Factors Influencing the Level of Technology Adaptation by Middle-School Teachers

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FACTORs INFLuENCING THE LEVEL OF TECHNOLOGY ADAPTATION

BY MIDDLE-SCHOOL TEACHERS

by

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submit a copy with your final dissertation to be bound as page number two.
ABSTRACT

Factors Influencing the Level of Technology Adaptation by Middle-School Teachers

The purpose of this qualitative case study was to examine those factors influencing a teacher’s level of adaptation to a one-to-one laptop program in a middle-school setting. The school chosen for this study is located in a semi-rural district with approximately 500 students in sixth through eighth grade. Over the past 10 years, the school district has implemented a one-to-one laptop program with students currently having access to their own personal computer each day. Collins’s (2007) technology, leadership management, and policy pyramid model provided a framework for this analysis. Teachers’ perceptions of leadership support for the planning activities, organizational integration activities, and maintenance activities revealed a deeper understanding of leadership’s role in initiating and sustaining the laptop program. District administrator interviews provided an additional perspective of the program’s implementation. The findings suggest leadership’s role in a change process does impact a teacher’s level of adaptation to a new technology program. Future studies should consider the role of leadership in technology innovations and leadership’s influence on teacher technology adaptation.

*Keywords:* technology integration, instructional technology, middle-school teachers, qualitative study, one-to-one computers
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Dedication

I am thankful that I have had the opportunity to share my educational experiences with the two most valued people in my life, my parents George and Frances Favre. They have always encouraged me to do my best and be proud of my accomplishments. I truly believe that age is just a number, and my parents are my role models for “how to enjoy a long and happy life.” Thank you both for being such wonderful parents providing me with your unconditional love and support.
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Chapter 1

The Problem

Introduction

Technology has become forefront in today’s society as a means of communication, research, and productivity, but the applications of technology in the traditional elementary classroom lag behind. School districts have spent millions of dollars on technology infrastructure, professional development for teachers, software, and hardware but are challenged to justify these expenses and demonstrate a correlation to measurable gains in student academic achievement. Parents, local school boards, and state mandates have put demands on school leaders to successfully increase the integration and adaptation of technology while demonstrating the cost effectiveness of the expense (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). Since technology literacy was first mandated in the No Child Left Behind Act of 2001 (NCLB, 2002), school districts have continued to expand the use of new technologies but more so as a tool to enhance instruction than a commitment to transforming how and what students learn (Zhao, 2009). Identifying those factors that influence successful technology integration and provide sustainability in classroom technology adaptations will provide valuable information to the school leaders who make policy and budgetary decisions. Public education has not effectively tapped into the vast potential computer technology has to offer and is challenged to find research-based practice to guide technology decisions.

Collins’s technology leadership, management, and policy pyramid (TLMPP) model identifies three key activities necessary for successful technology implementation: (a) organizational integration activities, (b) maintenance activities, and (c) planning activities
supported by “a foundation of committed leadership” (Collins, 2009, p. 17). Effective inclusive planning and preparation within an organization are essential for integrating new technologies, and as Collins (2009) explained, all three sides of the TLMPP model support the goal of excellence while recognizing the importance of the human relationships involved in a change process.

“Like the sleeping dragon of mythology, the power of technology lies dormant until provoked, then once provoked, one becomes witness to its awesome power and capabilities” (Kidd, 2009, p. 89).

Over the past 30 years the impact of personal computers and the consequential application of various new technologies have changed the landscape of American business, education, and society. The Internet has allowed communication to be transported into a high-speed network with instant results and access to endless information. Computer science was first suggested as a new graduation requirement for high school students in A Nation at Risk, a report commissioned by President Ronald Reagan, which publicized American students’ lack of preparation for the workforce (National Commission on Excellence in Education, 1983). Support for educational technology grew through the efforts of the National Science Foundation, the U.S. Department of Education, National Aeronautics and Space Administration (NASA), and numerous other federal agencies (Coley, Cradler, & Engel, 1997). Educational technology refers to any technology used in teaching and learning, and during the 1980s the multimedia computer was introduced as a way to revolutionize classroom instruction (Coley et al., 1997). Public policy focused on increasing access to the Internet, and E-rate was introduced in 1990 by the Federal Communications Commission to the Internet infrastructure in schools (Culp, Honey, & Mandinach, 2003). As Culp et al. explained, the National Technology Plan of 2001 required by
the NCLB (2002) legislation called for new technology literacy requirements for eighth-grade students and provided guidelines to policymakers to support effective technology implementation in our nation’s schools. The majority of public schools have now expanded technology resources for students, including access to online library resources, online textbooks, and the ability to store their files electronically.

In 2010 the National Education Technology Plan called for an increased effort to close the achievement gap by improving technology skills to insure college readiness and successful college matriculation for all high school students (U.S. Department of Education, 2010). Deficiencies in student performance may be equated to many factors including poverty, a lack of social experiences, and low self-esteem (Duran & Valadez, 2007). Finding ways to motivate these learners is a challenge, and the classroom teacher is responsible for developing instructional practices, which will have positive outcomes.

The difference between affluent and low-income students’ access to technology has been labeled the digital divide and has been defined in terms of computer and Internet use, skills, and applications (Duran & Valadez, 2007). When examining accessibility to classroom rigor, there is a disparity as indicated by the greater level of engagement in problem solving, communication skills, and creativity available for higher income students (Kidd, 2009). A digital divide has also been identified between the level of technology use in the home and at school, which presents a challenge to the classroom teacher as well as the modern student digital learner. A recent report by the U.S. Department of Commerce showed a continued disparity in computer and Internet access when comparing family demographics and geography. Results of the survey indicated 46% of low-income families (incomes of less than $25,000) had access to the Internet (U.S. Department of Commerce, 2013).
School policy and implementation practices should address the needs of all students, as every student deserves the supports needed to be successful. In addition, NCLB (2002) required schools to ensure all students are proficient in mandated high-stakes testing. Many states are moving towards an online platform for benchmark and standardized assessments. These tests necessitate classroom instruction to shift towards technology practices aligned to the skills needed for online testing and challenge schools to provide additional assistance to students who may not have the advantage of the Internet or a computer at home. Students will need to be proficient with a keyboard, controlling a mouse or keypad, writing skills, and multitasking so that their technology skills do not significantly impact their test results. In addition, students who are economically disadvantaged might not have the opportunity to practice on a home computer or have technology available to them other than in the classroom.

Zhao and Frank (2003) identified two major disparities in the use of technology: (a) the students’ level of technology use outside of school as compared to in school and (b) the gap between measured productivity and expenditures in schools as compared to businesses outside of the education field. Computer and Internet accessibility has grown significantly as the options for Internet connectivity have expanded to mobile computer devices and cellular phones. In 2011, statistical data indicated 75.6% of households had a computer, and household Internet access had increased to 71.7% (U.S. Department of Commerce, 2013). With the current increase in options for the Internet through various mobile devices such as phones and tablets, these figures continue to increase. Most students have access to technology outside their regular classroom setting, but many schools still do not offer students the opportunity to use technology on a regular basis as part of their daily instruction or learning activities. Critics see this as a significant gap in the educational programing offered to students and a failure to include 21st
century skills as part of the curriculum and pedagogy. Educators are also challenged to provide technology that is applicable in a setting and proven to enhance student performance. Computer use in the classroom is generally controlled by the teacher whose instructional design is based on curriculum, the students’ needs, and the technology that is available.

