectual property policy, district support, grants, principal days, principal e-mail, staff development policy, and a technology committee.

Sound technology leadership will reflect in participatory decision-making regarding technology and high uses of technology by teachers (Tong & Trinidad, 2005). The leadership required to make key decisions within the framework of technology comes with varied levels of knowledge, expertise, and dedication. School administrators must be competent users of digital-age tools because they, along with other educational leaders, will make decisions that will guide what technology will be purchased and how the technology will be used by staff and students in the school (ISTE, 2009). Decision-making is often seen as a leadership function, but decision-making in regard to technology is an element of leadership about which principals sometimes are not the most knowledgeable. “Although there is no clear definition of school principals’ duties regarding their technological leadership in schools, it is apparent that school principals are responsible for technological applications in schools” (Eren & Kurt, 2010, p. 625). As a leader of resource management, principals need to include a plan for purchasing, maintaining, and replacing equipment within the school (Flanagan & Jacobsen, 2003; Williamson & Redish, 2009, p. 180). Many times principals rely on the technical knowledge of technology coordinators, media specialists, and sometimes teachers to ensure that relevant technology is purchased and a part of the educational technology program. Without the expertise of someone that understands technology from a technical and instructional standpoint, principals run the risk of purchasing
outdated software, obsolete hardware, and using technology as a “stand alone” piece of equipment.

Principals that feel less than comfortable making technological decisions and/or acting as a technology leader, often rely on technology coordinators (also referred to as instructional technology specialists) to assist with educational technology needs for the school. Technology leadership, from a principal’s perspective is many times exhibited through distributive leadership whereas the principal delegates certain task to the appropriate personnel (i.e., instructional technology specialists). Instructional technology specialists are viewed as key personnel in planning and maintaining the educational technology program at the school level. According to Tondeur and Newhouset (2010), instructional technology specialists work best for schools when they are viewed as administrators within the schools and allowed to collaborate with school personnel in a one-on-one setting.

Conversely, other principals do have the technological skills and knowledge to make sound decisions regarding educational technology in a school. Banoglu (2011) conducted a study on 134 principals to determine if they were competent enough to be technology leaders in their schools. To measure school principals’ technology leadership qualities, Banoglu utilized an instrument known as the Principals Technology Leadership Assessment (PTLA), which was based off of the NETS-A criteria and developed by the American Institutes for Research and UCEA Center for the Advanced Study of Technology Leadership in Education (CASTLE). The results of the study proved that these principals were competent to be technology leaders and that women principals outperformed their male counterparts in the area of leadership and vision.

Principals that are comfortable with technology tend to be comfortable with participating in technology initiatives. According to a study conducted on 870 principals by Eren and Kurt
(2010), training plays an important role in school principals’ technological leadership behavior. Technological leadership behavior as defined by Eren and Kurt (2010) is essentially the ability of the principal to meet the expectations of the six NETS-A standards and 31 performance indicators set forth by ISTE (2002). School principals who are proficient in technology use demonstrate high levels of technological leadership behavior. Leadership behavior from the principal (positive or negative) impacts the attitudes of the staff in regard to technology and other initiatives.

Teachers and Educational Technology

All aspects of technology in education are a part of an organization’s (school and/or school district’s) educational technology program. Educational technology in schools encompasses everything involving technology (i.e., equipment, access, integration, education (curriculum), leadership, and other instructional and technological functions). The disposition of the classroom teacher regarding educational technology is also an important entity to include in the overview of an educational technology program. As stated by Leu et al. (2004), “The appearance of the Internet and other ICTs in school classrooms will increase, not decrease, the central role that teachers play in orchestrating learning experiences for students” (p. 1599).

Teaching and learning with and about technology depends upon the teacher and learners’ attitude, comfort level, ease of use, and perceived usefulness of the technology. Cifuentes, Maxwell, and Bulu (2011), did a study on how the use of a professional learning community could positively impact teachers’ attitudes about integrating technology into their teaching practices. The study confirmed conclusions reached by other studies (Harris et al., 2009; Hughes, Kerr, & Ooms, 2005), which basically showed that teachers feel most comfortable learning about
technology integration and doing it when in a setting that includes technology, pedagogy, and content experts collaborating through face-to-face discussions.

Teachers’ attitudes toward technology are the most significant predictor for teacher and student use of technology for a variety of instructional strategies (Palak & Walls, 2009). Teachers in technology rich schools use technology in ways that support their existing teaching approach. Student use of technology in schools is often dependent upon the teachers’ comfort level and acceptance of technology as a valued resource (Holden & Rada, 2011). Technology usage must be evident by the teacher for purposes other than administrative and management purposes if facilitating student-centered learning is to take place through technology integration.

Coppola (2005) reported on an ethnographic study where teachers were empowered to use technology at their own rate of comfort. The results were that teachers were able to connect the technology to their teaching and feel supported by technology leaders as they learned about technology simultaneously with their students. Hughes et al. (2005) performed a similar study involving middle school teachers. In their study, an inquiry group for technology professional development was formed to discuss content pedagogy and technology in an effort to increase teacher learning and the integration of technology into the curriculum. The study found that having an inquiry group that consisted of different participants with different technology and pedagogical expertise provided a learning environment that was non-threatening and purposeful for teachers in obtaining ideas, strategies, and content knowledge regarding technology integration.

In many instances, some teachers want to integrate technology but may not have the technological knowledge to do so. Modeling technology lessons and usage of devices will not prepare teachers with the necessary comfort level to integrate technology appropriately.
throughout the curriculum or their teaching years (Mills & Tincher, 2003). A course for teachers on how to integrate technology appropriately into specific subject areas will be more useful and resourceful to teachers as opposed to sporadic professional development on digital tools. As suggested by Mills and Tincher (2003),

> Developing technology integration expertise in teachers will not be achieved through the provision of a technology course or two built into the professional education curriculum. Preparing new teachers who are technology integrators will require a professional education curriculum that is infused with opportunities for teacher candidates to learn with technology and model technology use throughout their professional preparation. (p. 398)

Advocates of technology education for pre-service teachers have argued this point for over 10 years (Shoffner, Thomas, & Dias, 2000). Furthermore, a technology curriculum with technology integration as the focus is needed for teachers to help students and others become more technology literate (Wilson & Notar, 2003).

As technology specialists understand and other educators have recently realized, technology integration is a process that requires various knowledge and skills, as stated by Hofer and Swan (2008). Technology skills have been utilized as a focal point in helping educators and students gain technology literacy thus far; but knowledge of technology in the sense of how, why, and when to use technology in regard to meeting goals and objectives that are content driven is a different level of understanding. Creswell (1998) defined knowledge as follows:

> Within the meanings people make of it, knowledge is gained through people talking about their meanings; knowledge is laced with personal biases and values; knowledge is written in a personal, up-close way; and knowledge evolves, emerges, and is inextricably tied to the context in which it is studied. (p. 19)

Teachers must possess knowledge of various technologies in order to associate the right technology with the appropriate lessons. Teachers must also have a strong knowledge of pedagogy and content to integrate technology appropriately. Koehler and Mishra (2008) have
developed a theoretical framework for technology integration based on the three aforementioned areas (technology, pedagogy, and content).

The Technology, Pedagogy, and Content Knowledge (TPACK) framework is the multiple intersections of knowledge in the areas of technology, pedagogy, and content (Harris et al., 2009). A teacher’s ability to integrate technology with curriculum at a high level will depend on a teacher’s comfort level of TPACK (Harris et al.; Hofer & Swan, 2008; Koehler & Mishra, 2008). As teachers become comfortable using technology, they are more apt to incorporate technology into their teaching plans. The confidence to appropriately and effectively integrate technology into a lesson not only comes with comfort but also continued support. Training teachers sporadically on how to use technology tools is helpful but it alone will not provide the skill development needed to integrate technology at higher levels (Zhao & Bryant, 2006). Consequently, student technology literacy will suffer due to a lack of teacher knowledge, confidence, and other factors contributing to teacher challenges in integrating technology appropriately and effectively.

Intrinsic and extrinsic challenges for implementing technology education have been documented as evidenced by the case studies done on Queensland teachers in Australia (Finger & Houguet, 2009). The study provides insight as to what intrinsic factors such as technology knowledge and understandings of the curriculum impede teacher progress in implementing technology education. Extrinsic factors such as lack of resources and professional development are also mentioned. As emerging technologies continue to bring forth new literacies, teachers will require more technological education and professional development to teach students of a digital age (Leu et al., 2004). Nonetheless, technology education and professional development in the area of technology integration for teachers is still lacking, thus impacting teachers’
attitudes, beliefs, and comfort level when teaching about and with technology. However, to help teachers understanding technology and how it is to be used in schools, technology standards have been adopted by most school districts nationally.

National educational technology standards for students (NETS-S) as direction-setting assistance to teachers were first released in 1998, followed by national educational technology standards for teachers (NETS-T) in 2000. These standards represented a baseline for what teaching and learning with technology should look like in classrooms and, more importantly, the integration of technology in education. The need for technology in schools and technology integration became more apparent to society with the advent of digital tools, globalization, and the need for a highly skilled labor force to be able to compete globally in modern society (Leu et al., 2004). As technology continues to change the needs of the current and future workforce, technology literacy becomes more vital to the teaching and learning component of education. And as technology standards govern educational technology programs in public schools, competence with technology becomes a fundamental requirement for most educators.

Incorporating technology (hardware) in schools has been a massive ordeal for both private and public organizations. The integration of technology in the classroom has been even more of a challenge for teachers. Fortunately, organizations’ such as ISTE and International Technology and Engineering Educators Association (ITEEA) provide technology standards, performance indicators, and other resources to scaffold teachers’ learning.

Technology standards for teachers (NETS-T) were refreshed in 2008 and divided into five categories with each category being accompanied by four performance indicators. Additionally, technology standards for students (NETS-S) were refreshed in 2007. Both sets of standards should be used in conjunction with performance indicators to inform teachers about the
technology skills and mastery of technology concepts expected of students. The five categories for teachers (NETS-T) are (1) facilitate and inspire student learning and creativity, (2) design and develop digital-age learning experiences and assessments, (3) model digital-age work and learning, (4) promote and model digital citizenship and responsibility, (5) engage in professional growth and leadership. There are six categories for students (NETS-S): (1) creativity and innovation; (2) communication and collaboration; (3) research and information fluency; (4) critical thinking, problem solving, and decision making; (5) digital citizenship; and (5) technology operations and concepts.

Although the two sets of technology standards do not mirror each other or show a direct correlation, they do complement each other to an extent. The teacher standards (NETS-T) call for the modeling and facilitating of digital age learning and 21st century skills by teachers for students. The student standards (NETS-S) call for students to learn through 21st century skills and technology tools. A transformation in both the NETS-T and NETS-S has occurred in regard to what the teaching and learning expectations are for technology use in classrooms. The focus has shifted from learning about technology and how to use it, to utilizing 21st century skills (i.e., critical thinking, problem solving, and decision making) to model, design, and develop digital age work, learning experiences, and assessments. A brief summarization of the NETS-T and the accompanying performance indicators are presented in the following paragraphs.

**Facilitate and Inspire Student Learning and Creativity**

This standard calls for teachers to use their knowledge of technology, pedagogy, and content to influence the use of technology by students. Identical to TPACK, this standard is calling for teachers to integrate knowledge of the necessary components needed to facilitate and
engage students in technology integration in both face-to-face and virtual environments. Performance indicators for this standard would involve teachers modeling and promoting creativity and thinking utilizing digital tools. Teachers would facilitate use of digital tools to solve real world problems.

*Design and Develop Digital-age Learning Experiences and Assessments*

This standard calls for teachers to transform the learning environment through the use of digital age learning experiences and assessments using digital tools. Essentially, teachers would be transforming how students learn through the use of modern day technology. Performance indicators for this standard would involve teachers managing their own learning environment through the use of personalized learning activities, technology rich learning environments, and assessments.

*Model Digital-age Work and Learning*

This standard calls for teachers to demonstrate how business and/or work is conducted in modern society. Teachers would model skills and best practices of 21st century teaching and learning. Performance indicators for this standard would involve teachers communicating and collaborating with stakeholders using digital tools. Teachers would also exhibit technology fluency in being able to deliver/transfer current knowledge through technological resources.

*Promote and Model Digital Citizenship and Responsibility*

This standard calls for teachers to demonstrate technological awareness and global awareness in their behavior and profession when dealing with digital tools and technology.
Performance indicators for this standard would involve teachers abiding by rules, regulations, and laws regarding technology in the following areas: social activities, copyright issues, plagiarism, and equitable access for students.

Engage in Professional Growth and Leadership

This standard calls for teachers to continue learning with and about technology in an effort to improve their skill set and demonstrate effective technology uses. Furthermore, teachers can exhibit leadership qualities and perform leadership roles within his/her school to model professional growth and leadership in this area. Performance indicators for this standard would involve teachers contributing to the educational program at the school beyond the classroom level. Teachers can also model this standard by communicating a vision for the school technology plan and exploring/recommending technology best practices in the area of technology leadership and technology integration.

Technology Integration

Technology integration from a general standpoint is defined as the usage of technology hardware and/or software to create, embellish, and demonstrate or research information within any given subject area (Barron et al., 2003). In education, technology is typically embedded into a subject so that the technology makes the teaching of the subject interesting, relevant, and practical to real-world experiences. Technology integration is meant to be cross-curricular rather than a separate course or topic within itself. The integration of technology into a school district is often difficult and must be planned for to be implemented efficiently and effectively.
Technology integration, as defined by Anderson and Dexter (2005), in a study based on technology leadership, is when teachers in their school did the following: experimented with new teaching methods involving computers, used computers for their own professional tasks, had students use computers to do curriculum assignments, involved themselves in planning or implementing Internet-based activities, and sought technology coordinators for advice about integrating technology into the curriculum. In the Anderson and Dexter (2005) study, technology integration was basically thought of as integrating computers and/or computer applications into the school-based curriculum and environment. However, recent definitions of technology have shown that technology is more than just computer hardware.

Technology integration from a district and school-based perspective entails digital tools being utilized to improve the functioning and operation of schools from an Information and Communications Technology (ICT) and management perspective. A technology outcome that school leaders’ are expected to lead is the integration of technology into the school’s curriculum and technology literacy of students. One of the many purposes of EETT is for educators to promote technology integration into curricula and instruction that are aligned to state academic standards (NCLB, 2005). Past research on technology integration indicates that teachers have struggled with understanding how to integrate technology into the curriculum (Gibbs, Dosen, & Guerrero, 2009). As stated by Mills and Tincher (2003) in a study on elementary and middle school teachers, technology expertise will occur through a technology curriculum that provides opportunities for teachers to learn with technology and model technology use throughout their teaching experiences. Furthermore, Holden and Rada (2011) posited that the more teachers feel comfortable with technology in terms of perceived usefulness and ease of use, the more likely technology is to become integrated into their teaching plans allowing for student use.
The foundation for successful technology implementation requires educators and policy makers to possess a viable vision for technology use, enact the vision, and link the vision to other important organizational endeavors (Williamson & Reddish, 2009). Different school organizations have chosen to implement technology into classrooms in various ways. As seen in the study conducted by Barron et al. (2003), most schools are using technology as a communication tool and integrating technology as a productivity, research, or problem-solving tool. Some school organizations have chosen to integrate technology through technology education whereas technology courses are taught through a business education curriculum. Other school organizations have chosen to integrate technology into core subject areas whereas technology is infused in the teaching and learning process. Both methods of technology integration (through every subject area or utilizing a technology curriculum taught through specific subject areas) are viable options. Unfortunately, neither method totally supports school personnel in the challenging task of integrating technology.

It is apparent from the discussions focused upon technology leadership, teachers, and technology integration to this point, that technology integration presents challenges for teachers, principals, schools, and school districts. Teachers and principals face the huge task of reinventing schools and classrooms in a society that has been transformed by digital technologies. Many educators feel overwhelmed by the mandate to integrate computer technology into the curriculum (Li, 2007), despite the professional development that some educators have received. In the past, certain technology was too expensive for school districts. Schools had to incur the cost of purchasing hardware, software, and basic training. And now that studies have shown that “access” and knowing how to use the technology on a functional level is not sufficient to improve academic achievement (Mills & Tincher, 2003; Wecker, Kohnlet, & Fischer, 2007),
school districts have incurred another expense in providing professional development to educators on how to appropriately integrate technology into the school curriculum. According to Dawson and Rakes (2003), the more technology training the principal receives, the higher the level of technology integration in his or her school. Principals and other educational administrators often treat technology and its intended use as a separate entity despite the NCLB mandate and EETT program. As evidenced by the national technology plan and the multitude of funding sources that public schools receive for technology (USDOE, 2004; SETDA, 2010), the problem is not necessarily lack of funds, but lack of adequate training and understanding of how the emerging technologies can be used to enrich the learning experience (Finger & Houguet, 2009; Hofer & Swan, 2008).

Literacy in America

People living in the United States have the opportunity to be productive in the workforce through education. In the industrial age, reading, writing, and arithmetic were basic skills taught in public schools to prepare students entering the workforce. In the digital age, educators are charged with preparing the present and future workforce of America by incorporating 21st century skills into the academic curriculum (Dede et al., 2005; IRA, 2009). This opportunity exists and is needed based on the demands of a changing global workforce (industrial to digital) and the needs of organizations to participate in an increasingly global, interconnected world.

Global communication and access to information has transformed not only the workforce and economy but also how people use emerging technologies to access information (Dede et al., 2005; IRA, 2009; SpeakUp, 2007). People seldom write and read printed hard copies of memos, letters, newspapers, magazines, and other media that they have little control of regarding the
content. They are much more likely to utilize a piece of technology, access the Internet and search for whatever information that they feel is pertinent to them, sometimes using the same publications only through an electronic source. This is an example of literacy defined by today’s standard known as the digital age; not just being able to read and write information that is placed in front of you, but having the ability to retrieve it, process it, and utilize the results yourself (Leu et al., 2004).