The level of technology adaptation in the classroom has been linked closely to several variables related to teacher perceptions, school-level conditions for technology integration, and school-level supports (Bebell, O’Dwyer, Russell, & Hoffman, 2010; Hew & Brush, 2007; Inan & Lowther, 2010). Inan and Lowther utilized a research-based path model to investigate technology integration in public schools in Tennessee, and they found the following variables have a significant impact on technology integration in the classroom:

- years of teaching: self-reported number of years as a teacher;
- computer proficiency: teachers’ perceptions of their own computer ability level;
- computer availability: the number of computers available in the classroom for student use;
- teachers’ beliefs: teachers’ perceptions of technology’s influence on student learning and achievement and impact on classroom instruction and learning activities;
- teachers’ readiness: teachers’ perceptions of their capabilities and skills required to integrate technology into their classroom instruction;
- overall support: teachers’ perceptions of support from administration, peers, parents, and community for technology integration in the school;
• technical support: teachers’ perceptions of adequacy of technical support, availability of resources, and assistance with computer software and troubleshooting; and


Teacher readiness, teacher beliefs, and computer availability were shown to have the highest level of impact on a teacher’s integration of technology in the classroom (Inan & Lowther, 2010). The factors identified as having influence on teacher perceptions including school-based supports are critical when considering the implementation of a technology application. Providing committed leadership is essential for the strategic planning and implementation of a successful technology integration (Collins, 2009).

The foundation of a successful integration within an organization is the committed leadership that supports the idea of change and recognizes the needs to implement the change (Collins, 2009). Committed leadership encompasses all stakeholders in the school when considering a technology integration, and this includes the administration as well as teachers, students, parents, and support staff. In the school setting, district administration drives policy and management decisions that direct how a change is implemented. Many barriers within a school organization affect technology integration and influence the organizational culture, teacher beliefs, and acceptance of change (Hew & Brush, 2007). Leading change requires insight into the values, beliefs, and perceptions of those impacted by the change (Heifetz, Grashow, & Linsky, 2009), and in the school setting teachers are at the forefront of implementing a technology integration. The process of change requires many levels of activity from the planning stages to the training, adaptation, and evaluation of the outcomes.
Fullan’s framework for leadership is a convergence of theories for complex change incorporating Argyris’s external and internal commitment, noting that “five components of leadership represent independent but mutual reinforcing forces for positive change” (Fullan, 2001, p. 3). Successful leadership supporting change is bound by the actions of the leader. The components: moral purpose, understanding change, relationship building, coherence making, and knowledge creation and sharing have been equated to leading successful change in an organization (Fullan, 2001). The influence of leadership will be considered when identifying those characteristics, which influence a teacher’s adaptation of technology in the classroom setting.

**Problem Statement**

The challenge to successfully integrate technology into our public educational system and demonstrate measurable outcomes to justify the expense is a problem facing most schools today. Districts have spent millions of dollars on technology infrastructure, professional development, hardware, and software, but the use of technology lags in the traditional elementary classroom. Pressure to increase technology integration in schools is now magnified with New Jersey’s recently mandated computer-based assessments, which require students to complete standardized testing on a computer (NJ Department of Education, 2014). These tests will measure academic achievement for students in Grades 3 through 11 for compliance with NCLB (2002) requirements to receive federal funding. Additionally, schools have been mandated to increase the emphasis on 21st century technology skills for college and career readiness that are included in the Common Core State Standards adopted by New Jersey. Some of the factors that have been identified as influencing a teacher’s level of technology adaptation include teacher perception of leadership support, teacher perception of professional development effectiveness, and teacher
perception of technology availability and maintenance (Inan & Lowther, 2010). Identifying those factors, which influence successful technology integration and provide sustainability in classroom technology adaptations will provide valuable information to the school leaders who make policy and budgetary decisions for a school district. This study contributes to the body of knowledge identifying the key factors, which influence a teacher’s level of technology adaptation in a one-to-one laptop program in a classroom setting.

**Purpose of the Study**

The purpose of this case study was to examine the factors influencing the level of technology adaptation by teachers in their classrooms. Specifically, this study sought to investigate to what extent district leadership influences middle-school teachers’ levels of adaptation in a one-to-one laptop initiative. Building on the relationship between teacher perceptions of district leadership support of the organizational integration activities, maintenance activities, and planning activities in a one-to-one laptop initiative, Collins’s (2009) technology leadership, management, and policy pyramid model was used to frame this investigation. The school district chosen for this study has committed to providing every student the opportunity to use a personal laptop computer daily as part of the regular classroom instruction. The middle-school that was used as a case study had had a one-to-one laptop program for over 7 years and provided the setting to collect data on the factors influencing a teacher’s level of technology adaptation.

This study has policy implications for schools in New Jersey as they plan to meet new standardized online testing requirements and federal mandates for career and college readiness. Moreover, similar programs have been implemented in other states, and this study provided valuable insight into the effectiveness of school leadership in this change process.
Research Questions

The intent of this research was to focus on those factors influencing the level of technology adaptation by teachers in a middle-school setting. This study considered how teacher perceptions of district leadership support may influence their instructional decisions for technology integration in the classroom. Teachers normally control the daily structure and content of their lessons and utilize a lesson plan format aligned to the school’s curriculum. Many districts require technology to be included as part of the lesson plan for instruction to document the technology skills utilized and the Common Core Teaching Standards that are met.

The primary research question posed for the study asked:

- To what extent does district leadership influence a middle-school teacher’s adaptation of technology in a one-to-one laptop initiative?

Five subsidiary questions were developed to investigate the primary research question.

- How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school?
- How do middle-school teachers perceive the role of district leadership in supporting the planning activities for a one-to-one laptop initiative?
- How do middle-school teachers perceive the role of district leadership in supporting the integration of technology into the curriculum?
- How do middle-school teachers perceive the role of district leadership in supporting professional development for technology integration?
- How do middle-school teachers perceive the role of district leadership in supporting the maintenance activities for technology?
Theoretical Rationale

Collins’s (2009) technology leadership, management, and policy pyramid (TLMPP) model provided a theoretical framework focusing on three key activities, which need to be supported by school leaders: planning for a new technology program, maintenance of the technology, and organizational activities that are necessary to support the successful integration of a new technology. Collins explained, “No model or effort with technology should exist without the foundation of committed leadership” (p. 17). Any successful change in an organization requires strong leadership guiding the necessary components to introduce and implement the change. Collins’s TLMPP model is a pyramid supported by a foundation of committed leadership with three sides: planning activities, organizational integration activities, and maintenance activities equally important to the success of technology (Collins, 2009, p. 18). “The apex or vision of the model is to attain excellence in using technology (Collins, 2009, p. 17). Collins utilized the TLMPP model to demonstrate how the three sides representing planning, organizational integration, and maintenance activities are related to a successful technology program, while committed leadership provides support as the base of the pyramid.

Framing the TLMPP model by research that supports successful change leadership in schools, Collins considered the importance of the “change agents” who must identify and meet the needs of those implementing the change. He referenced Gene Hall and Shirley Hord’s concerns-based adoption model (CBAM) as an example of the kind of framework necessary to support change within the school context (Collins, 2009). Studies that have identified the factors necessary for successful technology adoption in the classroom and leadership needed for the implementation of change were considered in the design of this project. Change leadership
and the impact of actions taken by leaders when proposing new technology innovations, decisions, or policies have great influence on those implementing the change.

Miranda and Russell (2011) supported the importance of district-wide commitment to technology with their secondary analysis of Use, Support, and Effect of Instructional Technology (USEiT) data from 21 Massachusetts school districts. Successful teacher technology adaptations are linked to district leadership activities that define and support technology goals, encourage support at all administrative levels, and effectively communicate the importance of the technology initiative (Miranda & Russell, 2011). Relating the leadership practices identified in this study that influence a teacher’s level of adaptation to Collins’s TLMPP model provide further support for the importance of committed leadership. This study determined how the district leadership support of the planning activities, organizational integration activities (related to the curriculum and professional development for teachers), and maintenance activities influence a teacher’s level of technology adaptation in the classroom.

**Significance of the Study**

“The collective weaknesses of educational technology research has created a challenging situation for educational leaders and policymakers who must use flawed or limited research evidence to make policy and funding decisions” (Bebell et al., 2010, p. 31). Utilizing the school setting to study the relationships between levels of technology integration and the leadership, access to technology and teacher characteristics within that setting will add to the current knowledge and address gaps in the research (Hew & Brush, 2007; Palak & Walls, 2009; Tondeur, Valcke, & van Braak, 2008; Zhao & Frank, 2003). Inan and Lowther (2010) suggested the need for further qualitative studies to include rich data collected from classroom observations and interviews with key personnel such as principals, teachers, and students. This study is significant
because as New Jersey school districts seek to improve students’ 21st century skill sets and prepare for online state assessments for all students in Grades 3 through 11, the relevancy of computer integration is central to policy and curricular decisions. Several strategies to consider in the implementation of technology integration and to overcome barriers to this process have been identified: “(a) having a shared vision and technology integration plan, (b) overcoming the scarcity of resources, (c) changing attitudes and beliefs, (d) conducting professional development, and (e) reconsidering assessments” (Hew & Brush, 2007, p. 232). As political pressure and public policy shift to an emphasis on college and career readiness for high school graduates, school districts are now held accountable to insure all students have access to computers and the Internet and that they become proficient in technology skills. As the process of technology integration in the classroom and preparation for the transition to online testing continues, the need for further study provided research-based best practices that will enhance this process.

**Limitations**

This case study was conducted in a K–8 public school district in southern New Jersey. Specifically, teachers and administrators were recruited from and interviewed at the district’s middle-school. The semi-rural school district with approximately 500 students serviced a population of mostly White students with 12% considered economically disadvantaged. Data were gathered from interviews with the teachers and administrators during the fall semester over a 2-month period. The sample for this study consisted of nine classroom teachers and four administrators including the superintendent, the school principal, the supervisor of curriculum, and the academic achievement officer. Teacher interest in technology may have been a factor in those teachers accepting an invitation to participate in this study. A larger sample size might
provide different results. As with all qualitative research, it is assumed that the responses of the participants were honest and truthful concerning the district’s one-to-one laptop program and teacher perceptions of the district leadership support.

**Delimitations**

Delimitations result from using a single public-school district and focusing only on those teachers who are participating in a one-to-one laptop program in a middle school with sixth-through eighth-grade classrooms. Valuable information was gleaned from this case study, but the application of this research may be limited for use in other school settings or districts.

**Key Terms**

The following definitions of terms clarify their meaning in the context of this study and resulting narrative.

*Committed leadership:* This term refers to leaders fully committing themselves to a systematic approach for technology leadership, management, and policy (Collins, 2009, p. 12).

*Educational technology:* Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Januszewski & Molenda, 2013, p. 1).

*Level of computer adaptation:* These are three graduated levels of technology integration implemented by the teacher in the classroom

- **Entry phase:** This is classroom instruction that remains consistent, and teachers struggle with the implementation of technology.

- **Adoption phase:** The teachers begin to use technology in the classroom mainly to provide instruction on computer skills then start to increase integration and use technology during instruction. Teachers gain confidence.
Invention phase: The teacher is willing to try new methods and ways to integrate technology in the classroom. (Sandholtz, Ringstaff, & Dwyer, 1997)

Maintenance activities: These activities support or sustain technology. Maintenance activities can occur daily, weekly, monthly, quarterly, semiannually, or annually and rely on the support of committed leadership to ensure they are planned, financed, and implemented (Collins, 2009).

Middle school: For the purpose of this study the middle school encompasses the administrators, teachers, and students in a school serving Grades 6 through 8 housed in one building.

One-to-one computers: This method is used in classroom instruction and supports student center activities by: (a) providing students with use of portable laptop computers loaded with contemporary productivity software such as word processing tools, spreadsheet tools, and so forth; (b) enabling students to access the Internet through schools’ wireless networks; and (c) focusing on using laptops to help complete academic tasks such as homework assignments, tests, and presentations (Penuel, 2006, p. 331).

Organizational integrational activities: This refers to “the process of integrating (technology) within a given organizational setting” (Collins, 2009, p. 13). In the context of an educational organization these activities refer to curricular integration activities and professional development activities.

Planning activities: These activities support technology by defining the technology goals, policies, and procedures of a school district and formulating a plan for how they will be implemented. Planning activities support the maintenance and organizational integration
activities to complete the complex system necessary for successful technology integration (Collins, 2009).

*Technology integration:* This refers to an adaptation of technology in classroom instruction, which requires the use of technology as an integral part of student learning.

**Summary**

In summary, Chapter I introduced this study’s problem statement, research questions, purpose, and significance as framed by national and local concerns for computer integration in the classroom. The delimitations and limitations were also addressed.

Chapter II provides a review of the research and current literature supporting the topic of this study, considering those factors that influence teachers’ levels of technology adaptation in the classroom. The discussion begins with a brief historical introduction to the advent of technology in education, the impact state and federal laws have had on policy decisions, and future concerns facing school districts concerning technology integration. The theoretical framework is discussed along with those relevant factors identified as having influence on teachers’ perceptions and level of technology adaptation. A closer look at the theoretical implications of leadership’s impact on school organizations undergoing change is aligned to theoretical framework.

In Chapter III the study’s methodologies including sample description and selection, data collection process, and the procedures used for data analysis are reviewed.

Chapter IV presents a review of the data collected from individual interviews with teachers and administrators recruited for this study. Themes that emerged during the coding process are discussed and aligned to the theoretical framework. In particular, teacher perceptions of leadership’s support and activities were aligned to a teacher’s level of technology adaptation
in the classroom. Perceptions from district administrators on the planning activities, organizational integration activities, and maintenance activities that had been identified through the theoretical framework clarified the emerging themes. In addition, a review of school artifacts added further validity to the findings.

Following a summary of the problem and research methods, I discuss the key findings and their implications for policy and practice in Chapter V. Those leadership activities that were shown to have the most influence on teacher adaptations of technology in the classroom were identified as key findings. These activities provide a basis for suggestions for future policy and practice when implementing a new technology program. Finally, I conclude with some suggested topics for future study.
Chapter II

Review of the Literature

Introduction

The 21st century classroom has been propelled into a higher level of technology adaptation that continues to evolve rapidly with every innovation. It is no longer a question of including computers in the elementary classroom but rather a decision of when and how often. The modern learner spends more time on the Internet than on the playground and can find the answer to any question using an Internet search engine in seconds. Standardized testing has moved to an online platform, allowing teachers to retrieve student achievement data within hours of administering a test. Digital textbooks, a variety of electronic mobile devices, and a multitude of communication platforms provide many choices for virtual learning. These changes are readily accepted by tech-savvy teachers, but the overall level of adaptation by teachers can vary due to many factors including teacher perceptions, availability of technology, professional development, and level of supports. Decisions concerning technology policy, management, and leadership directly impact the teacher who is in the forefront in the implementation of technology in the classroom.

This literature review begins with the historical development of technology applications in elementary education and the current trends in use and practice for instruction. Research topics include studies supporting the influence of leadership and teacher perception in regard to the levels of technology integration in the classroom and instruction. Other relevant subtopics will address the implications for district-level policy and leadership decisions when selecting and implementing a technology integration focusing on those relevant practices found to support sustainability and success. These include teacher professional development, organizational
management activities, and activities supporting technology maintenance. For the purposes of this study the term technology integration refers to an adoption of technology in classroom instruction, which requires the use of technology as an integral part of student learning. Identifying those factors that influence successful technology integration and sustainability in classroom technology adaptations was central to this investigation. An examination of technology adaptation from a historical perspective will provide a better understanding of the direction technology integration has taken in elementary education.