A person’s literacy, numeracy, and oracy (ability to articulate oneself) are important factors in demonstrating readiness and competence for the workplace, in particular the 21st century workplace. The ability to articulate one’s knowledge is important to show competency in a particular area. Literacy and numeracy are terms used to identify if a person possesses and/or comprehends knowledge in various skill areas. The term literacy has recently been used to identify, group, and measure the understanding of present day emerging technologies. The importance of having technology literacy skills in today’s world (the digital age) is just as important as having basic literacy skills during the industrial age (Hutchison & Reinking, 2011).

**Traditional Literacies**

The term “literacy” in America has evolved with the progression of schools and society since the forming of colonies back in the 1600s (Urban & Wagoner, 2009). Basic skills such as reading and writing contributed heavily to a person being considered literate in the past and in today’s society. At one time, literacy was determined by a person’s ability to recall information that was read to him or her. In other parts of America, literacy was determined by a person’s ability to write his or her name. As time progressed, a more challenging determination of literacy emerged which required a person to be able to read certain scriptures from the Bible, which
eventually became any scripture in the Bible. Literacy, for the most part, has always been associated with a person’s ability to read and write and not necessarily to do arithmetic, as evidenced from the examples above.

Arithmetic, which is actually a part of numeracy, is also a basic skill area. Numeracy, commonly referred to as mathematical literacy, is universally acknowledged as a key skill in life. Numeracy can be defined as the following set of skills: number sense, operation sense, computation, measurement, geometry, probability, and statistics. The understanding of numbers in measurements, ratios, computation, and other mathematical skill areas has been vital to the development of the world from an architectural perspective (Gradwell, Welch, & Martin, 2000). The basic skill areas of arithmetic, writing, and reading have been vital in the development of new literacies throughout the world. Without these basic skills, communication would be restricted among people. If people were not able to understand these beginning levels of computing and communicating, sciences and technologies that are continuing to be studied and built upon today probably would not exist. As stated by Leu et al. (2004),

Foundational literacies will continue to be important within the new literacies of the Internet and other ICTs. In fact, it could be argued that they will become even more essential because reading and writing become more important in an information age. Reading, writing, and communication will assume new forms as text is combined with new media resources and linked within complex information networks requiring new literacies for their effective use (p. 1590).

Emerging New Literacies

New literacies have emerged as a result of the emerging technologies. “The Internet and other ICTs have become central technologies of literacy for a global community in an information age” (Leu et al., 2004; Williams, 2009). The Internet alone has impacted globalization more than many other technologies combined. Globalization is a major
contributing factor to new knowledge, communication, and work relations among all nationalities thus providing the gateway for new literacies to emerge in a changing society (Leu et al., 2004; Williams, 2009). The concept of literacy in reference to the emerging technologies has brought needed attention to a new area of student performance. Technology literacy is becoming, in a sense, a basic literacy component of the 21st century. As stated by Amtmann and Poindexter (2008), “Technological literacy, computer literacy, computing literacy, and information literacy are overlapping terms referring to the ability to use technology to solve problems, communicate, and aid education” (p. 281). Information and communication technologies (ICT) literacy has become an expectation in the global workforce. Twenty-first century skills encompassing ICT literacies are also becoming a part of the K-16 academic curriculum due to the skills required of students entering the work place. The PISA study of 2003 stated:

An effective use of ICT in schools can have an immediate positive impact on the schools’ learning environment. Successful use of ICT in schools can help students develop skills, both specific to ICT and more generally, that will be useful for them in their future academic and professional lives. Such students will have the advantage of being familiar with different media common to the modern workplace, and should be able to use these ICT skills to access, compile, synthesize and exchange information effectively. (OECD, 2005, p. 9)

Technological literacy in past years may have been regulated to computer skills and how people used computers to improve learning, productivity, and performance. However, an updated definition of technological literacy would include similar performance outcomes with an array of technologies and not just computers. The State Educational Technology Directors Association (SETDA, 2010) agreed that a common definition to be utilized by the states was needed to define technology literacy. The SETDA panel defines technology literacy as, “The ability to responsibly use appropriate technology to communicate, solve problems, access, manage, integrate, evaluate,
and create information to improve learning in all subject areas and to acquire lifelong knowledge and skills in the 21st century” (n.p.).

Certain aspects of technology are considered when a person is considered to be technologically literate. Britton, DeLong-Cotty, and Levenson (2005) stated that technologically literate students need to gain formal knowledge about the nature of technology, technology and society, the design process, and the designed world. Technology literacy is most associated with being able to use technology in terms of operations. Other aspects of technology literacy include the retrieval and dissemination of information as well as the development of products.

Computer literacy at one time was the only technological literacy that mattered to most organizations when technology became useful for schools and businesses. In fact, jobs in corporate America rewarded workers that not only had college degrees but also had computer literacy. Workers who were considered to be computer literate were considered skilled workers. In a longitudinal study on wage inequality, Wheeler (2005) detailed how wage inequality had become greater with the advent of skilled workers based on their job function involving computers. School districts across America also recognized technology as a needed resource to expedite administrative daily routines and improve student achievement. Educational software applications and the Internet remain to be pivotal resources in the development of students’ technology literacy (Chang, 2008). According to the aforementioned study, students who accessed the Internet for homework were more computer literate than students who did not. Conversely, Wecker et al. (2007) reported findings that do not support computer literacy as being a positive acquisition for students in different subject areas. In fact, their study revealed that having computer literacy does not always or automatically indicate that you acquire more
knowledge when applying or using computer technology to learn about other academic subject areas.

The concept of computer literacy has been absorbed into broader concepts such as information and communications (ICT) literacy and in some cases has faded away from library literature (Childers, 2003). Most often, computer literacy will be referred to in terms of a set of computer skills or competencies. As broader concepts regarding literacy have emerged, computer literacy has become viewed as a skill set and not a literacy.

Nonetheless, students must show proficiency of computer skills as assessed by the Eighth Grade Technology Literacy Assessment (EGTLA) and the 21st Century Skills Assessment (21st CSA) to be considered computer literate at the middle school level. A basic understanding of how to use computer hardware, spreadsheets, multimedia and presentation software, database software, telecommunication and Internet resources, systems and fundamentals along with social and ethical issues pertaining to computer uses and its management are requirements of computer literacy at the eighth grade level (www.learning.com). The Library Network Technology Committee also recognizes many of these same basic computer competencies identified by learning.com and the EGTLA as computer literate criteria (http://tech.tln.lib.mi.us/finalbasic.htm). Because of technological advancements, the evolution of the digital age, and all of the new technologies, literacy has begun to take on a more comprehensive definition even for middle school students as evidenced by the updated technology standards for teachers and students and the adoption of the 21st CSA.

The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2005) defines literacy as the “ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a
continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society” (UNESCO, 2005).

The development of technologies such as the Internet has changed how society accesses, processes, and communicates information. Literacies have emerged that will become a part of the digital age. The most common literacies (information, technological, computer, and information and communication) are perhaps viewed as foundational to the emerging literacies of the 21st century. Digital literacy is just as vital today as the three R’s were in the industrial age. A brief description of each of the literacies will be examined below to see how different literacies have evolved from technological advancements.

Today’s Literacies

Information Literacy

The definition of information literacy has been redefined many times. Present and past literature refers to information literacy as “the ability to recognize the need for information, how to discover, assess and utilize the information effectively” (ACRL, 2002; ALA, 1989).

Information and Communication Technology (ICT) Literacy

Information and communication technology (ICT) literacy as defined by the International ICT literacy panel is “using technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society” (http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf). ICT literacy has become an “umbrella” literacy for previously mentioned literacies (information, technology and computer).
Emerging technologies have prompted the need for “new literacies.” The desire to access, produce, and do “things” faster, more efficiently, and on a larger scale requires people to use technology and become “multiliterate” (Williams, 2009). Just as the terms technology literacy and computer literacy have been replaced by ICT literacy, new literacies continue to emerge as technology evolves. A brief description of each “new literacy” will be examined to see how emerging literacies have evolved from technological advancements and past literacies.

Digital Literacy

Digital literacy, as defined by the University of Illinois at Urbana-Champaign, is as follows:

The ability to use digital technology, communication tools or networks to locate, evaluate, use and create information; the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers; a person’s ability to perform tasks effectively in a digital environment.

(www.digitalstrategy.govt.nz/Media-Centre/Glossary-of-Key-Terms/)

Digital literacy is the skills required to access, navigate, and create digital materials using various technologies. Basic digital literacy skills consist of using computers and mobile devices, software and applications, the Internet for communicating, searching, and posting information within a safe, legal, and ethical manner (http://www.digitalliteracy.gov/content/learner).

Visual Literacy

Visual literacy, as defined by the Association of Colleges and Research Libraries, is defined as follows:

A set of abilities that enables an individual to effectively find, interpret, evaluate, use and create images and visual media. Visual literacy skills equip a learner to understand and analyze the contextual, cultural, aesthetic, intellectual, and technical components
involved in the production and use of visual materials. (http://acrlvislitstandards.wordpress.com/category/vl-definition)

**Media Literacy**

Media literacy, as defined by most organizations, is the ability to access, analyze, evaluate, and create media in a variety of forms (www.medialit.org/media-literacy-definition-and-more). The Center for Media Literacy (one of the first organizations to address media literacy) defines it as a 21st century approach to education.

It provides a framework to access, analyze, evaluate, create and participate with messages in a variety of forms--from print to video to the Internet. Media literacy builds an understanding of the role of media in society as well as essential skills of inquiry and self-expression necessary for citizens of a democracy. (http://www.medialit.org/reading-room/what-media-literacy-definitionand-more)

**The Challenges of 21st Century Education**

Eleven years into the 21st century, technology is regarded as one of the most important entities throughout the world. From basic computers equipped with Internet capabilities to phones with global positioning systems, the evolution of the digital age continues. The Federal government provided assistance to the 21st Century Skills Forum (which is a partnership consisting of government, business and education) by creating a structure for the understanding and implementation of 21st century skills and technological literacy (http://www.21stcentury skills.org). Based on the Partnership for 21st Century Skills (2009), necessary student outcomes are the skills, knowledge, and expertise students should master to succeed in work and life as the coming century unfolds:

- The three Rs in core subjects
- Creativity and innovation
- Critical thinking and problem solving
Three of the skills listed: information literacy, media literacy, and ICT literacy seem to be related to the concerns of the study in a meaningful manner. As implied throughout this study and stated by Wagner (2010), 21st century teaching and learning is needed for students to be prepared for today’s workforce. Additionally, these skills have been requested by business leaders and incorporated into many non-traditional schools that are led by advocates for a better public education (Wagner, 2010). More specific attention to positions taken by Wagner will be cited later in support of the current focus on student literacy performance and preparing students for today’s workforce.

A 21st century education has become important to America’s government, businesses, and other stakeholders based on the global workforce and America’s inability to manufacture new jobs for its citizens (Dede et al., 2005; Wagner, 2010). The United States is struggling to compete with other countries in the areas of manufacturing, technology, science, and labor costs. The competitive advantage that America once had has now dissipated due to a variety of factors, most notably the changing needs of the world.

In the digital age, emerging technologies require future workers to have new literacies, new skills, and global awareness. ICT skills, math and science skills, creativity, and the ability to solve complex problems will be expected of the 21st century worker (Business-Higher Education Forum, 2005). These skills and others are needed to compete in a global marketplace that is constantly and rapidly changing do to technological innovations and global needs.
The Partnership for 21st Century Skills (P21) uses four areas to describe a 21st century education. The four areas are core subjects and 21st century themes, learning and innovation skills, information, media and technology skills, and life and career skills. The areas are further broken down into six elements, some of which repeat from core subject areas: core subjects, 21st century content, learning and innovation skills, ICT literacy, life skills, and 21st century assessments. Each area has indicators that help describe and make up the overarching area.

*Core Subjects and 21st Century Themes*

The area of core subjects and interdisciplinary themes basically entails the core subject areas including world languages and general courses such as history, geography, arts, government and civics, science, world languages, and economics. The 21st interdisciplinary themes include global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy, and environmental literacy. The area of core subjects and interdisciplinary themes addresses the need for students to master not only the core subject areas but also 21st century interdisciplinary themes that need to be taught by teachers.

*Learning and Innovation Skills*

The second area, learning and innovation skills, is made up of creativity and innovation, critical thinking and problem solving, and communication and collaboration. This area addresses the need for students to be collaborative communicators, which is easily accomplished through social networking. Davidson et al. (2010) posited that the future of learning institutions will rely heavily on social networking through the Internet. Students have to apply the knowledge that they have attained and use it to be innovative and entrepreneurial.
Information, Media, and Technology Skills

The third area, information, media, and technology skills references the following literacies: information literacy, media literacy, and ICT literacy. These literacies are the new basic skills literacies that are recognized globally and expected of students and workers in the digital age.

Life and Career Skills

The fourth area, life and career skills, involves flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility. These skills are reminiscent of the seven survival skills that Wagner (2010) references in his book, The Global Achievement Gap. The life and career skills basically call for students to be multi-talented risk-takers that are not afraid to make their own way in a competitive society.

In light of the preceding discussion of the challenges of a 21st century education, the 21st century classroom, according to visionary administrators and students, is a student-centered, technology-rich environment with laptops, multi-media equipment, interactive whiteboards, online databases, communication tools, learning management systems, student email or IM access, games and virtual simulations, and unlimited student access to the Internet (SpeakUp, 2007). Even at the elementary school level, teachers and students are utilizing digital tools to create the 21st century classroom experience. Swan, Hooft, Kratcoski, and Unger (2005) did a study on approximately 500 elementary and middle schools in the Midwest, where they examined how teachers have incorporated 21st century technology into the classrooms to increase student motivation, engagement in learning activities, and quality student work. They
found that the use of mobile computing devices increased student motivation and engagement in learning activities. These classrooms exist throughout the nation and in virtual environments through online classes.

A multitude of states and school districts have invested in online classes to meet the needs of students and 21st century learning. While high school student interest in taking an online class rose 21% from 2007 to 2008, the big increase was actually among middle school students, which boasted a 46% increase (http://www.tomrrow.org). Students’ primary reason for taking an online class was to get extra help in a subject (44%) in which they were struggling thus viewing online learning as a tool for their own self-directed remediation.

In a challenging and timely publication entitled, The Global Achievement Gap, Wagner (2010) pulled most of the previous discussion together when he wrote about how even our best schools in America are failing our children. His thoughts are cited in some detail in closing this chapter. His claim is that the current school-based curriculum does not challenge students to think analytically but merely to regurgitate information that was spoon-fed to them by their teachers. He even brings light to America’s teacher education preparation programs when he discusses core competencies vs. content coverage. He makes the point that colleges and universities are teaching educators a range of courses that do not necessarily prepare them for teaching or being an administrator.

Advocates and critics of public education believe that schools are teaching students how to succeed on state tests and not how to succeed outside of the classroom (Dede et al., 2005; Wagner 2010). This has become evident by the number of students dropping out of college, the number of students enrolling in remedial college courses (during the first year of college), and the constant requests from business leaders for workers that have 21st century skills (Wagner,
Schools are still stuck in the Industrial Age where teaching students to be citizens and mastery of the three R’s and testing were most important. A call for a new curriculum or at least one that involves 21st century teaching and learning is overdue. Wagner (2010) believed that there are seven survival skills needed by students for careers, colleges, and citizenship as they move further into the 21st century. The seven skills that are quite similar to the Partnership’s list included earlier in this chapter of the study are as follows:

1. Critical Thinking and Problem Solving
2. Collaboration Across Networks and Leading by Influence
3. Agility and Adaptability
4. Initiative and Entrepreneurialism
5. Effective Oral and Written Communication
6. Assessing and Analyzing Information
7. Curiosity and Imagination

The seven survival skills are considered to be the “new basic skills” for work, learning, and citizenship for the 21st century (Wagner, 2010). The first skill, critical thinking and problem solving, equates to students being able to ask good questions. The second skill, collaboration across networks and leading by influence, references people being able to work in teams, specifically virtual teams, as they collaborate globally on worldly problems. Leading by influence refers to how citizens influence diverse groups to work together toward a common goal. The third skill, agility and adaptability, refers to employees’ ability to think, change, be flexible, use a variety of tools, solve new problems, deal with ambiguity, and learn on the fly. As stated by Dede et al. (2005), “Workers must be prepared to shift jobs and careers more frequently, to be flexible and adaptable in acquiring job skills, and integrate and focus a changing mix of job-specific and educationally generic skills on business processes and problems” (p. 10). The fourth skill, initiative and entrepreneurialism, calls for employees to take the initiative in finding solutions to problems and create their own jobs. The fifth skill, effective
oral and written communication, entails graduates being able to communicate through presentations, writings, and orally with members of their team and external communities. Sometimes it is not enough to just read what you see, you have to be able to interpret and communicate what you see effectively. Potential employers want employees that are clear and concise in their communication with other people. The sixth skill, assessing and analyzing information, references a person’s ability to manage, decipher, and use pertinent information given an influx of information. The seventh skill, curiosity and imagination, details how employees should be creative and innovative in solving problems or creating solutions.