**Historical Implications**

In the early introduction of technology in schools, educational leaders questioned whether computers should be introduced on a larger scale in the classroom. Skeptics questioned the cost effectiveness and impact on children and favored smaller individual applications with software used for drills, simulations, and enrichment (Cuban, 1986). As a result of the identified concerns outlined in *A Nation at Risk* in 1983, educators struggled with decisions on how to improve student performance centered on instructional strategies, teacher performance, and incorporating technology in schools (National Commission on Excellence in Education, 1983). Technology applications in the classroom began with students using computer software for enrichment and remediation (Kulik, 2003). These educational software programs were employed as supplemental resources with minimal integration into instruction or the curriculum. Word processing and data management applications appeared in the 1990s and transitioned computers into an important educational tool for teachers and students (Kulik, 2003). By the mid-1990s researchers and educational policymakers agreed technology should play an integral part in classroom instruction, but as technology resources increased the experts debated how schools should best support implementation. A review of educational technology data identified the
importance of attending to the social organization of schools and the impact new technologies have on the teachers who lead instruction in the classroom (Coley & et al., 1997). Many students’ first experiences with computers occurred in a technology class held in a computer lab. As the availability of software increased, schools purchased programs for student data management, gradebooks, and lesson plans that required teachers to become computer literate. Early use of the Internet for classroom activities included web-quest searches, science laboratory simulations, and research engines. Technology continued to be used as a supplementary tool with the level of classroom adaptation based primarily on the teacher’s skill level and the availability of the technology. Throughout the last 20 years the influx of technology in education and continuous innovations in hardware and infrastructure have contributed to the expansion of opportunities for school management as well as classroom instruction.

Beyond computers, the use of technology expanded in education to include peripheral equipment such as printers, projectors, video cameras, networks, personal digital appliances, MP3 players, and iPods with endless applications in the classroom (Kidd, 2009). Internet availability in schools continued to grow, expanding from 27% in 1997 to 93% in 2003 (Bebell et al., 2010). The change from dial-up connections to high-speed broadband service improved the access and speed of the Internet. Increased accessibility to the Internet has allowed for expansion of classroom use, electronic communication via email, and the introduction of school web pages. New software including online textbooks, wireless technology, and portable computers such as tablets and laptops has resulted in dramatic increases in the use of technology. A move towards a one-to-one classroom environment with each student having a computer device has continued to expand in many districts, and teachers have found having computers in the classroom is easier to integrate than using a computer lab (Tondeur et al., 2008). As
technology applications and equipment continue to evolve, schools are also adjusting to how computers are utilized for teaching and learning. Many states are moving to digital or online tests for state testing, while school districts are using computer-based assessments for teacher-made tests as well as standardized assessments to track student achievement (Bebell et al., 2010). As the use of digital assessments and technology continues to expand, the disparity in the level of technology resources between affluent and poor urban students is magnified.

The digital divide has been described as a gap between the available technology in high-resource schools and schools that have limited access to computers and the Internet (Duran & Valadez, 2007). The digital divide can be analyzed by looking at the access students have to technology in the classroom and how the technology is being used by individual students (Becker, 2007). The National Telecommunications and Information Administration (NTIA) found a consistent gap in the access of computers and Internet in the categories of education, income, and race (U. S. Department of Commerce, 2004). A lack of access to technological resources, telephones, computers, and the Internet has been identified in urban schools, affecting minority students and children from low-income families or single-parent households (U.S. Department of Commerce, 2004). Studies showed that coupled with a lack of available technology, low-resource schools also tend to have inferior classroom instruction (Becker, 2007; Kulik, 2003; Warschauer, Knobel, & Stone, 2004). Teachers tend to rely on computer programs using drill and practice for low socioeconomic status (SES) students and use more innovative practices with high SES students. Kidd (2009) referred to Pinar’s description of the “drill and kill” method of preparation for standardized testing in which students are not exposed to a “pedagogical practice that promotes quality teaching and active student learning” (p. 92). The challenge is not only to provide schools with the technology but also address the needs of the
teachers so they are adequately trained and ready to implement. The National Education Technology Plan of 2010 highlighted the continued gap in technology availability, teacher preparation, and resources for underserved populations such as economically disadvantaged students in low-resource school districts (U.S. Department of Education, 2010). Although the majority of public school districts now have Internet and computer resources for students, the 2016 National Education Technology Plan, Future Ready Learning: Reimagining the Role of Technology, indicated the digital divide still presents these challenges. Students from urban and rural districts continue to lack equity in access to technology as a tool to enhance their learning experiences both in school and at home where access to such digital resources as the Internet, online homework assignments, and textbooks is lacking (U.S. Department of Education, 2016). As districts look to expand technology in the classroom for instruction and learning, school leadership must consider the impact legislation such as the Every Student Succeeds Act of 2015 and political influences have on how technology programs are implemented.

With the reauthorization of the No Child Left Behind Act in 2010 came the realization that student achievement still lagged the intents of the original legislation; moreover, the achievement gap remained between suburban students and students from economically disadvantaged urban school districts. Those realities still held true in 2016 with the publication of the National Education Technology Plan. In reference to the digital divide, Secretary of Education, Arne Duncan, expressed, “If the technology revolution only happens for families that already have money and education, then it’s not really a revolution” (U.S. Department of Education, 2016, p. 1). The plan offers recommendations for learning, teaching, leadership, student assessment, and infrastructure for technology (U.S. Department of Education, 2016). Proficiency in technology literacy is critical for students to achieve these goals.
School districts are held accountable for student performance that is tied to the dissemination of federal grants including Individuals with Disabilities Education Act (IDEA) and Titles I, II, and III monies that support economically disadvantaged students, teacher professional development in those districts, and English as a second language (ESL) students. No Child Left Behind was reauthorized with the signing of Every Student Succeeds Act (ESSA) in 2015. ESSA was aligned to the activities supporting technology in Title IV Part A also authorized in 2015 (U.S. Department of Education, 2017). Recently the 2017 National Education Technology Plan Update was published by the Department of Education because the 5-year span between national technology plans was not adequately addressing the fast-paced changes that have occurred in technology. These federal documents provide a guideline for policy and reaffirm the direction technology education has taken nationally. As the demand for more research-based evidence on specific computer applications has increased, so has the need for research that provides successful interventions to help close the achievement gap affecting students in low-achieving schools (Kidd, 2009). Teachers are forefront in providing the necessary instructional strategies and technology adaptations to meet the needs of their students.

**Technology Adaptation**

Teachers generally command the design and implementation of the instructional practices used in their classrooms. Traditionally, instruction has been guided by writing weekly lesson plans, establishing classroom rituals, and instructing students utilizing timeworn traditions such as direct instruction and textbooks. Today’s public-school educators are being challenged to provide lessons that align to rigorous core content standards, incorporate 21st century college and career readiness skills, and motivate technology-savvy students. New policies and curricular changes are moving schools towards a more technology-enriched environment for student
learning. Technology adaptation can be defined as how a teacher chooses to integrate computers in the classroom for instruction and learning. The levels of technology adaptation by teachers can be traced to many underlying factors such as personal experience with technology, a fear that technology changes will affect one’s available time for planning, or the perception of leadership’s support for a new technology initiative. An analysis of research identifying factors supporting successful technology integration by teachers will provide valuable information for those stakeholders charged with influencing decisions and implementing policy for technology in their school districts.

One paradox facing researchers is determining a methodology to evaluate the various data related to educational technology in the classroom. Measuring the level of teacher computer adaptation, student computer contact, access to technology resources, and the success of individual technology applications are some of the data points considered by researchers. Seven scales developed to measure technology applications by teachers based on information garnered from a variety of research methods and associated with the most prevalent uses include:

- teachers’ use of technology for class preparation,
- teachers’ professional e-mail use,
- teacher-directed student use of technology during class time,
- teachers’ use of technology for grading,
- teachers’ use of technology for delivering instruction,
- teachers’ use of technology for providing accommodations, and
- teacher-directed student use of technology to create products. (Bebell et al., 2010, p. 35)

Focusing on the teacher practices related to the use of technology in the classroom provides a focal point for this study of technology adaptation. Evaluating those factors
influencing teachers at varying levels of technology adaptation will provide insight into the leadership and management practices that best support successful technology integration.

Technology integration associated with instruction can assist in determining the levels of teacher technology adaptation as follows: (a) the entry phase in which the teacher is learning about computers, still relies on traditional instructional practice, and uses minimal technology in the classroom mainly for preparation or record keeping; (b) the adoption phase during which time the teacher begins to utilize technology in delivery of instruction and allows students to use computers for information and supplemental activities; and (c) the invention phase when the teacher willingly integrates technology as part of instruction and allows students to use computers for learning (Sandholtz et al., 1997). Teachers may be required to use technology for school management functions such as grade books, lesson plans, and email; however, the levels of adaptation for the adoption and invention phases are closely related to a teacher’s pedagogy and philosophy of education. Traditional teacher-centered instructional practice tends to exhibit low levels of computer adaptation, whereas a constructivist approach utilizes more student-centered activities (Danielson, 2007) and generally results in a higher level of computer integration (Tondeur et al., 2008).

When a technology program, such as one-to-one laptops, is adopted as part of the school’s plan for curriculum and instruction, implementation requires adaptation by the teacher. The level of adaptation by the teacher can range from avoidance to innovative applications. Various studies have considered how teachers use technology (Palak & Walls, 2009), what factors influence teacher adaptation of technology (Schrum & Levin, 2012), and the impact of technology on measured outcomes (Kidd, 2009). Both school-level factors and teacher-level factors have been shown to influence technology integration. School-level factors to consider
include overall school support structures including professional development and leadership support, technical supports, computer access, and computer availability (Bebell et al., 2010). Teacher-level factors include teacher perceptions and attitudes (Lim, 2007; Tondeur et al., 2008). Research conducted on teacher perception and attitude towards technology provides further evidence of those factors that influence a teacher’s level of technology adaptation.

**Teacher Perceptions**

The majority of elementary teachers have some experience with computers and technology, but the levels of adaptation in classroom instruction are highly variable. Two domains identified and linked to integration of technology by Sandholtz et al. (1997) were: (a) teacher confidence and comfort levels with technology and (b) the levels of support both general and technical have broad connections to many similar studies on technology integration. Teachers are strongly influenced by what they believe to be true and their own personal experiences as a classroom teacher. Several studies have shown teacher beliefs and attitudes strongly impact their instructional decisions related to computer integration in the classroom (Ertmer, 2005; Palak & Walls, 2009; Zhao & Frank, 2003). Specifically, those perceptions include how teachers view their personal ability levels with technology, their readiness to interface with new technology instructional strategies, and their perceptions of how technology will impact their students’ achievement levels (Inan & Lowther, 2010). Studies indicate the level of experience with technology and a teacher’s willingness to be innovative are strong predictors of technology adaptation. Teachers who perceive their personal skill levels to be sufficient to integrate technology are the most likely to be successful (Inan & Lowther, 2010). Having a higher comfort level with technology supports a teacher’s transition to technology-based practices in planning and instruction. In a study of 68 primary schools in Belgium, Tondeur et
al. (2008) found having a constructivist belief towards teaching has a significant impact on the adoption of computer use in the classroom. Teachers who have a constructivist approach and utilize more student-centered activities generally show a higher level of computer integration in their classroom activities (Tondeur et al., 2008). In a review of Becker’s study using the Teaching, Learning and Computing Survey (TLC) with more than 4,000 teachers in over 1,100 schools, a clear relationship was found between a teacher’s philosophy and computer use in the classroom, the objective for their use, and the types of software implemented (Palak & Walls, 2009). Unless teachers have a strong commitment to student-centered computer integration activities, teacher-centered use of computers is more likely to be the norm (Palak & Walls, 2009). When constructivist-oriented teachers have adequate experience, longer class periods, and necessary resources, they are more likely to have students utilize computers (Palak & Walls, 2009). The motivation for accepting change relies on teachers feeling comfortable, secure, and confident they will be considered successful by their peers (Glickman, 1985). The relevancy of teacher self-efficacy and perceptions of their own ability levels with technology must be considered and addressed when planning the activities to support a technology integration program. Various supports within the school such as professional development, reliable technology, and committed leadership should be considered in the implementation of a technology integration

**Technology Leadership, Management, and Policy Model**

Collins (2009) explained his intention with the technology leadership, management, and policy (TLMPP) model was to “establish a conceptual framework, a reference guide, and to identify best practices to assist leaders, managers and policy-makers responsible for implementing technology in their respective organizations” (p. 10). An investigation of those
research findings that support the elements of the TLMPP model provides a deeper understanding of how technology applications have changed and expanded in schools and the challenges school leaders face in their commitment to technology integration.

How leaders approach change in their organizations has been shown to have a significant impact on the success of a new initiative. With the movement towards integrating technology directly into classroom instruction, school leadership becomes critical in the planning and implementation process. Identifying those leadership activities that support and influence a teacher’s level of technology adaptation into the classroom will be of value to school leaders who guide the change process.

Various studies supporting change initiatives in education by Boyd, Rogers, Hall, Hord, and others provided a framework for Collins’s (2009) technology management, and policy pyramid (TLMPP) model. Collins described Hall and Hord’s concerns-based adoption model as “a systematic approach for introducing any innovation into an education environment” utilizing change agents to determine needs and providing the means to acquire necessary resources (Collins, 2009, p. 15). This model demonstrates how technology is adapted in the educational setting and has been used in various studies (Sandholtz et al., 1997; Schrum & Levin, 2012). The committed leadership of the Collins TLMPP model acts as the foundation for those activities necessary for a successful technology initiative. The transformation needed to successfully lead such changes requires “creating a culture (not a structure) of change” (Fullan, 2001, p. 44).

Numerous studies on transformative leadership have identified the qualities needed to cultivate the change process. Effective transformative leaders establish a vision, collaborate, communicate, empower, set goals, and encourage innovation (Kotter, 1995). When leadership strategies utilize a human resource lens to approach change, consideration is given to critical
needs, roles, talents, and values of those affected by the change (Bolman & Deal, 2008). Fullan (2001) explained positive change is more likely when school leaders develop the social capital necessary to support their organizations by cultivating trust, providing information, and sharing expectations. Social capital allows members of an organization such as teachers in a school to develop skills and support each other in new initiatives. When individuals hold each other accountable and positive results are celebrated, a more collaborative atmosphere exists supporting the coherence needed in a change culture (Fullan, 2001). Leaders who strive to “pursue moral purpose, understand the change process, develop relationships, foster knowledge building, and strive for coherence – with energy, enthusiasm, and hopefulness” will increase their ability to affect change (Fullan, 2001, p. 11). The following will expand on the impact of these five factors.

As Fullan (2001) pointed out, the development of moral purpose supports sustainability and increases creativity while expanding and meeting goals with passion and purpose. Leaders must act with moral purpose to be effective and recognize how those actions directly impact the success of their organizations. Moral purpose is foundational to effective change uniting all five leadership components and demonstrating how human needs must be addressed (Fullan, 2001). Providing clarification and an understanding of the technology changes provides assurance to teachers as they look to their administrators to be technology leaders (Ertmer et al., 2002). The importance of committed leadership must be valued as the challenges of implementation and supporting the needs of teachers are critical to the change process.

Organizational integration activities are the actions taken to support the integration of technology in an organization (Collins, 2009). Implementing a new technology application such as one–to-one laptops in a classroom requires consideration of the existing curriculum and
current instructional practices as part of organizational activities. The establishment of the curriculum and instructional practice results from the input of various stakeholders and policymakers in a school district. Federal, state, and local mandates also impact the development and implementation of curriculum. When considering the addition of technology into a school organization, many curricular decisions directly impact the integration process and the potential for success.

Effective use of educational technology occurs when the application directly:

(a) supports the curriculum objectives being assessed,
(b) provides opportunities for student collaboration and project/inquiry based learning,
(c) adjusts for student ability and prior experience and provides feedback to the student and teacher about student performance,
(d) is integrated throughout the lesson, and
(e) provides opportunities for students to design and implement projects (Kidd, 2009, p. 94).

Studies have shown learning can be enhanced with educational technology that requires inquiry-based activities, decision making, collaborative group exercises, and using computers for problem solving, presentations, publishing, and communication (Kidd, 2009).