As discussed above, Wagner (2010) has apparently done an admirable job in describing the components of the necessary skill sets that students need to possess for 21st century learning in schools and placement in the global workforce. It appears that he has pulled much of the developing thought relative to the challenges of the emerging technologies together and directed them at the schoolhouse door. This study will provide direction and foresight to current and future educational stakeholders informing them on the role of technology in schools in addition to the skills and literacies needed by teachers and students to ensure global awareness and a competitive workforce among our students.
CHAPTER 3

METHODOLOGY

Background

Elements embedded in the No Child Left Behind (NCLB) legislation (2001) called for focused attention in the public schools regarding technology literacy. Based upon the need to develop the technological literacy skills of students, the emerging technologies are tools being used to prepare students to live and work in an Information Technology Era. In support of the expectations generated by NCLB, funding levels at all levels of government have been increased in recent years to ensure that the infrastructure demands of the emerging technologies are more adequately met (SETDA, 2010). Additionally, the NCLB legislation focused upon the role of the middle school in the technology efforts and called for an assessment of technological literacy at the eighth grade level in public schools across America. Consequently, the middle schools in the system were a primary focus of the research effort.

Administrative and academic responses to technology literacy expectations have generally been made with a target of successful “technology integration” across all facets of the operation of public schools. The urban school system in the southeastern region of the United States of America in which this study was conducted was an early and continuing participant and advocate of meeting the challenges of the emerging technologies educationally in the best interest of its students. The position was embraced by the urban system that technology literacy is another basic literacy area of increasing concern, perhaps even more important than the traditional literacy areas, which were stressed during the earlier Agricultural Era and the
Industrial Era. An indication of the interest in this school system in attempting to respond to the challenges of the emerging technologies was reflected by its early use of the recommended standardized instruments for assessing the level of student literacy performance of its eighth graders as called for by the NCLB act. The system for the 2011-2012 school year had 5 years of archived test scores that were utilized in a foundational manner in this study. Additionally, the system, as a means of assisting the building principals and in developing a technology leadership team approach at the school level in dealing with this emerging area of needed leadership, established technology coordinator positions within the individual schools and dedicated system-level leadership to this area.

Purpose of the Study

This exploratory and descriptive action research study was undertaken in an effort to reflectively describe and update the initiatives undertaken by an urban school system at the system and school levels to comply with the expectations of the NCLB legislation. Furthermore, the study is expected to possibly help move the system in the direction of successful technology integration in dealing with the emerging technologies educationally. Utilizing the information generated through this action research study, a set of recommendations will be presented for consideration in the development of a data-based improvement plan. This plan will be used to enhance the system’s ability to continue to move successfully forward from a technology integration perspective at the system and individual school level.
Research Design

There are two categories of research that all other research stems from: basic research and applied research (Glanz, 1998). Action research is one type of applied research that educators use when a specific educational problem exist. Creswell (2008) stated, “The scope of action research provides a means for teachers or educators in the schools to improve their practices of taking action and to do so by participating in research (p. 597). Action research implies an orientation to research, a form of professional practice, a research process, and, for teachers, a reflective way of teaching (Arhar, Holly, & Kasten, 2001, p. 15). The same implications obviously apply for leaders and administrators relative to their continuing efforts to improve the operation of the educational units from a continuous improvement perspective.

The steps in action research include determining if action research is the best design to use, identifying a problem to study, locating resources to help address the problem, identifying information you will need, implementing the data collection, analyzing the data, developing a plan for action and implementing the plan and reflecting. (Creswell, 2008, p. 609)

There are two types of action research: practical and participatory (Glanz, 1998). Practical action research is used to solve or improve a school or school district issue. Participatory action research is used to address social and community-based issues with the aim of improving society. This study utilized practical action research in an attempt to answer research questions and create a plan of action to enhance successful technology integration in the classroom through technology leadership at the school level that is impacted primarily through the initiatives and practices of the school principal.

Under the action research umbrella, a mixed methods research design, as discussed by Creswell (2008), with quantitative and qualitative dimensions, was employed in generating and
analyzing the data produced by the study. The research was explanatory and descriptive given the possible relationships among the multiple variables that were considered in the study.

Qualitative data exist in this study based on responses to open-ended items from the Technology Integration (TI) surveys utilized with the teachers, technology specialists, and media specialists for each respective school. The technology and media specialists’ responses to these open-ended items were considered at the individual school levels in relationship to the results of the quantitative dimensions of the study. The responses were considered across the middle schools with consideration given primarily to any differences in schools with higher levels of student technology literacy performance and those with less promising student results.

The quantitative data generated in the study was organized and presented in tabular formats that allowed the use of appropriate statistical analysis procedures in exploring any possible relationships among variables in keeping with the exploratory nature of the study. The small numbers generated by the Convenience Sample of the eight middle schools in the urban system limited the ability to utilize more advanced statistical analysis when comparing the results from these schools.

Research Questions

1. How do the school technology literacy scores vary across schools and across the 5 years covered by the study?

2. Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and the teachers technology integration school scores as measured by the Teachers Technology Integration Survey?
3. Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and school scores as measured by the technology literacy assessments’ of eighth grade students in the individual middle schools?

4. Is there a significant difference in the teachers technology integration scores among the teacher groups by discipline?

Populations

The basic population for the study consisted of eight middle schools in an urban school system in the Southeastern region of the United States. Based upon a preliminary review of the student performance data over the 5 years of the study, it was decided by the district to include the top four middle schools and four additional middle schools chosen from a specific region (the researcher’s region) of middle schools in the system. The individual middle schools, teachers, technology specialists, and media specialists, respectively, were the basic units of analysis with respect to the different analysis conducted.

The media specialist, technology specialist, and teachers in each of the eight middle schools were asked to participate in this study. Every teacher in each school was asked to participate in this study, which was solely for the purpose of the researcher’s study. The participants in the study included 8 media specialists, 5 technology specialists, 19 language arts teachers, 26 math teachers, 22 science teachers, 24 social studies teachers, 10 special education teachers, and 5 teachers who did not identify themselves in any category listed. The combined list of respondents totaled 119 participants in eight middle schools. Each media specialist and technology specialist from the eight identified schools participated in the study providing a 100% response rate for these two groups, respectively. The response rate for teachers, however, was
only 31% in which 106 of the 342 teachers participated in the study. Teacher participation rate by subject area was not obtained at the time of the study. Participants that did not disclose item information were not removed from all sample analysis, only analysis that involved the item information that they omitted.

Instrumentation

Exploratory descriptive research of the type undertaken in this study was conducted using an instrument(s). An instrument, as defined by Creswell (2008), is a tool for measuring, observing, or documenting quantitative data. An example of an instrument could be a test, log, questionnaire, assessment instrument, tally sheet, or even a survey. Whatever tools a researcher decides to utilize, their use must provide valid and reliable information that lends itself to successful analysis and subsequent presentation in understandable forms.

Principal’s Survey Booklet

Three of the surveys utilized in this study contained items that were influenced by content from the Principal’s Survey Booklet (Anderson & Becker, 1998). The Principal’s Survey Booklet (Anderson & Becker, 1998) was modified in developing surveys and an interview guide. Only questions that pertained to seven distinct areas--Technology Policies, Technology Committee, Technology Grants, School Technology Budget, Technology Integration, Technology Uses, and Unmet Technological Needs--were a part of the amended survey. Additionally, questions that referred directly to the principal were reworded to address the Technology Specialist, Media Specialist and Teacher as Technology Leader. The Principal’s Survey Booklet (Anderson & Becker, 1998) and the Technology Specialist Survey (Appendix A)
were field tested for validity and reliability perspectives. The instruments ( Principals, Technology Specialists, and Teachers Survey booklets) created by Anderson and Becker were used in a series of national studies that have been conducted on school computer use since 1983. The surveys are endorsed by the International Society for Technology in Education (ISTE) and have been utilized in purposeful sampling of schools. Information from approximately 4,100 teachers, 800 technology coordinators, and 850 principals has been compiled from 1,150 schools using these instruments as the primary data source. More recent attention to and discussion of these instruments was provided by Anderson and Dexter (2005) in an article that has served as a point of departure for this component of the current study.

Permission to utilize the instrument(s) was received through an email and letter exchange between Anderson and the researcher (Appendices E and F). In the modified replication of their use in this study, the School Technology Leadership Survey (STLS) served as a structured interview guide with the technology specialists’ and technology chairperson (media specialist) of the individual schools as a part of a Technology Leader group.

Five instruments were used to collect the data for this study: Eighth Grade Technology Literacy Assessment (EGTLA), 21st Century Skills Assessment (21st CSA), School Technology Leadership Survey (STLS), Teachers Technology Integration Survey (TTIS), and Technology Specialist Technology Integration Survey (TSTIS). The EGTLA and the 21st CSA are two different assessments that were used to measure eighth grade technology literacy of students. These two data pieces were analyzed and scored independently of each other due to the fact that the assessments measured different components of technology literacy. The following section will describe each of the instruments used in this study.
Eighth Grade Technology Literacy Assessment (EGTLA)

The EGTLA is comprised of 42 multiple choice and performance-based questions that measure eighth grade student technology literacy. By design (performance-based and multiple choice questions/responses) many questions require the demonstration of step-by-step procedures to receive credit for correct responses. Additionally, multiple-choice items require a correct response to be chosen to receive credit for correct responses. The questions assess computer literacy from the standpoint of operating and utilizing computer hardware and computer software. Scores from the EGTLA (for the first three school years covered by the study) were calculated by a computer-based program and stored electronically on the host’s database. The scores were presented on an annual basis in rank order by percentages of students’ deemed proficient each year. Attention was given to increases and decreases in school scores for each of the 3 years covered by the assessment and to the school averages in considering the individual school data. Sample question types are as follows:

1. Which is an improper use of an online chat room?
   A. Forming study groups with friends
   B. Asking about a class you missed
   C. Posting gossip about classmates
   D. Making plans for a surprise party

2. Create a bar chart with the following data.

<table>
<thead>
<tr>
<th>Biggest Countries</th>
<th>6,592,772</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>3,851,809</td>
</tr>
<tr>
<td>Canada</td>
<td>3,717,813</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>3,717,813</td>
</tr>
<tr>
<td>China</td>
<td>3,705,407</td>
</tr>
<tr>
<td>Country</td>
<td>6,592,772</td>
</tr>
</tbody>
</table>

3. What does a file’s extension tell you?
   A. What kind of file is it
   B. How much memory space the files has
   C. Who wrote the file
   D. Where the file is located
The assessment was administered to all eighth grade students. The assessment was created by learning.com, which is an online resource center for various subject areas. The Eighth Grade Technology Literacy Assessment (EGTLA) is psychometrically validated (www.learning.com/techliteracy-assessment). The EGTLA is a standardized assessment and considered to be an acceptable measure of eighth grade technology literacy (www.gadoe.org/it.aspx?PageReq=ToolKit). A Rasch Analysis of the items on the EGTLA indicated that the items on the assessment have a high range of reliability from the high .80s to the low .90s (Condon, 2009). The instrument meets the acceptable definition as defined by Creswell.

21st Century Skills Assessment (21st CSA)

The 21st CSA was also used to measure eighth grade student literacy and is comprised of a combination of two sets of 40 multiple choice and performance-based questions. Similar to the EGTLA and because of the design of the assessment, (performance based and multiple choice questions/responses) many questions require the demonstration of step-by-step procedures to receive credit for correct responses, and multiple-choice items also require a correct response to be chosen. The questions assess technology literacy from the standpoint of computer technology, social media, 21st century skills, and information and communications technology (ICT). Similar to the EGTLA, scores from the 21st CSA (for the last two school years covered by the study) were calculated by a computer-based program and stored electronically on the host’s database. The scores were presented on an annual basis in rank order by percentages of students deemed proficient each year. Attention was given to increases and decreases in school scores for each of
the 2 years covered by the assessment and to school averages in considering the individual school data.

Sample question types are as follows:

1. You want to post club rules and information online that only other club officers can make changes to, and other pages that any member can update. Which of the tools listed would be the best choice for this?
   A. A discussion area
   B. A blog
   C. A Chat room or instant messenger
   D. A wiki

2. Save this document to your desktop as an html document titled cleanup.html

3. Add a footer to the document below.

Kyoto was six years old when the aliens landed in Tokyo. Her parents huddled around the TV news all weekend. People on the street hurried by listening to reports on their mobile devices. They walked past her house with grim faces that matched the concern she saw in her parents’ eyes.

The assessment was administered to all eighth grade students. The assessment was created by learning.com, which is an online resource center for various subject areas. The 21st Century Skills Assessment (21st CSA) is psychometrically validated (www.learning.com/techliteracy-assessment). A Rasch Analysis of the items on the 21st CSA indicated that the items on the assessment have a high range of reliability from the high .80s to the low 90s (Condon, 2009). The 21st CSA is a standardized assessment and considered to be an acceptable measure of eighth grade technology literacy (www.gadoe.org/it.aspx?PageReq=ToolKit). The instrument meets the acceptable definition as defined by Creswell (2008).
School Technology Leadership Survey (STLS)

The School Technology Leadership Survey (STLS) was administered to the individuals identified as the technology leaders who are the technology specialist and the media specialist for each respective school. Each school technology leader group (technology specialist and media specialist) that participated in the survey obtained a STLS score which contributed to a school rating between 0 and 14 with 14 being the highest score and 0 being the lowest score.

The STLS is a survey comprised of 12 items with 26 sub-questions embedded into the 12-item survey. Five items (along with their accompany sub-questions) on the STLS were used as filler items. One item (along with two sub-questions) was used as a demographic item. The content of the items and sub-questions were related to the following areas: technology usage, technology communication, and technology integration. The other six items (along with their accompanying sub-questions) were used to calculate the STLS score for each school. One item assessed technology policy in which 12 sub-questions were asked (two of which were filler sub-questions), two items assessed technology planning, and three items assessed technology finance (one of which was a filler item). All filler items were used for the purposes of demographic information and/or supplemental information regarding technology uses, technology integration, technology leadership, technology needs, technology communication, technology budgets, and technology policies for the purpose of having a better understanding of technology and its impact on technology leadership.

The STLS was developed from the Principal’s Survey Booklet (Anderson & Becker, 1998), which is the fifth in a series of national surveys conducted on school computer use, dating back to 1983, and which happens to be endorsed by a plethora of national educational endorsers. Sample items from the Principals Survey Booklet include some of the following questions:
1. Does your school have a computer technology committee?

2. Which groups of people do you regularly email as Principal?

3. During the current school year as Principal, approximately how many person days (8 hour days) did you spend on technology planning, maintenance, or administration?

Questions from the Principals Survey Booklet (Anderson & Becker, 1998) were modified (by rewording the questions) to reflect statements being asked of the “Technology Leader” opposed to the principal and questions about “computer technology” were modified (reworded) to reflect “technology” as a larger entity. The questions were reworded as follows:

1. Does your school have a technology committee?

2. Which groups of people do you regularly email as Technology Leader,

3. During the current school year as Technology Leader, approximately how many person days (8 hour days) did you spend on technology planning, maintenance or administration?

_Teachers and Technology Integration Survey (TTIS)_

The Teachers and Technology Integration Survey (TTIS) was administered to teachers and media specialists. The TTIS (Appendix B) assessed teachers’ perceptions and attitudes about technology integration and technology support from the teacher’s point of view. The survey was given to teachers and media specialist based on the fact that media specialists taught Reading courses and, in some cases, Social Studies courses in this district. The scoring for this instrument regarding both groups (teachers and media specialists) were the same given the job descriptions for this particular initiative.
The Teachers and Technology Integration Survey (TTIS) is a survey comprised of 32 questions. Questions were rated on a 6-point Likert-type scale with a rating of 1 = Totally Disagree to 6 = Totally Agree. Fifteen questions on the TTIS contributed to a teacher score for each teacher that took the survey. Additionally, five open-ended items assessed “needed assistance for teachers from an instructional standpoint” regarding technology integration. Twelve demographic items concluded the survey. The survey was scored according to the following criteria: a sum of the points tallied from the Likert scaled items was calculated for each respondent. The higher the point value, the presumed higher degree of technology integration by the respondent within his or her instructional setting.

Sample item types of the aforementioned items include the following questions:
“Personally, I am committed professionally to developing my abilities to utilize the emerging technologies in my role as teacher,” “My school system/middle school should make efforts to respond to the emergence of technology literacy as a necessary step in preparing our students for an increasingly digital/global world, and “Successful movement in the technology integration direction is a priority in the school system.”

Five open-ended items were included in the survey where respondents have the opportunity to rank order responses, discuss, and provide additional details for specific survey questions.

Sample items include the following questions: “List in rank order from the list of the following things that you have found to be most useful in your administrative/record keeping/communication role as teacher: the technology integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment;” “List in rank order the things that you have found to be most useful in your classroom/instructional role
as teacher: technology integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment;” “Provide any additional comments that you feel might be useful as your system and your middle school continue to move successfully in a Technology Integration direction.”

Lastly, six demographic items were used to provide information on the participants. Sample items include the following questions: “Total Years of teaching experience_______,” “Primary Content Teaching Field/Assignment_____________________________________,” and “Grade Level__________________.”

*Technology Specialists and Technology Integration Survey (TSTIS)*

The Technology Specialist and Technology Integration Survey (TSTIS) was administered to technology specialists. The TSTIS (Appendix A) assessed technology specialists’ perceptions and attitudes about technology integration and technology support. The TSTIS was developed primarily from the previously discussed Principal Survey Booklet (1998) from the Anderson and Becker research.

The TSTIS is a survey comprised of 27 questions. The TSTIS items were adapted to address the audience of support personnel. Twenty-one attitudinal and perceptual survey items were drawn from an information strand from the earlier research and generated information for consideration by decision makers in keeping with the data-based/improvement goals of the action research study. Fourteen items contributed to a school score on the TSTIS. The responses to these items and to the seven qualitative items were analyzed individually in the study and considered in exploring possible information strands and trends from a qualitative perspective in support of the improvement goals of the school system. Responses to the TSTIS from a school
score perspective and on an individual item basis were explored with the demographic items as analysis variables.