One-to-one computer initiatives with students having their own personal computing devices have been implemented in many states to improve the availability of instructional technology and increasing access to computers in the classroom. While school districts are pressured to add technology, school administrators look for successful research practices to support integration activities. In Texas, a large-scale study by the International Society for Technology in Education (ISTE) revealed no measurable gains in student achievement on state
tests when relating to teacher instructional practices with computers, but students who used computers for homework outside the school did show improved test scores (Bebell et al., 2010). The ISTE found most one-to-one technology studies are inconclusive and pointed out many current studies “(a) fail to capture the nuanced ways laptops are being used in schools and (b) fail to align learning outcome measures with the measures of student learning” (Bebell et al., 2010, p. 47). When students using laptops were compared to those utilizing traditional paper-and-pencil testing, Bebell and Kay (2010) found students scored higher on standardized tests when essays were typed on a computer. The way technology is administered and the students’ levels of computer experience also need to be considered when determining the controls in such studies (Bebell & Kay, 2010). In his literature review of over 30 one-to-one computer studies, Penuel (2006) reported most of research focuses on the implementation process rather than student outcomes. The two skill areas shown to have been impacted significantly using one-to-one computer devices were computer literacy and writing (Penuel, 2006). Along with considering the curricular impact of technology integration, professional development for teachers and administrators has been identified as being an essential organizational integration activity. “Professional development must also be augmented by the organizational policy, practice and procedures that use technology” (Collins, 2009, p. 20). Successful integration requires aligning the curriculum to the technology, as well as the leadership commitment to provide the professional development for teachers to support their effective adaptation of technology (Collins, 2009).

Creating and sharing knowledge through professional development and mentoring has been shown to increase the level and quality of technology integration by teachers (Kopcha, 2012). Successful organizational activities shown to expand teacher technology adaptation and
integration include mentoring with fluent training for continual support, providing teacher training in the classroom, and establishing collaborative learning communities within the school (Kopcha, 2012). Six research-based principles of effective professional development practice applied to technology integration by Mouza include: teacher knowledge, reform-type activities, activities situated in teacher needs, opportunities for active learning, extensive duration, and active participation (as cited in Kopcha, 2012). Teachers need to feel confident a new instructional practice will be effective and want to be sure there will be positive results in student achievement. These core beliefs are essential if a teacher is going to accept an innovative practice (Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010) such as adapting one-to-one laptops as an integral method of instruction.

Professional development has been shown to be one of the essential organizational activities supporting successful technology integration (Ertmer, 2005; Lim, 2007; Penuel, 2006). In a mixed study, Palak and Walls (2009) randomly selected and surveyed 113 teachers on their use of technology in the classroom. To minimize the effect of barriers to integration, only schools demonstrating a commitment to school reform, professional development, integration of technology, and adequate technology infrastructure were chosen. The results demonstrated that even in a technology-enriched school, teachers rely primarily on their individual pedagogy designing more teacher-centered use of technology for students. “Focus on teacher training should move away from isolated technology training and toward integration of technology into curriculum to help teachers use technology to support student-centered pedagogy” (Palak & Walls, 2009, p.437). In a comprehensive review of the research on one-to-one laptop programs, professional development was identified as an essential support for successful integration by teachers (Penuel, 2006). In particular, professional development activities that “focus on
integrating technology into instruction” saw an increase in teacher use of student-centered laptop activities (Penuel, 2006, p. 339).

Planning activities are one of the three identified supports necessary for an organization’s implementation of technology in Collins’s TLMPP model (Collins, 2009). Planning is an essential process to ensure success of a technology integration and needs to be in alignment with the other two sides of the pyramid, organizational integration activities and maintenance activities (Collins, 2009). Technology acquisition has a critical impact on school budgets, and planning is key for responsible fiscal decisions, designing an implementation process, and sustaining a quality program. As Collins pointed out, planning for technology should be “proactive instead of reactive” (p. 22). Using a systems approach and including teachers for their expertise as the classroom facilitators creates an inclusive planning team (Picciano, 2002).

New Jersey’s Educational Technology Plan in 2007 first outlined the requirement for all public-school districts to provide a 3-year educational technology plan that included current technology hardware and software, as well as depreciation rates and timelines for future replacement and expansion (New Jersey Department of Education, 2007). Setting goals and planning for technology is challenging at best, and those responsible for planning face many obstacles when considering:

- Technologies themselves are multiple, implying different strategies of use and application.
- Technologies themselves are evolving rapidly, often far faster than schools are able to change their practices or even their purchasing plans.
- Local, state, and federal policy and budgetary environments in which schools are working are also in constant flux, making sustained investment and development
difficult.

• Public perceptions of the proper role for new technologies in K–12 education continue to evolve (Culp et al., 2003, p. 18).

Planning activities have a critical impact on the success of a technology integration program as they influence how resources should be allocated and support is provided to teachers. Ertmer (1999) identified planning activities such as the master scheduling, access to computers, teacher preparation time, teacher training, and maintenance support as potential external barriers to integration when they are not addressed in technology plans.

The reliability of the technology provided to teachers has a huge impact on their integration activities. Looking back on my personal experiences with classroom technology, there is no greater frustration for a teacher than having a great lesson planned requiring the Internet and having the wireless or server crash. As the third side of Collins’s (2009) TLMPP model, maintenance is a key component in the implementation of a technology program. Having the proper equipment and manpower to service the computers are critical components of technology maintenance. Teacher perception of technology in terms of servicing and support of the equipment is a strong indicator of successful integration (Inan & Lowther, 2010). Collins explained maintenance is an ongoing process that is sometimes neglected because these activities must be scheduled according to a variety of timeframes, require planning, and impact the budget. In his dissertation case study Connolly (2008) reported teachers were pleased with the overall support of technology maintenance by their district, but he recommended policymakers provide resources for replacement of equipment, which had been outlined in the district technology plan. In New Jersey, public school districts are required to present 3-year technology plans that include maintenance activities as part of district compliance with state regulations (New Jersey
Department of Education, 2007). As part of that process, typically the district technology
director devises a maintenance plan with input from various stakeholders. Connelly
recommended that teachers be included in the planning of technology due to their ability to give
insight from a teacher’s perspective. Even with committed leadership and extensive planning,
school districts face a variety of barriers to technology integration.

**Barriers to Integration**

Teacher attitudes towards technology integration may be affected by skill level and
training; however, even the most skilled teacher faces barriers such as time constraints for
preparation and planning and the actual instructional time allotted for students at the computers.

Teachers face obsolete equipment, lack of software, technical difficulties, and variations in
student skill levels, which cause even the most tech-savvy to not integrate technology on a
regular basis (Bauer & Kenton, 2005). Many of these obstacles are related to budget constraints,
a lack of tech support, and policy decisions made at the district level. Other constraints teachers
may face in technology implementation are usually the result of decision making at the
administrative level. Class periods of less than one hour and limiting access to computer labs
affect the kinds of computer activities a teacher can implement. Pressure to cover content and
prepare for high-stakes testing is particularly relevant today among elementary and secondary
teachers who must prepare students for online tests.

Some of the other related barriers that have been identified with integration of technology
include: (a) the lack of technology resources, (b) the lack of knowledge and skills, (c)
institutional barriers such as scheduling and leadership, (d) teacher attitudes and beliefs, and (e)
assessment (Hew & Brush, 2007). Teacher training and professional development is critical if
technology is to be integrated successfully. In a study conducted on pre-service mathematics
teachers, Kurz and Middleton (2006) used an intervention with the five types of computer software using constructivist activities. The pre-service teachers experienced the software as the learner and were asked to make distinctions between the applications tested. This experience allowed the teachers to view the software with a broader knowledge of strengths and weaknesses for future implementation, thus removing some of the initial barriers. School leaders are also challenged to find financial resources to fund technology initiatives and sustain them.

Technology for education is supported with a variety of sources including grants, local school budgets, E-rate, bonds, private grants, and donations. Estimates of federal spending on technology were reported at $729 million in 2001 and over $820 million for the 2003-2004 school year (O’Dwyer, Russell, Bebell, & Tucker-Seely, 2005). The NCLB (2002) entitlement grants are allocated to provide additional revenue to support special student populations such as special needs, economically disadvantaged, and those with limited English speaking. School districts must budget and allocate revenues to purchase technology infrastructure, equipment, software, hardware, and professional development for teachers annually. Recent estimates put worldwide educational technology spending over 13 billion in 2013 with the biggest growth in purchasing mobile devices such as electronic tablets taking 62% of the total K–12 spending (Nagel, 2014). How technology will support the mandates of the Every Student Succeeds Act of 2015 and assist in improving academic achievement is a prevalent concern in K–12 public education today.

**Policy Implications**

Technology policy in New Jersey has been driven by the vision set forth by policymakers challenging schools to embrace 21st century technology skills as a priority for students, teachers, and administrators:
Goal 1: All students will be prepared to excel in the community, work place, and in our global society using 21st century skills.

Goal 2: All educators, including administrators, will attain the 21st century skills and knowledge necessary to effectively integrate educational technology in order to enable students to achieve the goals of the Core Curriculum Content Standards and experience success in a global society.

Goal 3: Educational technology will be accessible by students, teachers, and administrators and utilized for instructional and administrative purposes in all learning environments, including classrooms, library media centers, and other educational settings such as community centers and libraries.

Goal 4: New Jersey school districts will establish and maintain the technology infrastructure necessary for all students, administrators, and staff to safely access digital information on demand and to communicate virtually (New Jersey Department of Education, 2007).

As school districts strive to meet state technology goals and struggle to find the financial resources to support their budgets, the need for additional federal funding has influenced their curricular decisions. A substantial resource for such funding comes from U.S. federal entitlement grants, and certain student achievement levels on state standardized tests are required under the No Child Left Behind Act of 2001 (NCLB, 2002). The driving force for many policy decisions concerning curriculum, allocation of resources, and technology have been linked to preparation for these tests in recent years.

In 2012 New Jersey was granted a waiver from No Child Left Behind regulations and agreed to make significant changes in their educational policy to address student academic
performance on state assessments and to provide a model curriculum embedded with 21st century learning skills ensuring college readiness (New Jersey Department of Education, 2011). As a result of the waiver, New Jersey committed to an online standardized assessment for all public-school students and adopted the Core Curriculum Content Standards for the State’s curriculum. These changes have caused a sudden paradigm shift in public-school policy decisions for technology planning and implementation.

In summary, this literature review examined a historical perspective of technology development over the past 30 years and how future decision making will impact how technology is utilized in the classroom. Technology innovations bring exciting alternatives to K–12 education, but NCLB (2002) requires that policymakers look to research-based instructional practices. Much of the relevant research in technology integration is not conclusive, and studies are needed to promote the advancement of sound pedagogy and quality curricular decisions.

Teachers are central to technology integration by infusing software applications and computer activities into their classrooms. District administrators are responsible for providing the equipment, professional development, and technical support necessary for successful technology integration in our schools. Providing students with the tools they need to be proficient on high-stakes testing requires educators on all levels to consider what can be done to meet these challenges. Issues such as the digital divide must be addressed so that access to technology is available to all students, and consideration of the types of activities that will be most successful for diversified learners also impact the success of technology integration. It is my hope that continuing the study of integrated technology applications will support the body of knowledge necessary to allow education to keep pace with the rest of the expanding digital world.
Chapter III

Methodology

Introduction

The purpose of this qualitative research study was to examine the factors influencing the level of technology adaptation by classroom teachers in a middle-school setting. The case study method was chosen because the research question sought to identify specific factors influencing technology adaptation in a particular setting (Yin, 2009). The middle school I chose for this study had an established one-to-one technology program. The one-to-one program provided each student with a MacBook Air laptop computer, and students picked up their laptops each morning in homeroom and returned them at the end of the school day. Students were not permitted to take the laptops home. Using a qualitative research design, I sought to gather data on the implementation process and outcomes of this one-to-one laptop computer program through the perceptions of the middle-school teachers. In particular my research question asked: To what extent does district leadership influence a middle-school teacher’s adaptation of technology using individual student computer devices? Using Collins’s (2009) technology leadership, management, and policy pyramid model to frame the study, I chose to investigate how a teacher’s perception of leadership support for the planning activities, organizational integration activities, and maintenance activities of a one-to-one program impacts the level of technology adaptation by the teacher in the classroom. Semistructured personal interviews with individual teachers and administrators provided valuable data for analysis and interpretation. Artifacts from the school district were reviewed to add further validity to the research data. Chapter III includes a complete description of the population sample, research design and
methodology, instrumentation, data collection, and analysis techniques utilized in this qualitative study.

**Research Design and Procedures**

**Population.** The school district chosen for this study was located in a semi-rural community in southern New Jersey. After a preliminary meeting with the superintendent, I decided to focus on the teachers in the middle school, as this school had the most experience in the district with implementing the one-to-one laptop program. The district’s middle school services a student population that is primarily White with approximately 13% of the students coming from economically disadvantaged families (New Jersey Department of Education, 2016). The teachers are departmentalized by subject area, and students change their classrooms and teachers throughout the day. The district technology plan indicated the dissemination of personal laptops in Grades 6 through 8 began in the fall of the 2009-2010 school year. Currently all students in Grades 6 through 8 receive a laptop in homeroom each day and carry it with them to all their classes. All classroom teachers have available wireless Internet and Smartboards for daily instruction along with the one-to-one laptops for each student. A formal letter was sent to the district’s superintendent via U.S. Mail requesting permission to conduct a study in the district’s middle school. After receiving permission in writing from the superintendent, I sent an application to the Seton Hall University’s Institutional Review Board (IRB) for approval to conduct my study.

Once IRB approval was granted, I sent letters of solicitation for participation in my study to all 42 teachers in the middle school. The letters were emailed as attachments using the school’s email system and prior to the beginning of their fall semester. Since there were only a few responses during the summer to the initial email, a follow up email was sent out once school had begun in September. Some teacher responses for acceptance to participate in the study were collected by return emails. Additional recruitment was needed and so I received permission
from the principal and sent out a copy of the letter of solicitation again through the school mail distribution. Purposeful sampling was the intent during the selection process (Patton, 2002).

As Merriam (2009) explained, “Purposeful sampling is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned” (p. 77). The purposeful sampling criteria derived was based on the teacher’s level of computer adaptation, which is directly related to the purpose of the study and helped “guide in the identification of information-rich cases” (Merriam, 2009, p. 78). Three levels of computer adaptation were used in defining the sample (a) entry phase: instruction remains the same, and teachers struggle with the technology; (b) adoption phase: teachers begin to use technology in the classroom mainly to provide instruction on computer skills then begin to increase integration and use during instruction; teachers gain confidence; and (c) invention phase: the teacher is willing to try new methods and ways to integrate technology (Sandholtz et al., 1997). After responding to the letter of solicitation, teachers were invited to participate in personal interviews that were scheduled at their convenience. Some of the participants were recruited after interviews had begun and so the sample was not predetermined but evolved as the collection of data continued over a 2-month period. The planned sample size for teacher interviews was limited to nine teachers with three teachers representing each of the three phases of computer adaptation with levels identified during the interview process. However, during the interview process it was discovered that some teachers were not completely in one phase or level. For example, some teachers were clearly identified as intervention phase while others were transitioning from entry phase to the adoption phase. Moreover, none of the teacher participants were strictly in the entry phase with most of the teachers in the innovation phase. As Miles and Huberman (1994) described, “Samples in qualitative studies are usually not
wholly prespecified, but can evolve once fieldwork begins” (p. 27). Interest in technology may have been a factor in why certain teachers responded to the invitation to participate, although not all the participants were advanced in the integration of the technology. Miles and Huberman defined “conceptually-driven sequential sampling” with “understanding one key relationship in the setting reveals facets to be studied in others” (p. 27). Having knowledge of a teacher’s level of adaptation provided a deeper understanding into their perceptions as the data were analyzed.