The first 14 questions are evaluated on a 6-point Likert-type scale with a response set that ranges from *Totally Disagree* to *Totally Agree*. These questions assess technology specialists’ thoughts on the support that they believe they receive from their middle school and the district in the area of technology integration and the use of emerging technologies in schools. Additionally, seven open-ended items assess specific entities that were found to be “useful” from an administrative/recordkeeping/communication standpoint in addition to things that were seen useful from a classroom/instructional standpoint regarding technology integration. Six demographic items conclude the survey. Sample items include the following questions:

“Teachers are included and their concerns are considered in planning and decision-making processes related to the technology integration movement in the middle school in which I work,”

“Needed staff development assistance has been available in efforts to deal increasingly with the emerging technologies in my assigned middle school,” and “My assigned middle school is current with respect to appropriate policies and operational guidelines with respect to allow it to deal effectively with the challenges of the emerging technologies.” Seven open-ended items are included in the survey whereas respondents have the opportunity to rank order responses, discuss, and provide additional details for specific survey questions.

Sample items include the following questions: “List in rank order the things that you have found to be most useful in your classroom/instructional role as teacher: technology integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment,” “Does the middle school in which you work as a technology specialist vary in its movement in a positive direction with respect to dealing with the emerging
technologies as compared to other middle schools in the system? If so, please discuss that
variability with respect to the development of an Action Plan as an outcome of this study that
will assist in moving the system and the middle schools productively forward,” “Provide any
additional comments that you feel might be useful as your system and their middle schools
continue to move in a Technology Integration direction.” Lastly, six demographic items were
used to provide information on the participants. Sample items include the following questions:
“Years as a technology specialist in your middle schools________,” “Years in other
administrative/support positions in this school system________,” “Total Years of experience
in education____.”

Student Literacy Performance Assessment

Student data (i.e., score reports) from both assessments were coordinated and compiled
by Learning.com. The availability of both assessments for student use was determined at the
system level where schools were given a 2-week period to assess every eighth grade student. The
testing environment consisted of a computer lab where a test examiner (computer lab teacher),
test proctor (technology specialist) and classroom teacher were present during the assessment.
The test examiner and test proctor were required personnel that had to be present during the
assessment as required by the guidelines of students taking standardized assessments. The
classroom teacher typically accompanied his or her class to the lab and remained there for
classroom management and support only.

The assessment questions were available only to students that were in the eighth grade
that had a State Test Identification Number (STID). These numbers were imported into the
learning.com system and used as login credentials for students to access the assessment. Students
were read a script by the proctor before the beginning of the test that stated that the test results would not be used against them and that the teacher could not help any student with the content of the questions. The assessment questions were randomly disseminated so that students did not have the same questions simultaneously. Students had to get 70% of the questions correct in order to be considered proficient. The LEA requires that each school must also have 90% of their students that tested pass with a score equivalency of at least 70 in order to be considered proficient. The results of the assessment were exported to the Local Education Agency (LEA) and the State Department of Education (SDOE).

Student scores are typically indicative of their understanding about technology based on the fact that technology literacy has not been categorized as a pass/fail component for meeting school improvement targets or viewed as a reflection on the principal or the school. This has enabled schools to get a true indication of students’ abilities regarding technology. It is a sad reality that teachers’ knowledge of technology has been somewhat limited thus their ability to provide assistance or pass this same assessment may be questionable. Dishonesty and/or tampering with scores of the technology literacy assessment is unlikely based on the following:

- There is no federal or state mandate indicating that students must pass
- Neither students nor teachers are penalized for low test scores
- All eighth grade students don’t have to take the assessment

After students take the assessment, they must click a button that reads, “Turn In Test.” Once that button has been clicked, no one can alter student responses without having administrator credentials, which would only allow that person to restart the assessment for that student.
As indicated by the score reports published by the state department of education, the EGTLA and 21st CSA appear to be more rigorous and reliable regarding the performance of technology literacy of eighth grade students than other measurement tools used in the state.

**Data Collection Procedures**

Data collection has two aspects that are common to both quantitative and qualitative research methods. The standardization of procedures in collecting data and the respect of individuals and sites should be of paramount importance at all times (Ivankova, Dreswell, & Stick, 2006). The researcher accomplished both of these expectations by doing the following with respect to the structured interviews with the Teacher/Leader group:

- Used a scripted introduction and closing when conducting the interviews
- Only asked questions that were on the instruments
- Recorded all surveys using an audiotape
- Used an informed consent form
- Assigned corresponding numbers to schools and participants to protect their identity
- Kept all survey responses confidential.

Data collection from teachers was done in a manner that would protect the anonymity of the respondents and the confidentiality of the data. The researcher distributed and collected all teacher surveys at each school during faculty meetings and/or other school meetings. The teacher surveys were distributed without teacher names and/or any other identifying elements. Upon completion of the survey, the researcher collected the survey forms and enclosed them in an envelope to which only the researcher had access. The envelope was identified with a number to allow the researcher to be able to easily identify the school from which the surveys came.

Data collection procedures in a mixed methods research study involves the collecting of quantitative and qualitative information. In accordance with the mixed methods explanatory
research design, the researcher first collects and analyzes the quantitative (numeric) data followed by the qualitative (text) data to help explain the quantitative results obtained (Ivankova et al., 2006).

**Review of Related Research and Documentation**

The following foundational setting, action research steps were undertaken in an effort to meet the data-based system/school improvement goals of the study:

1. An updated comprehensive review of the research and practice literature on the umbrella topic of technology integration was completed in developing a framework through which the initiatives in the system might be studied and reviewed in exploratory and descriptive ways. Primary attention in this review was given to funding/infrastructure, staff development, and technology leadership and outcomes, with particular attention to assessing student achievement in technology literacy. Attention was given also to identifying analysis variables that might be useful in reviewing the data across the individual middle schools in the system. This review was presented in Chapter 2 of the dissertation.

2. A careful historical review was made of system policy and organizational leadership initiatives from the board/central office level that established the operational expectations for and support provided to the individual schools with respect to the technology integration response to the emerging technologies.

3. A review was made of the system and school-level Technology Plans as required by governmental and accreditation procedures and any previous assessment efforts related to those plans.
4. Particular attention was given to the summary reports generated annually for the SDOE in keeping with guidelines that have been established in light of NCLB expectations.

**Technology Leader Group/Structured Interview Data**

In addition to the technology integration surveys, the media specialist, technology specialist, and technology committee chairperson was asked to participate in a structured interview from a team approach for their respective middle school. The structured interview was used to better understand the data obtained from the technology integration surveys and ensure a more accurate description of what is transpiring with technology in that particular school. In most cases, the media specialist was the technology committee chairperson. The structured interview was centered on questions from the principal’s survey booklet (Anderson & Becker, 1998) to provide possible next steps for the school and the action research initiative for the district.

The researcher conducted the interview with the two-person and sometimes three-person technology leaders by using a script to explain the purpose of the interview and use of the information gathered from the interview. The technology leaders’ responses were audio recorded using a laptop computer and handwritten on the STLS by the researcher. The technology leaders were not given a copy of the STLS to answer the questions before, during, or after the interview. The researcher instead read the questions one by one to the respondents and instructed them to come up with a consensus response to each question before the researcher transcribed the answers on the STLS. At the conclusion of the interview, the respondents were given the opportunity to ask questions of the researcher regarding the STLS and the TTIS. Respondents were also given their results of their school’s TTIS score for their respective school. At that time,
comparisons were made between the school’s TTIS average score and the responses from the STLS.

To ensure the accuracy of the responses, and the correct interpretation of the participants’ responses, member checks (Teddlie & Tashakkori, 2009) were conducted with an alternative technology specialist who was knowledgeable about the dynamics and technology leadership of the school. In the interest of focusing and controlling the time demands of the interview process, survey items that involve standard answers for the urban school district that are known by the researcher, o, are available from other documented sources, were not included in the interview.

Demographic data that consisted of gender, age, and ethnicity were obtained from the individual technology integration surveys. Additionally, technology infrastructure data on the school, staff, and students was obtained through the SDOE website. The media specialists, technology specialists, and teachers were given the option of responding to the TTIS electronically or on a paper document with the researcher conducting the process in the respective middle schools.

**Student Performance Data**

The measures of technology literacy performance by the students were obtained through archival data sources through the learning.com website where secured results are maintained on student literacy performance as assessed by the two instruments utilized in the study (www.learning.com). Score reports are available for every eighth grade student detailing technology literacy and proficiency on the EGTLA in the following areas: word processing, multimedia and presentation, spreadsheets, systems and fundamentals, telecommunication and Internet, social and ethical issues, and database. The 21st CSA assesses technology literacy
through students’ skills in creativity, innovation, information fluency, critical thinking, decision-making, and digital citizenship. Eighth grade school technology literacy scores for the past 5 years were compiled for data analysis. As indicated in the discussion of the respective instruments, scores accumulated on the EGTLA were separated from scores on the 21st CSA for analysis purposes.

Data Analysis

The eight middle schools were randomly assigned a number to protect the anonymity of the respective schools in the data presentation and analysis process. Technology literacy scores and percentage of students’ deemed proficient for each of the 5 years on the respective measures were calculated and presented in a rank-order, tabular format by school numbers from 1 to 8. The rank order of the individual schools on these measures was calculated for each of the 5 years of the study. A mean ranking for the first 3 years and the last 2 years of the study was also calculated and presented. A mean percentage for the first 3 years on the eighth grade literacy test was calculated along with a “change score over those 3 years” and presented in tabular format. Similar attention was given to the last 2 years of assessment data.

Structured Interview Data

The School Technology Leadership survey (Appendix D) was the instrument utilized to obtain the School Technology Leadership scores for each school during the structured interview. The instrument was developed by using only the questions from the principal survey booklet that extracted a School Technology Leadership score from the Anderson and Becker study (2005). The items on the instrument were selected specifically for personnel that make decisions
regarding technology at that particular school. Principals’ were excluded from participating in the survey based on the fact that technology specialists and media specialists serve as the technology leaders and technology decision-makers in the school. The technology specialist, media specialist, and technology chairperson for each respective school were the only participants that answered the items on this particular instrument. Although the survey was originally constructed for principal responses, the items within the principal survey booklet were reworded to address technology leaders and/or teachers. For example, a question on the principal survey booklet that read, “During the current school year as Principal, approximately how many person days (8-hour days) did you spend on technology planning, maintenance, or administration” was rewritten for the School Technology Leadership Survey as, “During the current school year as Technology Leader, approximately how many person days (8-hour days) did you spend on technology planning, maintenance, or administration.” Technology leader groups were formed because there were items within the instrument that could best be answered by all three-group members opposed to just one individual (providing a more accurate description and consensus of technology and its multi-facets in the school), thus prompting for the inclusion of the technology specialist, media specialist, and the technology chairperson in the interview process. In most cases, the interview consisted of the technology specialist and the media specialist who basically served as the technology chairperson in the school (as mandated by most principals of the schools’ that participated in the study).

Data analysis of the responses to the quantitative items in the interview began with the calculation of a school technology leadership score for each school based on a similar point calculation criteria used in the Anderson and Dexter (2005) study referenced as technology indicators (Appendix G). All items and sub-questions were scored with a value of “1” if the
component was evident and “0” if the component was not evident, based on the criteria mentioned below:

**Technology Policy**

All questions regarding technology policy were coded/scored with a value of “1” for each policy that was in place at the school.

**Technology Planning**

Schools that had a current technology committee were coded/scored with a value of “1.” Schools that had a technology leader (media specialist) that spent 5 or more days on technology planning, maintenance, or administration during the current year were coded/scored with a value of “1.” One day was considered to be an 8-hour equivalent time period.

**Technology Finance**

Schools that had a site based budget for technology costs were coded/scored with a value of “1.” Schools that obtained specials grants (i.e., technology grants or monies that could fund technology initiatives) within the last three years were coded/scored with a value of “1.”

Based on the responses from the two/three-member group interview, select open-ended items were used to complete the interview. The STLS was comprised of five technology indicators (Technology Committee, School Technology Budget, District Support, Grants, and Intellectual Property Policy).

The individual school technology leadership scores were presented in tabular format by the individual school numbers from 1 to 8 similar to the presentation of the student performance scores discussed earlier. In a similar manner, the individual schools were ranked according to
these school technology leadership score and school technology outcomes scores in preparation for the use of the ranks in exploring the research questions of the study. The tabular presentation formats from the Anderson and Dexter article (2005) were utilized as a means of making descriptive comparisons among the various data sets.

*Technology Integration Survey Data*

School scores on the Technology Integration Surveys were treated in a similar manner in exploring any possible relationships among them and the student literacy scores, school technology leadership score, and school technology outcomes scores. A school score was developed for the attitudinal/perceptual items scored on the Likert-type response scale from a point value of 1 (*Strongly Disagree*) to a point value of 6 (*Strongly Agree*). Small scale, rank-order techniques (McClave, Dietrich, & Sincich, 1997) was also utilized in exploring any possible relationships among those scores and other variables identified in the study. Attention was also given to the responses by the teachers to some of the individual items on the survey which focus upon areas of anticipated importance from the review of the research and practice literature, particularly the Anderson and Dexter study.

*Technology Integration Action Plan*

The current action research study was conducted with the intent to improve technology literacy of middle school students through the use of technology leadership and technology integration. Arharet al. (2001) defined action research as follows:

*A form of teaching; a form of reflective practice and professional learning founded on an ethical commitment to improving practice and realizing educational values. Action research involves individuals and groups identifying areas for improvement, generating ideas, and testing these ideas in practice.* (p. 285)
Information and data that are produced by the quantitative dimensions of the study through the interview, survey processes, and the qualitative aspects are the review of related system and school documents, the open-ended items in the structured interview process with the principals, technology coordinators and technology chairperson, and similar response opportunities provided to the teachers on the TTI survey. These aspects were considered and treated from a trend analysis perspective in looking for data points that might contribute to the ongoing system/school improvement goals of the overall research effort. More specifically, the data gathered from the Technology Integration Surveys, school technology leadership scores, school technology outcomes scores, 21st CSA scores, EGTLA scores, and school-based group interviews were used to make a decision on how the integration of the emerging technologies can better serve the urban school district in its quest to meet the technology literacy mandate of the NCLB act. The structured interview began with the media specialist, technology specialist, and technology chairperson participating in a survey based on school technology leadership. At the conclusion of the structured interview, the media specialist, technology specialist, and technology chairperson for each respective middle school had an opportunity to ask the researcher any questions about the surveys, interview, or findings based on the study to this point. The researcher then closed the interview by providing a compilation of the data, along with a review of the responses to the open-ended items (from the technology integration surveys) that provided the needed data to make decisions regarding technology integration at that particular middle school. The researcher provided this information to the respondents of the technology leader group only, with the goal of improving technology literacy at the middle school level through data analysis and collaborative decision-making. These cumulative efforts were undertaken and utilized in the production of a Technology Integration Action Plan that will
give direction to the urban public school system and the respective middle schools as they move 
collectively forward into the 21st Century.

Approval Process to Conduct Study

Urban School System

To conduct any type of research in the urban school system involving staff, students, or 
information related to them, approval has to be granted by the Department of Research, 
Planning, and Accountability of the urban school district. According to the district policy, 
“Groups or individuals desiring to conduct research studies in this school district must submit a 
‘Research Request Application’ and a detailed proposal to the Department of Research, 
Planning, and Accountability for approval prior to implementation of the study.” This screening 
process is in place to protect students, staff, and the instructional programs within the schools.

The University of Alabama

The University of Alabama also has a process that doctoral students have to adhere to 
when conducting research. A three-chapter proposal describing the research has to be submitted 
to and approved by a doctoral committee prior to the submission of the research proposal to the 
Institutional Review Board (IRB) of The University of Alabama. Official IRB approval must be 
obtained before the research may be started and any data gathered. The IRB approval process is a 
requirement of the federal government (http://osp.ua.edu/site/irb.html).
The Researcher

The researcher is employed by the urban school system as a Technology Specialist/Coordinator. One of the eight middle schools involved in the study was under the technological supervision of the researcher. This school was not excluded from the study but the researcher was excluded. An alternative Technology Specialist that was also responsible for the technology “on-goings” at each school was used as the replacement respondent in the respective school.

Summary

Chapter 3 started with a limited background as a review in establishing a basis for moving into the discussion of the research methods of the study. A restatement of the purpose of the study with discussions about the action research steps to be taken in developing a data framework for the study was also included. Attention was given to the research design with subtopics including a restatement of the research questions, identification of the populations, a discussion of the instruments to be utilized in the study, and attention to the data collection and analysis procedures. The chapter concluded with a discussion of the approval processes for conducting the research and a discussion of the role of the researcher.
CHAPTER 4
ANALYSIS OF DATA

This chapter presents results and the analysis of data on technology leadership and the perceptions of technology leaders and teachers regarding technology leadership and technology integration in the urban middle school in this study. Additionally, eighth grade technology literacy scores (over a 5-year period) were analyzed along with technology leadership scores and technology integration scores in order to explore the relationship among technology leadership, technology integration, and a demographic variable (primary content teaching field/assignment) involving the participants and their respective middle school scores. The chapter begins with an overview of the purpose of the study, the research questions, and the data collection procedures. The remainder of the chapter presents the data collected for this study in the form of tables with supporting discussions.

Overview

The purpose of this exploratory and descriptive action research study was to reflectively describe the initiatives started by an urban school system at the system and school levels to comply with the expectations of the NCLB legislation. Furthermore, the study is expected to help move the system in the direction of successful technology integration in dealing with the emerging technologies educationally. Utilizing the information generated through this action research study, a set of recommendations will be presented in a subsequent chapter for consideration in the development of a data-based improvement plan for the urban school system.
This chapter provides an overview of the results of the descriptive, correlational, and qualitative analysis of the data from this study.

Descriptive Analysis

This study was comprised of eight middle schools in an urban district. Participants included middle school educators of all grade levels (6-8): 8 media specialists, 5 technology specialists, 19 Language Arts teachers, 26 Math teachers, 22 Science teachers, 24 Social Studies teachers, 10 Special Education teachers, and 5 teachers who did not identify themselves in any category listed. The combined list of respondents totaled 119 participants in eight middle schools in an urban southeastern school district. The urban district where the study was conducted has an active enrollment of almost 51,000 students, attending a total of 85 schools: 43 elementary (K-5), 3 of which operate on a year-round calendar; 15 middle (6-8); 10 high (9-12); and seven charter schools. The school system also supports two alternative schools for middle and/or high school students, two community schools, and an adult learning center.

Of the 119 voluntary participants 106 participants (89%) completed usable surveys. Ninety-seven participants (91.5%) answered demographic questions related to the study. Sixty-five participants (67%) were female and 32 participants (33%) were male. Nine participants did not respond to the demographic question related to gender. Table 1 indicates the results of the gender demographic.
Table 1

*Gender Demographics*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>65</td>
</tr>
<tr>
<td>Female</td>
<td>32</td>
</tr>
<tr>
<td>Unknown</td>
<td>9</td>
</tr>
</tbody>
</table>

The response rate for the ethnicity item on the survey was also at 92%. Sixty-nine participants were African American, 14 participants (14%) were Caucasian, 6 participants (6%) were Hispanic, 1 participant (1%) was Asian, 8 participants (8%) were listed as “other,” and 8 participants did not respond to this item. Table 2 indicates the ethnicity demographic of the study.

Table 2

*Ethnicity Demographics*

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>69</td>
</tr>
<tr>
<td>Caucasian</td>
<td>14</td>
</tr>
<tr>
<td>Hispanic</td>
<td>6</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
</tr>
<tr>
<td>Unknown</td>
<td>8</td>
</tr>
</tbody>
</table>

The response rate for the number of years teaching item on the survey was 93%. Twelve participants (11%) reported that they had been teaching 0 to 3 years, 27 participants (27%) reported that they had been teaching 4 to 7 years, 27 participants (27%) reported that they had been teaching 8 to 11 years, 33 participants (33%) reported that they had been teaching 12 years
or more, and 7 participants did not respond to this item. Table 3 indicates the years’ of teaching experience demographic.

Table 3

*Years Teaching Experience*

<table>
<thead>
<tr>
<th>Years teaching experience</th>
<th>Number of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>12</td>
</tr>
<tr>
<td>4-7</td>
<td>27</td>
</tr>
<tr>
<td>8-11</td>
<td>27</td>
</tr>
<tr>
<td>12+</td>
<td>33</td>
</tr>
<tr>
<td>Unknown</td>
<td>7</td>
</tr>
</tbody>
</table>

**Research Questions**

Four research questions were explored in this study.

1. How do the school technology literacy scores as measured by the Eighth Grade Technology Literacy Assessment and the 21st Century Skills Assessment, vary across schools and across the 5 years covered by the study?

2. Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and the teachers technology integration school scores as measured by the Teachers Technology Integration Survey?

3. Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and school scores as measured by the technology literacy assessments of eighth grade students in the individual middle schools?

4. Is there a significant difference in the teachers technology integration scores among the teacher groups by discipline?
Findings Associated with the Research Questions

This is a summary of the collected data that were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Findings based on the research questions will be shown using tables, narratives, and descriptive statistics. Statistical analysis such as Spearman Rho Analysis, One-Way Analysis of Variance (ANOVA), and Post Hoc tests were used to analyze the data. Multiple data sources such as Student Technology Literacy assessments, Technology Integration surveys, and School Technology Leadership surveys, were used in this study to help determine if any relationships among technology leadership, technology integration, and eighth grade technology literacy scores exist.

The major purpose of the study was to describe and update the technology initiatives undertaken at the system and school levels to comply with the expectations of the NCLB legislation and to develop a data-based improvement plan that might give direction to technology integration efforts as the system moved further into the 21st Century. The legislation essentially called for technology leadership at the system and school level, technology integration at the classroom level, and technology literacy of all eighth grade students.

Findings Associated with Research Question 1

How do the school technology literacy scores vary across schools and across the five years covered by the study?

This question examined the technology literacy of eighth grade students through the lens of the Eighth Grade Technology Literacy Assessment (EGTLA) and the 21st Century Skills Assessment (21CSA). Both assessments were analyzed using descriptive statistics over a 3-year (EGTLA) and a 2-year period (21CSA), respectively. The passing score demonstrating
proficiency for the EGTLA is 220 points and the passing score demonstrating proficiency for the 21CSA is 300 points. In analyzing the EGTLA data in the first 3 years of the study within the last 3 years of its existence, all the schools showed continuous improvement. All eight schools are improving at different rates with the average 3-year score increase totaling a 27.125% increase. In analyzing the data by school, the same two schools School ID1 and School ID2 (SID1 and SID2) performed in the top quartile throughout the 5 years of the assessments. Two schools (SID1 and SID2) in the first year of the EGTLA were able to meet the passing requirement score compared to only one school (SID1) in the first year of use for the 21st CSA. The top performing school (SID1) for the EGTLA was also the top performing school (SID1) for the 21st CSA. Table 4 depicts this information.
Table 4

**Eighth Grade Technology Literacy Assessment Scores and 21st Century Skills Assessment Scores**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EGTLA</td>
<td>EGTLA</td>
<td>21st CSA</td>
<td>21st CSA</td>
<td>21st CSA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. SID1-230</td>
<td>1. SID1-232</td>
<td>1. SID1-243</td>
<td>1. SID1-321</td>
<td>1. SID1-342</td>
<td>1. SID1-235</td>
<td>1. SID1-332</td>
<td>1. SID1-284</td>
</tr>
<tr>
<td>2. SID2-223</td>
<td>2. SID2-217</td>
<td>2. SID2-228</td>
<td>2. SID2-287</td>
<td>2. SID2-308</td>
<td>2. SID2-224</td>
<td>2. SID2-298</td>
<td>2. SID2-261</td>
</tr>
<tr>
<td>4. SID4-178</td>
<td>4. SID4-193</td>
<td>4. SID4-193</td>
<td>4. SID4-264</td>
<td>4. SID4-276</td>
<td>4. SID4-193</td>
<td>4. SID4-270</td>
<td>4. SID4-232</td>
</tr>
<tr>
<td>5. SID5-172</td>
<td>5. SID5-192</td>
<td>5. SID5-212</td>
<td>5. SID5-261</td>
<td>5. SID5-258</td>
<td>5. SID5-192</td>
<td>5. SID5-260</td>
<td>5. SID5-226</td>
</tr>
<tr>
<td>7. SID7-166</td>
<td>7. SID7-185</td>
<td>7. SID7-214</td>
<td>7. SID7-252</td>
<td>7. SID7-254</td>
<td>7. SID7-190</td>
<td>7. SID7-253</td>
<td>7. SID7-222</td>
</tr>
</tbody>
</table>

93
In analyzing the 21st CSA data within the last 2 years of its use as the end-of-the-year assessment instrument, some schools increased in score and some schools decreased in score. One school score (SID8) stayed the same. Five schools (SIDs: 1, 2, 3, 4, and 7) increased their point value, while two schools (SID1 and SID2) had a 21-point increase. The smallest decrease in point value was 3 points by SID5 and the largest decrease in point value was 14 points by SID6. The 2011 21st Century Skills Assessment score average for all eight schools was 271.50. The 2012 21st Century Skills Assessment average for all eight schools was 276.75. These data represent a 1.934% increase for the eight schools over the 2-year period. See Tables 5 and 6 and Figures 1 and 2 for additional details.

Table 5

_Eighth Grade Technology Literacy Assessment Scores by Year and School Rank_

<table>
<thead>
<tr>
<th>School ID</th>
<th>EGTLA08</th>
<th>School ID</th>
<th>EGTLA09</th>
<th>School ID</th>
<th>EGTLA10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>230</td>
<td>1</td>
<td>232</td>
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<tr>
<td>2</td>
<td>223</td>
<td>2</td>
<td>217</td>
<td>2</td>
<td>232</td>
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<tr>
<td>3</td>
<td>196</td>
<td>3</td>
<td>193</td>
<td>3</td>
<td>221</td>
</tr>
<tr>
<td>4</td>
<td>190</td>
<td>5</td>
<td>193</td>
<td>8</td>
<td>218</td>
</tr>
<tr>
<td>5</td>
<td>178</td>
<td>7</td>
<td>192</td>
<td>6</td>
<td>214</td>
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<tr>
<td>6</td>
<td>178</td>
<td>6</td>
<td>186</td>
<td>7</td>
<td>212</td>
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<tr>
<td>7</td>
<td>172</td>
<td>8</td>
<td>185</td>
<td>5</td>
<td>209</td>
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<tr>
<td>8</td>
<td>166</td>
<td>4</td>
<td>181</td>
<td>4</td>
<td>201</td>
</tr>
<tr>
<td>Avg. Score</td>
<td>191.625</td>
<td></td>
<td>197.375</td>
<td></td>
<td>218.75</td>
</tr>
</tbody>
</table>
Figure 1. EGTLA scores.

Table 6

21st Century Skills Assessment Scores by Year and School ID

<table>
<thead>
<tr>
<th>School ID</th>
<th>21st CSA11</th>
<th>School ID</th>
<th>21st CSA12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>321</td>
<td>1</td>
<td>342</td>
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<tr>
<td>2</td>
<td>287</td>
<td>2</td>
<td>308</td>
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<tr>
<td>3</td>
<td>269</td>
<td>3</td>
<td>272</td>
</tr>
<tr>
<td>4</td>
<td>264</td>
<td>4</td>
<td>276</td>
</tr>
<tr>
<td>5</td>
<td>261</td>
<td>5</td>
<td>258</td>
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<td>6</td>
<td>267</td>
<td>6</td>
<td>253</td>
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<td>7</td>
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<td>8</td>
<td>251</td>
<td>8</td>
<td>251</td>
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<tr>
<td>Avg. Score</td>
<td>271.5</td>
<td></td>
<td>276.75</td>
</tr>
</tbody>
</table>
Findings Associated with Research Question 2

Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and the teachers’ technology integration school scores as measured by the Teachers Technology Integration Survey?

This research question examined the effectiveness of school technology leadership and its possible relationship with teacher technology integration at the classroom level. School technology leadership was rated by certain survey questions (questions 2, 3, 8 and 10) on the School Technology Leadership Survey (STLS). Each question and sub-question that required a Yes/No response was given a point value of 0 or 1 to contribute to a school technology leadership score. This process was replicated for each school. The STLS was comprised of an assortment of question types: Yes/No, open-ended, multiple choice, and short response. Participants were given a single point for each yes response on the yes/no questions. Each school
The technology leader group (technology specialist and media specialist) that participated in the survey contributed to a school rating between 0 and 14, with 14 being the highest possible score and 0 being the lowest possible score. Teacher technology integration was another source of information that was required by school personnel in the NCLB legislation. Questions 1 through 15 of the Teachers and Technology Integration Survey (TTIS) addressed teachers’ perceptions of technology integration at the school and classroom level. Questions were rated on a Likert-type scale with a rating of 1 being *Totally Disagree* and 6 being a rating of *Totally Agree*. The aforementioned 15 questions on the TTIS contributed to a teacher score for each teacher that took the survey. The teacher score range on the TTIS was from 15 points to 90 points. A compilation of teacher scores on the TTIS for each school contributed to an overall TTIS school score for that school. The higher the numeric score on the TTIS, the greater the perception of technology integration was presumed by that teacher for that school. A Spearman’s Rho analysis revealed that there was no relationship between technology leadership and teacher technology integration \((r = -.153, p > .05)\). The small sample size of eight schools is most likely a contributing factor to the insignificant and negative correlation between technology leadership and technology integration. Table 7 depicts the raw data that were used to compare the two different sets of scores. Table 8 encompasses statistical analysis for the raw data used in Table 7.
Table 7

*STLS Scores and TTIS Scores*

<table>
<thead>
<tr>
<th>School ID</th>
<th>STLS score</th>
<th>TTIS score average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
<td>66.53</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>68.92</td>
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<tr>
<td>3</td>
<td>10</td>
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<td>4</td>
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<tr>
<td>8</td>
<td>6</td>
<td>61.83</td>
</tr>
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</table>

Table 8

*Correlations STLS and TTIS*

<table>
<thead>
<tr>
<th></th>
<th>STLS</th>
<th>TTIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STLS Correlation Coefficient</td>
<td>1</td>
<td>-.153</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.717</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

*Findings Associated with Research Question 3*

Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and school scores as measured by the technology literacy assessments of eighth grade students in the individual middle schools?

This question examined the effectiveness of school technology leadership and its possible relationship with student technology literacy scores as measured by the EGTLA and the 21st CSA. The EGTLA is an assessment that is used to measure technology proficiency of eighth grade students. The assessment measured students’ computer technology skills in using hardware and software. To demonstrate proficiency on this assessment, students have to score 220 to be at the proficient level. A Spearman’s Rho Correlation analysis revealed that there is no relationship
between technology leadership scores and the EGTLA scores \( (r = .623, p > .05) \). As stated earlier (regarding technology leadership and teachers integrating technology), a small sample size in all likelihood is a contributing factor to the lack of significance as shown by the analysis. However, given the strong correlation indicated by the correlation coefficient, there is reason to believe that technology leadership is correlated with student technology literacy. Table 9 depicts the raw data (STLS scores and EGTLA scores) that were used to compare the two different sets of scores. Table 10 depicts statistical analysis for the raw data used in Table 9.

Table 9

*STLS Scores and EGTLA Scores*

<table>
<thead>
<tr>
<th>School ID</th>
<th>STLS score</th>
<th>EGTLA score average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
<td>235</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>224</td>
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<td>3</td>
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<td>6</td>
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<td>193</td>
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<td>7</td>
<td>12</td>
<td>192</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>190</td>
</tr>
</tbody>
</table>

Table 10

*Correlations STLS and EGTLA*

<table>
<thead>
<tr>
<th></th>
<th>STLS</th>
<th>EGTLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>STLS Correlation Coefficient</td>
<td>1</td>
<td>.623</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.099</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

The 21st CSA is an assessment that is used to measure students’ performance and knowledge based on technology literacy, critical thinking, creativity, and other 21st century
skills. This assessment became a state assessment for schools to use in an effort to demonstrate technology literacy of eighth grade students. To demonstrate proficiency on this assessment, students have to score a point value of “300” to be at the proficient level. A Spearman’s Rho Correlation analysis revealed that there is a relationship between technology leadership and student technology literacy as measured by the 21st CSA scores \( (r = .700, p < .05) \). Despite having a small sample size, the correlation between technology leadership and student technology literacy as measured by the 21st CSA was significant. Table 11 depicts the raw data (STLS scores and 21st CSA scores) that were used to compare the two different sets of scores. Table 12 depicts statistical analysis for the raw data used in Table 11.

Table 11

*STLS Scores and 21st CSA Scores*

<table>
<thead>
<tr>
<th>School ID</th>
<th>STLS score</th>
<th>21st CSA score average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
<td>332</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>298</td>
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<tr>
<td>3</td>
<td>10</td>
<td>271</td>
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<tr>
<td>4</td>
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<td>260</td>
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<td>5</td>
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<td>7</td>
<td>12</td>
<td>260</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>253</td>
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</tbody>
</table>

Table 12

*Correlations STLS and 21st CSA*

<table>
<thead>
<tr>
<th></th>
<th>STLS</th>
<th>21st CSA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STLS</strong></td>
<td>1</td>
<td>.700</td>
</tr>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.053</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
Findings Associated with Research Question 4

Is there a significant difference in the teachers’ technology integration scores among the teacher groups by discipline?

This questioned examined the technology integration scores of teacher groups by discipline (Math teachers, ELA teachers, Social Studies teachers, Science teachers, and teachers labeled as “Other teachers” [Special Education teachers, Physical Education teachers, Itinerate teachers]). The perception of teacher technology integration for each teacher group was analyzed using descriptive statistics of means as shown in Table 9. A One-Way ANOVA analysis was used to determine if there was any significant difference between the teacher groups as shown in Table 11. Additionally, Table 12 shows the results of a “Post Hoc” (Tukey) test that was used to conduct multiple comparisons of the teacher group “means” against each other. The dependent variable was the teacher technology integration mean scores and the independent variable was the teacher groups. Teacher scores on the TTIS contributed to a school score in addition to a discipline score. Table 10 illustrates the range of scores for teachers on the TTIS. The minimum score of any participant was 34 and the maximum score was 90. Table 9 shows Teacher Group mean scores as follows: English Language Arts = 60.63, Math = 67.81, Science = 66.14, Social Studies = 70.38, and Other (P.E., Foreign Language, Special Education, Fine Arts) = 68.00. In Table 11, the means of each group were compared to complete a One-Way ANOVA among disciplines. One discipline (Social Studies) was significantly greater than the lowest performing discipline (English/Language Arts). The analysis showed $F(4, 96) = 2.85, p < .05$ as shown in Table 11. Furthermore, a Post Hoc Test (LSD) revealed significance below the 0.05 level among the mean differences of certain disciplines. The mean difference between English Language Arts and Math was below the 0.05 significance level at .016. The mean difference between English
Language Arts and Social Studies was below the 0.05 significance level at .002. Table 12 shows the details describing the information above. Table 13 depicts the following information:

- Mean scores on the TTIS ranged from 60.63 to 70.38
- Social studies teachers had the highest mean score ($M = 70.38$) on the TTIS followed by teachers listed as “Others”
- ELA teachers had the lowest mean score ($M = 60.63$) on the TTIS
- The standard deviation ranged from 7.174 to 11.413 with Social Studies teachers being most alike in their responses as evidenced by a standard deviation of ($SD = 7.174$)
- ELA being most different in their responses as evidenced by a standard deviation of ($SD = 11.413$)
- ELA teachers’ scores on the TTIS ranged from 34-80
- Math teachers scores on TTIS ranged from 46-90
- Science teachers scores on TTIS ranged from 40-83
- Social Studies teachers scores on TTIS ranged from 57-83
- Teachers labeled as “Other” had score ranges from 53-79
- The highest overall score was from the math group
- The lowest overall score was found in the ELA group.
Table -13

Descriptives of TTIS

<table>
<thead>
<tr>
<th>TTIS</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>60.63</td>
<td>11.413</td>
<td>2.618</td>
<td>34</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>67.81</td>
<td>9.831</td>
<td>1.928</td>
<td>46</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>22</td>
<td>66.14</td>
<td>11.294</td>
<td>2.408</td>
<td>40</td>
<td>83</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>70.38</td>
<td>7.174</td>
<td>1.464</td>
<td>57</td>
<td>83</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>68.00</td>
<td>7.288</td>
<td>2.305</td>
<td>53</td>
<td>79</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>66.72</td>
<td>10.090</td>
<td>1.004</td>
<td>34</td>
<td>90</td>
</tr>
</tbody>
</table>

Note. 1=ELA, 2=MATH, 3=SCIENCE, 4=SOCIAL STUDIES, 5=OTHER; Five teachers did not denote their discipline on the survey.

Table 14

ANOVA for TTIS

<table>
<thead>
<tr>
<th>TTIS</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1079.562</td>
<td>4</td>
<td>269.891</td>
<td>2.847</td>
<td>.028</td>
</tr>
<tr>
<td>Within Groups</td>
<td>9100.675</td>
<td>96</td>
<td>94.799</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10180.238</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 15

Multiple Comparisons

<table>
<thead>
<tr>
<th>(I) Discipline: 1 = ELA, 2 = Math</th>
<th>(J) Discipline: 1 = ELA, 2 = Math</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 = Science, 4 = Social Studies</td>
<td>3 = Science, 4 = Social Studies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>-7.176</td>
<td>2.939</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-5.505</td>
<td>3.049</td>
<td>.074</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>-9.743*</td>
<td>2.990</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>-7.368</td>
<td>3.804</td>
<td>.056</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>7.176</td>
<td>2.939</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1.671</td>
<td>2.820</td>
<td>.555</td>
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<td></td>
<td>4</td>
<td>-2.567</td>
<td>2.756</td>
<td>.354</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>-.192</td>
<td>3.623</td>
<td>.958</td>
</tr>
</tbody>
</table>

(table continues)
### Findings from Structured Interviews and Surveys

**Structured Interviews**

The structured interviews conducted by the researcher gave insight into the study in a manner in which the researcher could better understand the culture and climate of the environment from a technological standpoint. Although the technology leaders (by school) were from the same district and utilized the same resources (i.e., technology curriculum, personnel, etc.), their responses varied on an item regarding the importance of computers and the emerging technologies used at their school. None of the respondents felt as though computers and the emerging technologies were “not important” in regard to preparing students for future jobs, improving student achievement scores, promoting active learning strategies, and deepening...
student understanding. But three out of eight school teacher leader groups (lower scoring schools on the STLS) responded to this question with an answer choice of *slightly important*, while the other five groups (higher scoring schools on the STLS) responded to this question with an answer choice of *very important*. Other sub-questions from the item revealed that the importance of computers and the emerging technologies were “not important” goals in satisfying parents, students, teachers, or community interests.

Another finding from the interview revealed that teachers took the greatest lead in the adoption of the technology integration movement. APS required Social Studies teachers to be technology leaders in their classrooms. Principal leadership can only go so far, and at times teachers have to take on leadership roles (Staples et al., 2005). In a study on school-based technology integration, Staples et al. (2005) referenced a principal’s story about utilizing competent technology savvy teachers to move a school forward in the area of technology integration. A teacher’s technological competence is one of the most important factors in shaping instructional technology activities for students (Gorder, 2008). Teachers were instrumental in this technology integration movement.

**STLS**

The School Technology Leadership Survey (STLS) is an instrument that was used to measure technology leadership from the perspective of the school-based technology leaders. The following bulleted statements (taken from the STLS) represent a consensus response by the technology leaders about technology integration. Six of the eight schools (75%) surveyed had scores of seven or greater indicating positive school technology leadership. Scores of seven or greater indicate positive technology leadership on this 14-point scale because a point value of
seven would indicate at least half of the responses specify policies, committees, budgets, or grants for technology are in existence at the school. Responses from the STLS are as follow:

- Policies are in place to address technology usage for students and staff from an instructional and administrative standpoint.
- The majority of the schools (62.5%) in this study have a technology committee and a budget for technology.
- Teachers have taken the greatest lead in the adoption of the technology integration movement at the school level as evidenced by question 3 on the STLS.
- Six of the eight schools (75%) in this study have received special grants during the last 3 years to support experimental programs.
- Professional Development was reported by 75% of the respondents as the most serious unmet technological need of the schools.

As stated in the Anderson and Dexter (2005) study, technology leadership is necessary for effective utilization of technology in schools. The NETS outlined expectations for school personnel in this area of needed expertise. Furthermore, technology leadership was shown to have a positive correlation with technology integration (Anderson & Dexter, 2005).

**TTIS**

The Teacher Technology Integration Survey (TTIS) is a survey that was used to measure the perception of technology integration by the teacher within the classroom. The instrument helped yield scores that could indicate if teachers believed in the technology initiative within the district, school, and classroom. The score range for each question that was used to yield a score ranged from 1 to 6 with 1 meaning *Strongly Disagree* and 6 meaning *Strongly Agree*. The vast
The majority of the scores were 4, 5, and 6, indicating that the participants Agreed (4) to Strongly Agreed (6) with the survey question. There were no survey questions in which a participant Strongly Disagreed (1).

One question on the TTIS asked about students’ technological development. Six of the eight schools (75%) surveyed had favorable results regarding the question about students developing in a positive technology literacy direction during a teacher’s employment at that particular middle school. Students showed improved technology scores in each year of the EGTLA. Consistent training on technology integration, a technology curriculum, and personnel to model and train teachers within this technology initiative have proven to be beneficial to student technology literacy. A teacher’s attitude toward technology impacts students’ and teachers’ use of technology for instructional purposes (Palak & Walls, 2009). The more comfortable a teacher is with content knowledge, technological knowledge, and pedagogical knowledge, the more likely technology integration will occur at a high level with the possibility of impacting student academic achievement (Harris et al., 2009).

**MSTIS**

The Media Specialist Technology Integration (MSTIS) survey was constructed from the TTIS. The primary purpose of the MSTIS was to examine some of the open-ended and single response questions and compare those responses with those of the technology specialist. The following statements (taken from the MSTIS) represent a consensus response by the media specialists about technology integration:

- Feedback from the annual assessment of eighth graders on the technology literacy test has been utilized with my students in a focused manner.
• Media specialists utilize these people in the following order when they need technological assistance with equipment or technology integration in an administrative/recordkeeping way--first, technology coordinator; second, assistant principal; and third, grade-level chairperson.

• Media specialists utilize these people in the following order when they need technological assistance with equipment or technology integration in a classroom/instructional way--first, principal; second, assistant principal; third technology coordinator.

• Media specialists have found the “Technology Integration Development and Equipment Use” to be the most useful to them in an administrative/record keeping/communication role as a media specialist based on the Technology Integration Surveys.

• Media specialists have found the “Technology Integration Development and Equipment Use” to be the most useful to them in a classroom/instructional role as a media specialist.

• The media specialist reported the highest mean score of all teacher groups on the Technology Integration Surveys.

_TSTIS_

The Technology Specialist Technology Integration Survey (TSTIS) was constructed from the TTIS. The primary purpose of the TSTIS was to examine some of the open-ended and single response questions and compare those responses with those of the media specialists. The
following statements represent a consensus response from the technology specialists about technology integration:

- The feedback from the annual assessment of eighth graders on the technology literacy test has been useful with the teachers and their students.

- Technology specialists believe that teachers utilize these people in the following order when they need technological assistance with equipment or technology integration in an administrative/recordkeeping way--first, technology coordinator; second, assistant principal; and third, grade-level chairperson.

- Technology specialists believe that support staff utilizes these people in the following order when they need technological assistance with equipment or technology integration in a classroom/instructional way--first, principal, assistant principal; second, principal; and third technology coordinator.

- Technology specialists have found the “Technology Integration Development and Equipment Use” to be the most useful to them in an administrative/recordkeeping/communication role as a technology specialist.

- Technology specialists have found the “Technology Integration Development and Equipment Use” to be the most useful to them in a classroom/instructional role as a technology specialist.

Media specialists and technology specialists play an important role in school educational technology programs. People in these roles often facilitate the use of ICT literacy of teachers and students. ICT is a pathway to new literacies and success for all students (Leu et al., 2004). Literacy in this area has become commonplace in the global workforce. Technology leaders understand that the “Technology Integration Development” and “Equipment Use Initiative” will
provide an advantage for Atlanta Public Schools students in society. Furthermore, as indicated by the results of the technology integration surveys, teachers, media specialists, and technology specialists embrace the feedback from the student technology literacy reports. The reports help determine the professional development and teaching needed to assist teachers as they aim toward helping students in closing the digital divide.

Summary

This chapter analyzed data related to technology leadership, technology integration, and eighth grade technology literacy scores. This study also examined the student technology literacy data and survey data to find possible relationships among the aforementioned variables and within the various teacher groups regarding technology integration. Furthermore, the perceptions of the participants that were viewed as leaders and teachers were separately analyzed.

Data indicated that student technology literacy scores for the higher achieving schools remained consistent throughout the 5 years of the study, despite the change in assessments. Data also indicated that technology leadership had some significant correlation with student technology literacy scores (depending upon the assessment). However, there was a significant difference among teacher groups in analyzing group means for technology integration scores. Social Studies teachers scored higher than all other disciplines, which may lead to implications and discussions regarding what Social Studies teachers may be doing to have a positive perception of technology integration. Perception data, as reported by qualitative responses from technology specialists and media specialists will be used to support and negate some of the findings covered in this chapter.
CHAPTER 5
SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter includes the following sections: summary of the study, conclusions, implications, recommendations, and an action plan. The summary section summarizes the purpose of the study, research design, and the findings emerging from analysis of the data. The conclusion section presents information drawn from the findings and results of the data analysis. The implication section entails the researcher’s attempt to explore and explain any developments such as findings and conclusions that may have emerged as a result of the study. The recommendations and action plan sections detail the action or practice that should occur based on the study’s findings and conclusions.

Summary of the Study

Purpose of the Study

The purpose of this study was to describe, examine, and update the technology integration initiatives undertaken by the Atlanta Public School System (APSS) at the system and school levels to comply with the expectations of the NCLB legislation. The main objectives of this exploratory study were to identify and analyze possible relationships among student technology literacy scores, school technology leadership scores, and perceptions about technology integration from select staff (media specialists, technology coordinators, and teachers).
Research Design

Under an action research umbrella, this study employed a mixed methods research design. Open-ended responses were added to the end of each survey to help clarify many of the findings. The dependent variable in the study was the school technology literacy scores, the teacher technology integration scores, and the student technology literacy assessment scores. The independent variable was technology leadership.

Participants

The sample size of the study included 119 participants of which, 106 participants were teachers. The teacher group included 19 English/Language Arts teachers, 26 Math teachers, 22 Science teachers, 24 Social Studies teachers, 10 Special Education teachers, and 5 teachers who did not identify themselves in any category listed. Eight participants were media specialists and five participants were technology specialists. All participants were a part of the APSS at the middle grades level.

Literature Review

The literature review for this study included a detailed review of topics about technology. From the inception of primitive technology in public schools to the expectation of a technology curriculum and technology proficiency of eighth grade students, technology literacy was viewed within this study as paramount within today’s educational blueprint. The major technology components covered within the literature review entailed technology leadership and technology integration. Subtopics such as state and federal technology legislature, technology standards, planning for technology, technology training for teachers, traditional and current literacies, and
21st century education were included as needed components to adequately cover the full spectrum of the challenges that schools face, in properly preparing students for technology literacy.

Findings and Conclusions

The findings of this study have implications for technology literacy implementation for middle school students in the 21st century. Few studies have analyzed student technology literacy scores as a point of interest in conjunction with technology leadership and teacher technology integration. As a recommendation for future research, Anderson and Dexter (2005) recommended that their study, “School Technology Leadership: An Empirical Investigation of Prevalence and Effect,” be replicated with student technology literacy scores as a variable impacting school technology leadership. This study started out as a replication of that study (Anderson & Dexter, 2005). But due to modifications and a lack of sample schools that use standardized testing (for student technology literacy purposes), it was decided that this study should serve as an extension of the Anderson and Dexter (2005) study only. Upon further review, the study would examine technology leadership and its impact on student technology literacy scores in Atlanta Public Schools for the interest of an action research study. In this section, findings related to research questions about student technology literacy scores, technology leadership and teacher technology integration will be analyzed to provide implications, conclusions recommendations and an action plan for the APSS.
Research Question 1

How do the school technology literacy scores vary across schools and across the 5 years covered by the study?

1. An analysis of the data revealed that almost all schools made continuous progress from the inception of each assessment to the conclusion of each assessment:

   EGTLA 2007-2008 compared to EGTLA 2008-2009 = 3.00% Increase
   EGTLA 2008-2009 compared to EGTLA 2009-2010 = 9.31% Increase
   EGTLA 2007-2008 compared to EGTLA 2009-2010 = 12.59% Increase
   21st CSA 2010-2011 compared to 21st CSA 2011-2012 = 1.934% Increase

2. The data also reveal that the top performing schools were consistent in their technology achievements despite the assessment type and skills covered within the assessment.

3. Only two schools (SID1 and SID2) in the first year of the EGTLA were able to meet the passing score requirement compared to only one school (SID1) for the 21st CSA.

4. The top performing school for the EGTLA (SID1) was also the top performing school for the 21st CSA (SID1).

From the findings listed above and select questions from the TSTIS and MSTIS, the following conclusions were drawn:

1. Most schools’ student technology literacy scores improved when they were given the same assessment the following year.

2. Technology specialists and media specialists are able to use the feedback from the student technology literacy assessments to positively impact the student technology literacy scores on both student technology literacy assessments.
3. School ID 1 had the most proficient and knowledgeable eighth grade students in regard to technology literacy.

4. The 21st CSA is a more difficult technology assessment for eighth grade students to master than the EGTLA.

Technology scores from the EGTLA showed greater percentage increases in scores from year to year than did the 21st CSA. A multitude of reasons could have accounted for this occurrence but one of the main reasons was the technology curriculum. The technology curriculum for the EGTLA was aligned to the 1998 NETS-S (http://www.learning.com/techliteracy-assessment/), which entailed information regarding how to use computer technology hardware and software with an emphasis on an operations (http://www.iste.org/standards/standards-for-students). The 21st CSA is an assessment aligned to the updated 2007 NETS-S (http://www.learning.com/21st-century-skills-assessment/). The 2007 NETS-S were standards that entailed information about technologies and how they could be used for critical thinking, creativity, collaboration, and information fluency with an emphasis on problem solving and using higher order thinking skills (http://www.iste.org/standards/standards-for-students).

Research Question 2

Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and the teachers’ technology integration school scores as measured by the Teachers Technology Integration Survey?

An analysis of the data revealed that there was no relationship among school technology leadership scores and teacher technology integration scores. Responses from technology leaders on the STLS would indicate otherwise. Of the school technology leaders surveyed, 75% reported
favorable results regarding students developing in a positive technology literacy direction during a teacher’s employment at that particular middle school. A Spearman’s Rho analysis yielded a correlation coefficient of \( -0.153, p > 0.05 \), indicating a negative correlation showing no significance. However, other studies have shown that there is a correlation between technology leadership and technology integration (Anderson & Dexter, 2005). A small sample size used in this study could possibly be the reason for the negative correlation and insignificant finding. As teachers become more comfortable with content pedagogy and technology, the more apt they are to integrate technology in the classroom and impact student learning in a positive manner (Hughes et al., 2005).

**Research Question 3**

Are there relationships among school technology leadership scores as measured by the School Technology Leadership Survey and school scores as measured by the technology literacy assessments’ of eighth grade students in the individual middle schools?

An analysis of the data revealed that there is reason to believe that there is a relatively strong correlation between technology leadership scores and student technology literacy assessment scores; however, a Spearman Rho analysis indicated that the correlation was not significant. This is most likely due to the small sample size. Correlation coefficients of .623 (analysis of EGTLA scores and STLS) and .700 (analysis of 21st CSA and STLS) indicate that there is a correlation between technology leadership and student technology leadership. Technology leaders reported that “technology integration development” and “equipment use” were the most useful to them in a classroom/instructional role. A major component of “technology integration development” was 21st century teaching and learning. Commitment
from administrators and school technology leaders to use technology and embrace 21st century teaching was paramount for teacher technology integration. In a study conducted by Eren and Kurt (2010), implications were that principals and technology leaders’ comfort level with technology impacts their technology leadership behavior. The “technology integration development” and “equipment use” initiative were both supported by the district and principals of schools with the understanding that eighth grade Social Studies scores may have a negative impact due to the untraditional way of teaching Social Studies using technology integration as a major component. Nonetheless, teachers were given the freedom to make mistakes and learn how to teach with technology without reprimand or worry. Other studies show that when teachers feel most comfortable learning about technology they have been able to do so with the support of their administration and at their own rate of comfort, resulting in increased technology integration in their classrooms (Coppola, 2005; Hughes et al., 2005).

An analysis of the data revealed that there was a strong correlation between technology leadership scores and the 21st CSA scores. A Spearman Rho Correlation analysis yielded a correlation coefficient of .700. The significance level was .053 indicating that the relationship between the two variables was significant. From these findings, the following conclusion was drawn: Eighth grade student technology literacy scores do have a direct correlation with school technology leadership scores.

**Research Question 4**

Is there a significant difference in the teachers’ technology integration scores among the teacher groups by discipline?
An analysis of the data revealed that there is a significant difference in the technology integration scores among the teacher groups by discipline. The vast majority of the teacher technology integration scores were 4, 5, and 6, indicating that the participant *Agreed* (4) to *Strongly Agreed* (6) with the survey question. There were no survey questions in which a participant *Strongly Disagreed* (1). An ANOVA yielded an $F$-value of 2.847 at a significance level of .028, which is below the accepted significance level of 0.05. Additionally, a Post Hoc test (LSD) analyzed the mean differences of each teacher group to discover that there were significant differences among certain disciplines. The English Language Arts discipline, when compared to the Math discipline, yielded a significance level of .016. The English Language Arts discipline, when compared to the Social Studies discipline, yielded a significance level of .002.

In addition to the data listed above, the following findings emerged from the TTIS and statistical analysis:

1. Teachers are committed professionally to developing their abilities to utilize the emerging technologies in their role as teacher, as indicated by an average score of “6” on the TTIS.

2. Social Studies teachers had the highest technology integration scores of all teacher groups.

3. English/Language Arts teachers had the lowest technology integration scores of all teacher groups.

4. The mean difference score range of the teacher groups were between 60.63 and 70.38, which is less than a 10-point difference.

5. Successful movement in the technology integration direction is a priority in the school system, as indicated by an average score of “5” on the TTIS.
6. Successful movement in the technology integration direction is a priority of the leadership in the APS middle school, as indicated by an average score of “5” on the TTIS.

These findings led to the following conclusions:

1. The technology initiative undertaken by the Social Studies teachers has proven to be beneficial towards their success in integrating technology at a level that exudes more confidence and comfort than other teacher groups in integrating technology. Teachers with the strongest technology proficiencies use technology in more innovative ways in their content areas (Becker, 2000a).

2. APSS along with middle school teachers within the APSS are committed to utilizing emerging technologies in an effort to integrate technology.

Implications

The NCLB legislature in many ways can be viewed as the catalyst for middle schools aggressively utilizing technology from an instructional and administrative approach. As stated by the NCLB legislature, “The primary goal is to improve student academic achievement through the use of technology in elementary schools and secondary schools.”

Additional goals involve the following:

(A) To 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.

(B) To encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods
that can be widely implemented as best practices by State educational agencies and local educational agencies.

These goals brought about technology leadership, technology literacy, and technology integration as necessary components of teaching and learning in the APSS. In an effort to prepare middle schools for successful technology integration, the following district approved technology leadership initiatives were implemented:

- All schools have a technology committee in place
- Most schools have a technology budget
- Technology policies are in place to ensure effective technology use in classrooms
- Schools have obtained special grants during the last three years to support experimental programs at the school either directly or through the district.

As evident from the bulleted points listed above, technology leadership has played an intricate part in preparing middle schools for technology education. Additional initiatives regarding personnel and curriculum were also technological advancements made at the district level to ensure successful technology implementation from a resources point of view.

The section of the NCLB act known as Part D-EETT (Enhancing Education Through Technology) drew specific attention from the public school sector, in particular the middle schools, with the expectation of technological literacy of all eighth grade students. This expectation brought about a need for 21st Century teaching and learning, in particular technology literacy of teachers, in an effort to ensure effective technology integration as a necessary component of technology education. The district viewed the NCLB mandate as an opportunity to encourage 21st century teaching and learning. Core subject area teachers were provided an online curriculum for their respective subject area to assist them in integrating technology into
their subject. Additionally, Social Studies teachers received training from district-level personnel throughout the year and every year that students were assessed regarding technology literacy. However, according to the STLS, technology leaders state that an unmet need of teachers in schools was professional development in technology. According to Zhao and Bryant (2006), “Approximately one third of teachers have received little or no training with integrating computers into lessons or training on instructional software.” This is obviously a valid point that needs to be addressed, considering the fact that teachers were reported as the group that took the greatest lead in the adoption of the technology integration movement at the school level.

The investment in personnel and instructional resources that were committed to the implementation of the district-wide technology initiative demonstrated vision on behalf of the decision-makers in Atlanta Public Schools. Visionary leadership, previously referenced as “leadership and vision” (NETS-A 2002) was demonstrated by the district’s technology leaders with this initiative. This line of forward thinking appears to have benefited schools, teachers, and students as evidenced by the STLS, TTIS, and student technology literacy scores. The technology curriculum that APSS implemented through the Social Studies teachers’ curriculum appears to have provided the desired results from the various groups of eighth grade students throughout the years of student technology literacy assessment. As implied by Staples et al. (2005), successful technology leadership will encompass an alignment of technology use to a curriculum and the empowerment of teachers to be technology leaders. Over a 5-year period, technology literacy scores improved every year from a district perspective. The increases in the EGTLA were greater than those of the 21st CSA. This difference probably exists because of the knowledge needed and skills assessed on each respective assessment. When comparing the first year assessment results of the EGTLA and the 21st CSA, more students and schools passed the
EGTLA than the 21st CSA. Part of the reason for this finding could be attributed to 21st century education being implemented as a new way of teaching and learning. Communication, collaboration, creativity, and critical thinking are not new terms to the education realm but information literacy, media literacy, and information and communications technology (ICT) literacy are new approaches to accessing and mentally processing information. This shift in information gathering, knowledge building, and skill attainment could pose a challenge for students and teachers that are responsible for helping students conform to the change in necessary ICT skills.

Key Findings from the Study

1. Technology Education in middle schools is a priority, as a result of the district attempting to be in compliance with the NCLB act of 2001.

2. Technology leadership from the district level has provided the necessary foundation for middle school staff to implement technology in schools.

3. To ensure technology literacy of students, teachers had to become technology literate in order to integrate technology appropriately and effectively.

4. 21st century teaching and learning came to the forefront of technology education when schools were mandated to show technology literacy for all eighth grade students.

5. The face-to-face training that the Social Studies teachers received, in addition to the technology curriculum that was embedded in the Social Studies curriculum, impacted Social Studies teachers’ perceptions of positive teacher technology integration more than teachers who did not participate in the training.
6. Based on assessment results from the 21st CSA and EGTA, the 21st CSA appears to be more aligned to skills and literacies involving creativity and critical thinking and problem solving than the EGTLA.

Recommendations

The following is a list of recommendations for practice concerning technology integration in public schools.

1. The infusion of technology integration into the middle school Social Studies curriculum has given Social Studies teachers more confidence in teaching and learning 21st century skills. A similar mandate should be put in place for other core subject area teachers to improve all core subject area teachers’ comfort level with technology integration.

2. Face-to-face professional development in the area of technology integration should be provided to all teachers throughout the school year.

3. Professional development in the area of technology integration should be focused on Technological Pedagogical and Content Knowledge (TPACK) training.

4. Technology literacy in schools should be viewed with the same importance as reading, writing, and arithmetic to encourage teachers’ to become more technology literate thus improving their ability to integrate technology into their lessons.

5. Because technology literacy of eighth grade students is mandated, teachers at all grade levels leading up to high school should be required to integrate the technology curriculum into their daily lesson plans.
6. Further research should be done to investigate why student technology literacy scores leveled off when students took the 21st CSA the second year, in addition to what is happening or not happening in schools that are not making the expected technology literacy gains.

7. An extension of this study should be done to examine the relationship between technology integration and student achievement in core subject areas.

8. A recommendation for future research would be to investigate if the schools that received competitive technology grant money had higher student technology literacy scores (as measured by the EGTLA and 21st CSA and teacher technology integration scores as measured by the TTIS) than their counterparts.

Action Plan

The current study employed action research to develop an action plan for APSS to address technology literacy of eighth grade students. Data show that the vast majority of schools that participated in this study did make consistent gains, according to both student technology literacy assessments given during the school years of 2007-2012. Based on evidence within the study, it appears that the district has instructional resources and personnel to allocate toward the fulfillment of meeting the EETT mandate from the NCLB Act (2001). The technology curriculum that has been used for Social Studies teachers to integrate technology into their lesson plans should be updated to current NETS and used with all teachers. The NETS for students, teachers, coaches, and administrators should be a part of an initial professional development workshop for all stakeholders conducted by the Instructional Technology Specialists (ITS). Additionally, instructional technology specialists should provide professional development on how to effectively and efficiently integrate technology using the Technological Pedagogical
Content Knowledge (TPACK) model (Harris et al., 2009) with all teachers in all grades leading up to high school. Practice technology literacy assessments should be conducted quarterly in addition to the development of baseline data from these assessments to capture student technology assessment data. School-based media specialists can help develop and find assessment items to be used for the assessments. Technology data should be analyzed by grade level teams, which should include school-based administrator, instructional technology specialist, media specialist, and a grade-level teacher. Teachers should review assessment results with their classes and develop project-based assignments to address deficiencies that students exhibited on the assessments. These projects should then be used and presented by students as supplemental material as a part of a technology portfolio to be reviewed by the teacher and student in preparation for the year-end technology assessment.

The aforementioned findings, conclusions, implications, and recommendations are just that (findings, conclusions, implications, and recommendations), if not acted upon. In an effort to complete and close out this action research study, a plan was developed to encourage immediate action to prevent a loss of time and student achievement regarding technology literacy.

The researcher decided to request a meeting with the Atlanta Public Schools (APS) Superintendent to discuss the research that had taken place over the 5-year period involving the educational technology program within APS. At that meeting, the researcher will provide a condensed report consisting of the current status of APS regarding educational technology, findings, recommendations, and proposed “next steps action items.” The superintendent will be presented with the following findings, recommendations and action items:
Findings

1. Technology education in middle schools’ is a priority as a result of middle schools attempting to be in compliance with the NCLB act of 2001.

2. Professional development for teachers in the area of technology integration has led to improved technology literacy of teachers and students.

3. Social Studies teachers have successfully implemented technology integrated lesson plans into the social studies curriculum thus improving technology literacy of eighth grade students as measured by eighth grade technology literacy scores.

4. Instructional technology specialists, media specialists, and Social Studies teachers have been the key personnel impacting technology literacy (of students) and technology integration (for students) with the use of a technology curriculum embedded in a subject area.

Recommendations

1. Because technology is seen as the most cost effective way to improve academic achievement (Milken Exchange, 1997), technology literacy in schools should be viewed with the same importance as reading, writing, and arithmetic to encourage teachers’ to become more technology literate thus improving their ability to integrate technology into their lessons.

2. Because technology literacy of eighth grade students is mandated, teachers at all grade levels leading up to high school should be required to integrate a technology curriculum into their daily lesson plans.

3. Face-to-face professional development in the area of technology integration should be provided to all teachers throughout the school year.
4. Develop mock technology literacy assessments to be administered to students quarterly.

**Action Items**

1. Instructional technology specialists should provide mandatory training at the beginning of the school year, which should occur quarterly, on the National Educational Technology Standards (NETS) for administrators, coaches, teachers, and students.

2. Instructional technology specialists should provide professional development to teachers on the Technological Pedagogical and Content Knowledge (TPACK) model to improve teachers’ ability to integrate technology integration.

3. A change in the technology curriculum should be updated to reflect the current NETS addressing 21st century teaching and learning.

4. Mock technology assessments should be analyzed at the school level with the intention of remediating needed skill development.

If given permission to proceed with these “next step action items,” the researcher will then meet with the executive director and director of instructional technology to formulate a team of individuals committed to an agreed upon vision for improved technology literacy for all students in Atlanta Public Schools. Within the scope of this meeting, personnel, roles, expectations, timelines, curriculum needs, finances, and other resources will be examined to ensure a smooth transition into a new technology initiative. At the conclusion of this meeting, a timeline will be developed consisting of action items with assigned personnel to carry out those specific duties and functions.
Summary

This research was conducted in an attempt to provide an update on how the district was progressing toward meeting the technology expectations of the NCLB Act (2001). To conduct this research, an examination of student technology literacy scores, technology leadership, and perceptions of technology integration from school-based officials were investigated. This chapter provided a summary of the study including conclusions, implications, recommendations, and an action plan. The study’s purpose, research design, and participants were included in this chapter. Findings from the study along with supporting statistical data provided implications, conclusions, and recommendations, all of which were included in the chapter. The chapter concluded with an action plan and summary of the chapter.
REFERENCES


APPENDIX A

TECHNOLOGY SPECIALISTS and TECHNOLOGY INTEGRATION
DIRECTIONS: In responding to the items, please keep in mind a working definition of successful Technology Integration as:
The shared commitment to a success in moving a middle school and the faculty and staff, individually and collectively, in the direction of increasing comfort and effectiveness in utilizing the “emerging technologies” in the administrative and management operation of the school and in the development of curriculum and the delivery of instructional opportunities that enhance student learning in the several content fields and in the developing area of technology literacy as a needed basic and applied skill area as we move further into the Information Era in the 21st Century.

Please respond to the quantitative items using the Likert scale shown below by placing your selected response number in the space to the left of each numbered question (Place an “X” in the space on any item that you feel that you lack an informed basis for responding and please note the distinctions in the items with respect to your leadership of administrative/record keeping/communications functions and your leadership responsibilities in the classroom/instructional area in the paired questions):

<table>
<thead>
<tr>
<th>Totally Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Totally Agree</th>
</tr>
</thead>
</table>

1. Personally, I am committed professionally to developing my abilities to utilize the emerging technologies in my role as a technology specialist.
2. My school system should make efforts, especially at the middle school level, to respond to the emergence of the emerging technologies as a necessary step in preparing our students for an increasingly digital/global world.
3. Successful movement in the technology integration direction is a priority in the school system.
4. Successful movement in the technology integration direction is a priority of mine as a technology specialist who works primarily with middle schools.
5. Teachers are included and their concerns are considered in planning and decision-making process related to the technology integration movement in the middle school in which I work.
6. Needed staff development assistance has been available in efforts to deal increasingly with the emerging technologies in my assigned middle school.
7. My assigned middle school is current with respect to appropriate policies and operational guidelines with respect to allow it to deal effectively with the challenges of the emerging technologies.
8. My assigned middle school is current from the perspective of necessary equipment and infrastructure support for dealing effectively with the challenges of the emerging technologies from an administrative/record keeping/communications perspective.
9. My assigned middle school is current from the perspective of necessary equipment and infrastructure support for dealing effectively with the challenges of the emerging technologies from the perspective of my classroom/instructional leadership responsibilities.
10. My assigned middle school has made and is continuing to make a good degree of progress in the technology integration direction with respect to administrative/record keeping/communications functions.

11. My assigned middle school has made and is continuing to make a good degree of progress in the technology integration direction with respect to my classroom/instructional support responsibilities.

12. The students in my assigned middle school have developed in a positive technology literacy direction during the period of my association with them as a technology specialist.

13. Feedback from the annual assessment of eighth graders on the technology literacy test has been utilized in working with the teachers and their students.

14. The feedback from the annual assessment of eighth graders on the technology literacy test has been useful in working with the teachers and their students.

Please respond to the open-ended items

15. List the sources of assistance in rank order that you feel that teachers turn to when they have a need in dealing with a Technology Integration development or use of a particularly piece of equipment in an administrative/record keeping, communications application (i.e. principal, assistant principal, technology coordinator, chair or member of the IT Committee, grade level chair, peer teacher, librarian/media center staff, bookkeeper, secretary, etc....)

16. List the sources of assistance in rank order that you feel that support staff turn to when they have a need in dealing with a Technology Integration development or use of a particularly piece of equipment in an administrative/record keeping, communications application (i.e. principal, assistant principal, technology coordinator, chair or member of the IT Committee, grade level chair, peer teacher, librarian/media center staff, bookkeeper, secretary, etc....)

17. List the sources of assistance in rank order that you feel your teachers turn to when they have a need in dealing with a Technology Integration development or use of a particularly piece of equipment in a classroom/instructional application (i.e. principal, assistant principal, technology coordinator, chair or member of the IT Committee, grade level chair, peer teacher, librarian/media center staff, bookkeeper, secretary, etc....)
18. List in rank order; the technology Integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment, that you have found to be most useful in your administrative/record keeping/communication role as a technology specialists.

19. List in rank order; the technology Integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment, that you have found to be most useful in your classroom/instructional instructional support role as a technology specialists.

20. Does the middle school in which you work as a technology specialist vary in its movement in a positive direction with respect to dealing with the emerging technologies as compared to other middle schools in the system? If so, please discuss that variability with respect to the development of an Action Plan as an outcome of this study that will assist in moving the system and the middle schools productively forward.

21. Provide any additional comments that you feel might be useful as your system and their middle schools continue to move in a Technology Integration direction. (Use the back of the survey if additional space is needed).

Please provide the following demographic information by responding in the spaces provided or by placing an “X” by the appropriate response option:
22. Years as a technology specialist in your middle schools_________
23. Years in other administrative/support positions in this school system_________
24. Total Years of experience in education_______
25. The year in which you were born_______
26. Female _______ Male _______
27. Your Gender: African-American____ Asian-American____ Latin/Hispanic American____
White (other than Latino)____ Other_____

*The Technology Specialist and Technology Integration (TSTI) Survey was developed with the Principal’s Survey Booklet (Anderson and Becker, 1999 and 2005) as the foundational document.
DIRECTIONS: In responding to the items, please keep in mind a working definition of successful Technology Integration as:
The shared commitment to a success in moving a middle school and the faculty and staff, individually and collectively, in the direction of increasing comfort and effectiveness in utilizing the “emerging technologies” in the administrative and management operation of the school and in the development of curriculum and the delivery of instructional opportunities that enhance student learning in the several content fields and in the developing area of technology literacy as a needed basic and applied skill area as we move further into the Information Era in the 21st Century.

Please respond to the quantitative items using the Likert scale shown below by placing your selected response number in the space to the left of each numbered question (Place an “X” in the space on any item that you feel that you lack an informed basis for responding and please note the distinctions in the items with respect to your administrative/record keeping/communications role and your classroom/instructional roles of the paired questions):

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<th>Totally Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>Totally Agree</th>
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1. Personally, I am committed professionally to developing my abilities to utilize the emerging technologies in my role as teacher.
2. My school system/middle school should make efforts to respond to the emergence of technology literacy as a necessary step in preparing our students for an increasingly digital/global world.
3. Successful movement in the technology integration direction is a priority in the school system.
4. Successful movement in the technology integration direction is a priority of the leadership in my middle school.
5. Successful movement in the technology integration direction is a priority of my fellow teachers in this middle school.
6. Teachers are included and their concerns are considered in planning and decision making process related to the technology integration movement in this middle school.
7. Needed staff development assistance has been available in my efforts to deal increasingly with the emerging technologies.
8. My school is current with respect to appropriate policies and operational guidelines with respect to allowing it to deal effectively with the challenges of the emerging technologies.
9. My school is current from the perspective of necessary equipment and infrastructure support for dealing effectively with the challenges of the emerging technologies from an administrative/record keeping/communications perspective.
10. My school is current from the perspective of necessary equipment and infrastructure support for dealing effectively with the challenges of the emerging technologies from the perspective of my classroom/instructional responsibilities.
11. I have made a good degree of progress in the technology integration direction with respect to administrative/record keeping/communications at this middle school.
12. I have made a good degree of progress in the technology integration direction with respect to my classroom/instructional responsibilities at this middle school.

13. My students have developed in a positive technology literacy direction during my employment at this middle school.

14. Feedback from the annual assessment of eighth graders on the technology literacy test has been utilized in working with my students in a focused manner.

15. The feedback of student performance data and its use have been useful in my work with my students.

Please respond to the open-ended items

16. List the sources of assistance that you turn to in rank order when you have a need in dealing with a technology integration development or use of a particularly piece of equipment in an administrative/record keeping, communications application (i.e. principal, assistant principal, technology coordinator, chair or member of the Information Technology Committee, grade level chair, peer teacher, librarian/media center staff, bookkeeper, secretary, etc..).

17. List the sources of assistance that you turn to in rank order when you have a need in dealing with a technology integration development or use of a particularly piece of equipment in a classroom/instructional application (i.e. principal, assistant principal, technology coordinator, chair or member of the Information Technology Committee, grade level chair, peer teacher, librarian/media center staff, bookkeeper, secretary, etc..)

18. List in rank order; the technology Integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment, that you have found to be most useful in your administrative/record keeping/communication role as teacher.

19. List in rank order; the technology Integration development/equipment, new pieces of emerging technology equipment or new ways of utilizing existing equipment, that you have found to be most useful in your classroom/instructional role as teacher

20. Provide any additional comments that you feel might be useful as your system and your middle school continue to move successfully in a Technology Integration direction. (Use the back of the survey if additional space is needed).

Please provide the following demographic information by responding in the spaces provided or by placing an “X” by the appropriate response option:

21. Years teaching in this middle school
22. Years teaching in another middle school in this system
23. Total Years of teaching experience
24. Primary Content Teaching Field/Assignment
25. Grade Level
26. Does your middle school have an Information Technology (IT) Committee?
   Yes____ No____ Do Not Know____
27. Are you the chair of the IT Committee this year?
   Yes____ No____
28. Have you served as a member of the IT Committee during the past five years?
   Yes ___ No ___
29. Are you a member of the IT Committee this year?
   Yes ___ No ___
30. The year in which you were born ________
31. Female _______ Male _______
32. Your Gender: African-American ____ Asian-American ____ Latin/Hispanic American ____
   White (other than Latino) ____ Other ____

The Teachers and Technology Integration Survey (TTIS) was developed with the Principal’s
Survey Booklet (Anderson and Becker, 1999 and 2005) as the foundational document.
APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL LETTERS
June 12, 2012

Mr. Zawdie Jackson
493 Watson Bay
Stone Mountain, Georgia 30087

Dear Mr. Jackson:

Your request to conduct a research study within the Atlanta Public Schools (APS) was reviewed in accordance with the guidelines. Your research entitled “The Challenges of the Emerging Use of Technology in Schools: An Analysis of a Selected Urban School System in Georgia” is approved on the following conditions:

1. Your study will be confined in APS to the following schools: Brown, Bunche, Inman, Kennedy, King, Sylvan Hills, Sutton and Young Middle Schools.

2. Survey responses from Teachers, Media Specialists and Learning Technology Specialists in the selected schools will be used. Additionally, permission is granted to the researcher to use five years (2007-2012) of performance data related to the Eighth Grade Technology Literacy Assessment. Both of these data sets were gathered under secure procedures as mandated by APS. These data sets are being made available as ‘archival’ data for further analysis. APS staff will not be involved in the data collection.

3. The confidentiality of APS staff and schools must be ensured. Pseudonyms will be used for people, departments and the school. References to APS as “a large urban school system” are required in the title and text of your final report before publication or presentation outside of APS.

4. All data collection must be completed by December 31, 2012.

5. If changes are made in the research design or in the instruments used, you must notify the Department of Research, Planning and Accountability prior to beginning your study.

This letter serves as official notification of the approval of your research request. A copy of the final study must be sent to APS for your file. If you have any questions, please contact me at (404) 802-2781 or mtdouglas@atlanta.k12.ga.us.

Sincerely,

Monica Douglas
Senior Research Associate

Cc: Dr. Ruby Sullivan
Ms. Tiwanna Hayes

October 17, 2012

Zavellie Jackson
286 Wilson Mill Road
Atlanta, GA 30331


Dear Mr. Jackson,

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 5 as outlined below:

(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected, solely for non-research purposes (such as medical treatment or diagnosis).

Your application will expire on October 16, 2013. If the study continues beyond that date, you must complete the IRB Renewal Application. If you modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure (Investigator) form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

[Name]
Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama
UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying Information

Principal Investigator: Zandie Jackson
Second Investigator: Dr. Foster Watkins
Third Investigator: 
Department: Educational Leadership, Policy, & Technology
Education
University: University of Alabama
Address: 286 Wilson Mill Rd.
Attalla, Georgia 30331
Telephone: (404) 803-4300
FAX: (404) 696-1661
E-mail: Jacka002@yahoo.com

University of Alabama
362 Green Hall
Box 870102, Tuscaloosa, AL 35487

Date Submitted: 9/16/12
Panding Source: None

Type of Proposal: ☑ New
☐ Revision
☐ Renewal
☐ Completed
☐ Exempt

Please attach a renewal application
Please attach a continuing review of study form
Please enter the original IRB # at the top of the page

UA faculty or staff member signature: [Redacted]

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):

Type of Review: ☑ Full Board ☐ Expedited

IRB Action:
☐ Rejected Date: 
☐ Tabled Pending Revisions Date: 
☐ Approved Pending Revisions Date: 

☑ Approved - This proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date:
Items approved:  ☑ Research protocol (dated)
Informed consent (dated)
Recruitment materials (dated)

Approval signature: [Redacted]
Date 10/19/12
APPENDIX D

SCHOOL TECHNOLOGY LEADERSHIP SURVEY
School Technology Leadership Survey

1. A1. For How many years have you held the following positions?

a. # years as Technology Leader at this school..............

b. # years in an administrative position in any school...........

2. B1. Please select "yes" for each of the following areas for which there is a policy currently in place at your school. If the answer is not yes, please go to the next subquestion below it.

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Equity in access to technology (within your school building)</td>
</tr>
<tr>
<td>2.</td>
<td>Which classes or types of students get to use computers</td>
</tr>
<tr>
<td>3.</td>
<td>Security from unauthorized system access or entry</td>
</tr>
<tr>
<td>4.</td>
<td>Honoring intellectual property rights, e.g. copyrights</td>
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<tr>
<td>5.</td>
<td>Prohibition of use of adult-oriented material</td>
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<tr>
<td>6.</td>
<td>Student computer-related competency requirement</td>
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<tr>
<td>7.</td>
<td>Restriction of software purchasers to an approved list</td>
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<tr>
<td>8.</td>
<td>Computer game playing on school computers</td>
</tr>
<tr>
<td>9.</td>
<td>Installation of software that has not been purchased by school</td>
</tr>
<tr>
<td>10.</td>
<td>Periodic staff (teacher) development regarding technology</td>
</tr>
<tr>
<td>11.</td>
<td>No policies for any of the above areas</td>
</tr>
<tr>
<td>12.</td>
<td>New policy needs</td>
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</tbody>
</table>
School Technology Leadership Survey

3. B2. Does your school have a technology committee?
- [ ] yes
- [ ] no

4. B3. Which group has taken the greatest lead in the adoption of the technology integration movement at your school: parents, teachers, administration, or others? Place an X in only one.
- [ ] 1. Parents
- [ ] 2. Teachers
- [ ] 3. Administration
- [ ] 4. Other (please describe)

5. B4. How important are each of the following goals in shaping how computes and the emerging technologies are now used at your school?

<table>
<thead>
<tr>
<th>Goal</th>
<th>Not Important</th>
<th>Slightly Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. To prepare students for future jobs</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
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<tr>
<td>b. To improve student achievement scores</td>
<td>[ ]</td>
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<td>c. To promote active learning strategies</td>
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<tr>
<td>d. To deepen student understanding</td>
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<tr>
<td>e. To support instructional reform (e.g., attempts to increase collaboration/comunication among staff)</td>
<td>[ ]</td>
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<tr>
<td>f. To satisfy teacher interests</td>
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<tr>
<td>g. To satisfy parents' and community interests</td>
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<td>h. Other (please describe)</td>
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</tbody>
</table>

6. B5. During the current school year as Technology Leader, approximately how many person-days (8-hour days) did you spend on technology planning, maintenance, or administration? ...........
7. B7. Which groups of people do you as Technology Leader regularly e-mail. Mark all that apply.
   - 1. Teachers
   - 2. Administrative staff
   - 3. Students
   - 4. Parents
   - 5. None

8. B8. Does your school have a budget for technology costs over which you or someone else in your school have sole discretionary authority?
   - yes
   - no

9. B9. Does your district support the costs of technology more than, less than, or about the same as other districts? Mark only one.
   - 1. More than others
   - 2. Less than others
   - 3. About the same as others
   - 4. Don't know
   - 5. Not applicable

10. B10. Has your school obtained special grants during the last three years to support experimental programs at the school either directly or through your district
   - yes
   - no

11. B12. From your perspective, what are the most serious unmet technology needs of your school? Please briefly describe.
12. C7. As Technology Leader, do you think your districts's leadership is attempting to get teachers to implement any of the following instructional practices? Do you think most teachers ought to implement that practice?

Please mark each Column for each individual option that you believe to be true.

<table>
<thead>
<tr>
<th>a. Use of computers and related technology for practicing skills and learning facts</th>
<th>Is your district encouraging this practice?</th>
<th>Should most teachers implement the practice?</th>
<th>Do most teachers implement the practice?</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Use of computers and related technology for writing, analysis and problem-solving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Use of the Internet for searching for information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Use of the Internet for communicating with other classes or adults</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E

EMAIL CORRESPONDENCE
Yes, you may use the instruments. Best wishes to you in your research.
Ron Anderson

At 10:37 AM 5/11/2011, you wrote:
> Dear Dr. Anderson,
>
> I am a doctoral student pursuing the Ed.D degree at the University of Alabama in the area of Educational Leadership, Policy and Technological studies. I am employed as a Technology Coordinator in the Atlanta Public Schools System. In that position, I coordinate the technology support activities of a cluster of five schools including two middle schools. My research interests seem to be compatible and hopefully would extend research efforts reported by Dr. Sara Dexter and you in a 2005 article in the Educational Administration Quarterly entitled “School Technology Leadership: An Empirical Investigation of Prevalence and Effect.” It is my hope also that the research would contribute to the ability of my school system to reach higher levels of technology literacy success with our students. The study is undertaken from an Action Research/Data-based School Improvement perspective.
>
> My proposal which has been approved by my doctoral committee would propose to implement the suggestion in the article that your model be extended to include other assessments of outcomes of Technology Leadership. I am interested in extending your model to include Eighth Grade Technology Literacy Test (EGTLT) scores as available in my district on a standardized test over the past four years.
>
> Permission is requested from you as the lead author on the article to utilize the Principal Survey and Technology Specialist Survey (in whole or in part as yet to be determined) in a Convenience Sample Study of the fifteen middle schools in the Atlanta Public School System. My interest in the survey instruments is primarily based upon the need to come up with school scores on Technology Leadership and the related outcomes in your model in a total score and subscore manner that could be related to available school scores from the EGTLT.
>
> Your consideration of this request would be appreciated. Any guidance or suggestions that you might provide as this process moves forward would also be helpful. In the event that you would like to speak with me regarding this matter, feel free to contact me at: 404-580-2115 (cell) or 404-802-3687 and/or I can contact you at a time that is convenient for you.
> Respectfully:
>
> Zawdie Jackson
>
> cc: Dr. Sara Dexter, Dr. Henry J. Becker
>
> Ron Anderson, Professor Emeritus, University of Minnesota, 952-473-5910
APPENDIX F

LETTER CORRESPONDENCE
June 17, 2011

Dear Zawdie Jackson,

I just received you letter today as I am retired and don’t get my U of MN mail very often.

You are most certainly welcome to use the survey items in the article and in the study.

Best wishes,

Ron Anderson
**District Support**

District support indicates how much a principal feels their district or diocese supports costs of technology relative to other districts or dioceses. Responses are coded as follows: 1 = school district supports technology more than other districts; 0 = district supports costs of technology the same or less than other districts.

**Grants**

This variable indicates that the school or district obtained special grant(s) in the past 3 years for experimental programs where at least 5% of funding was dedicated to computer-related expenses. A value of 1 indicates that at least 5% of grant funding went to computing, and 0 indicates less than 5% of grant money went for computing or that the school did not receive grant money for experimental programs.

**Intellectual Property Policy**

The intellectual property variable indicates that the school currently has a policy in place honoring intellectual property rights (e.g. copyrights); 1 = yes, 0 = no.

**Net Use**

Net use is a measure of the extent to which teachers’ and others in the school used e-mail and the Web for a variety of purposes. The variable is the sum of frequency of teacher and student e-mail and Web use, not just the type of a school’s networking facilities. To create the variable, four questions were dichotomized such that responses of one half or more are coded 2 and less than one half are coded 1. These questions were summed with four additional dichotomous (2 = yes, 1 = no) questions about whether or not the school’s networking facilities and connectivity have been used in programs such as school-to-work transition programs, class or individual projects where the
Internet is used to acquire information from community or other groups, communications to parents about the school program, homework assignments via Web pages or e-mail, and students accessing information on school servers from home. Net use is the sum of all eight responses and ranges from 6 to 16.

**Principal Days**
Principal days on technology indicates that a principal reported spending 5 or more days on technology planning, maintenance, or administration during the current year. The question asked about 8-hour equivalent days. Five was selected as a cutting point so that it would divide the sample approximately in half. The variable was coded 1 if the principal spent at least 5 days on such activity and 0 if the principal spent fewer than 5 days on technology activity.

**Principal E-mail**
Principal e-mail was constructed from principal responses to questions about any regular use of e-mail to communicate with teachers, administrative staff, students, and parents. The variable is dichotomized so that 1 indicates principals who regularly e-mail with more than one of the groups, and 0 indicates principals who regularly email with no groups or only one group.

**School Technology Budget**
If a school had its own budget for technology, this variable was coded 1. Otherwise, it was coded 0. (Many districts do not give schools their own budgets with discretion over technology spending.)

**Staff Development Policy**
The staff development variable indicates that the school currently has a policy in place for periodic staff (teacher) development regarding technology; 1 = yes, 0 = no.
**Student Tool Use**

Student tool use measures the extent to which students use computers during the school year to do academic work, including writing reports, essays, and so on; simulations in science and social studies, spreadsheets, and databases; and looking up information on CD-ROMS, the World Wide Web, and other computer resources. Technology coordinators were asked roughly what percentage of student use of computers would involve each of the above categories of activity, where responses were coded 1 = 0%, 2 = 5%, 3 = 10%, 4 = 15%, 5 = 25%, 6 = 40% and above. Student tool use is the sum of responses to three questions.

**Technology Integration**

Technology integration indicates the relative number of teachers who are integrating technology into their teaching activities of various types, as reported by the technology coordinator. Technology coordinators were asked what proportion of the teachers in their schools did the following: experiment with new teaching methods involving computers, use computers for their own professional tasks, sometimes have students use computers to do curricular assignments, involved in planning or implementing Internet-based activities, and see technology coordinators for advice about integrating technology and curriculum. The following scale was used to estimate the proportions: 1 = none, 2 = almost none, 3 = about one fourth, 4 = about half, 5 = about three-fourths, 6 = almost all, and 7 = all. Technology integrated teaching is the sum of scores across these activities.

**Technology Leadership**

Technology leadership is a variable that measures school technology leadership. It represents the organizational decisions, policies, or actions that facilitate effective utilization of information technology throughout the school. The technology leadership variable is the sum of eight other
indicators: budget, district support, grants, intellectual property policy, principal days, principal e-mail, staff development policy, and technology committee. Each of these variables is dichotomous, coded 1 and 0, and described in further detail in this appendix.