Table 1 provides a breakdown of teacher respondents by their years of experience and their level of technology adaptation in the classroom.

Table 1

*Teacher Respondents*

<table>
<thead>
<tr>
<th>Teacher tent card</th>
<th>Years in education</th>
<th>Years in district</th>
<th>Level of adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>23.5</td>
<td>22</td>
<td>1–2</td>
</tr>
<tr>
<td>D</td>
<td>11</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>27</td>
<td>20</td>
<td>2–3</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>I</td>
<td>36</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>J</td>
<td>19</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>K</td>
<td>11</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>L</td>
<td>32</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>M</td>
<td>25</td>
<td>24</td>
<td>2–3</td>
</tr>
</tbody>
</table>
The school administrators chosen for semistructured personal interviews included the middle-school principal, supervisor of curriculum and instruction, academic achievement officer, and the district superintendent. Table 2 describes the years of experience, years in the district, and level of technology adaptation for each administrator respondent.

Table 2

Administrator Respondents

<table>
<thead>
<tr>
<th>Administrator tent card</th>
<th>Years in education</th>
<th>Years in district</th>
<th>Level of adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>24</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>9</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>15</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>H</td>
<td>22</td>
<td>21</td>
<td>3</td>
</tr>
</tbody>
</table>

As a qualitative research method, individual interviews provided an additional perspective from those staff members directly involved in the implementation and administration of the one-to-one laptop program.

**Data collection.** Individual interviews with nine classroom teachers and four school administrators were scheduled via email during the fall semester. Prior to the start of the interview, each participant received a copy of the informed consent form to sign, which I explained then provided time to answer any questions. Seven of the teacher interviews were held in the main office conference room, and two were held in selected classrooms to provide a quiet private space. Administrators were all interviewed individually in their own private offices with interview times arranged to meet their scheduling needs. All participants were identified by tent cards labeled alphabetically. The data collection instrument was provided to each participant and
included a short questionnaire and the 10 guided questions. In addition to the guide questions, probes were used to follow up when further detail or clarification was needed (Merriam, 2009). This allowed the interviews to be more like a conversation and allowed the participants to answer freely while keeping on the topic (Patton, 2002). Each interview was recorded with an electronic recording device, and participants were informed when the device was engaged. Interview lengths ranged between 40 and 90 minutes. Written field notes were also taken during each interview so that I could record cursory observations such as how the participant was feeling that day or his or her demeanor. Overall the interview experience was very positive, and I found having the opportunity to meet and listen to individual school staff members share their perspectives most enlightening.

Instrumentation. The data collection instrument for teachers included a short questionnaire and the interview guide with 10 questions. Guide questions were adjusted for the administrator interviews. The interview guide questions were reviewed by a panel of experts that included four school principals. A few adjustments were made to the order and content of the guide questions to ensure clarity for the respondents in the study. The interview guide questions were aligned to the research question (To what extent does district leadership influence a middle-school teacher’s adaptation of technology using individual student computer devices?) and five subsidiary research questions. The five subsidiary questions, the guided questions, and rationale are included in Table 3.
Table 3

*Research Subsidiary Questions, Interview Guide Questions, and Rationale*

<table>
<thead>
<tr>
<th>Research Subsidiary Question</th>
<th>Interview Guide Questions</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school?</td>
<td>Administrator Interview Questions</td>
<td>9. Describe how district leadership supports the one-to-one laptop initiative.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In discussing how to create a “culture of change” Ertmer et al. 2010 p. 275 explained, “Therefore, school leadership is a critical factor in facilitating teacher change. One of the primary roles of school leadership is to support teachers and create a shared vision for technology use.”</td>
</tr>
<tr>
<td></td>
<td>Teacher Interview Questions</td>
<td>9. Describe how district leadership supports the one-to-one laptop initiative. 10. What is your opinion of the district leadership’s support of the one-to-one laptop program?</td>
</tr>
<tr>
<td>Research</td>
<td>Interview Guide Questions</td>
<td>Rationale</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Subsidiary Question</td>
<td>2. How do middle-school teachers perceive the role of district leadership in supporting the planning activities for a one-to-one laptop initiative?</td>
<td>Administrator Interview Question 3. Describe the planning activities your district uses to support the one-to-one laptop program? Technology integration requires goal setting, foresight, and planning to be successful. (Collins, 2009; Culp et al., 2003; Ertmer, 1999)</td>
</tr>
<tr>
<td></td>
<td>3. Describe the planning activities your district uses to support the one-to-one laptop program?</td>
<td>Teacher Interview Question</td>
</tr>
<tr>
<td>Research</td>
<td>Interview Guide Questions</td>
<td>Rationale</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Subsidiary Question</strong></td>
<td>1. How would you define technology integration in terms of the one-to-one laptop program in your school?</td>
<td>How leadership makes and implements technology integration decisions directly impacts curricular and instructional planning and practice. (Kidd, 2009)</td>
</tr>
<tr>
<td>3. How do middle-school teachers perceive the role of district leadership in supporting the integration of technology into the curriculum?</td>
<td>2. What kinds of technology integration activities have observed teachers using in the classroom?</td>
<td></td>
</tr>
<tr>
<td>Administrator Interview Questions</td>
<td>4. How has technology been integrated into your district’s curriculum planning?</td>
<td></td>
</tr>
<tr>
<td>Teacher Interviews Questions</td>
<td>1. How would you define technology integration in terms of the one-to-one laptop program in your school?</td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>Interview Guide Questions</td>
<td>Rationale</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Subsidiary Question</td>
<td>4. How do middle-school teachers perceive the role of district leadership in supporting professional development for technology integration?</td>
<td>Professional development for teachers has been shown to be an essential support for technology integration in one-to-one laptop programs. (Penuel, 2006).</td>
</tr>
<tr>
<td></td>
<td>Administrator Interview Questions</td>
<td>5. Describe the professional development activities your district provides for technology integration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Do you feel the professional development activities have supported teachers in their technology integration of the one to one laptop program?</td>
</tr>
<tr>
<td>Teacher Interview Questions</td>
<td>5. Describe the professional development activities your district provides for technology integration.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Do you feel the professional development activities have supported you in your technology integration?</td>
<td></td>
</tr>
</tbody>
</table>

“Professional development for teachers should help teachers acquire technology competencies and skills. Most importantly, professional development should show how technology can enhance student learning and how it can be used in a variety of core content areas” (Inan & Lowther, 2010, p. 150).
<table>
<thead>
<tr>
<th>Research Subsidiary Question</th>
<th>Interview Guide Questions</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. How do middle-school teachers perceive the role of district leadership in supporting the maintenance activities for technology?</td>
<td>Administrator Interview Questions: 7. Describe the technology maintenance activities that support technology in your school.</td>
<td>One factor recognized as a key component of successful technology integration is maintenance activities. (Collins, 2009).</td>
</tr>
<tr>
<td>Teacher Interview Questions: 8. Do you feel the technology maintenance activities have supported classroom teachers?</td>
<td>8. Do you feel the technology maintenance activities have supported classroom teachers?</td>
<td>Studies indicate that teacher perception of available technology support and servicing impact the level of technology integration in the classroom. (Inan &amp; Lowther, 2010.)</td>
</tr>
</tbody>
</table>

Prior to asking the guide questions, each participant was thanked for volunteering, offered a bottle of water, then asked to give a description of their position and experience in the school district. The guide provided to the respondents asked three introductory questions: How many years experience do you have in teaching? How many years experience do you have in
your district? and What is one word you would use to describe the one-to-one laptop program in your district? The responses collected from the nine teacher and four administrator interviews were transcribed from the audio recordings into Microsoft Word documents. Member checks of the transcriptions by two teachers and one administrator were completed to support the validity and reliability of the transcribed data. I completed the transcriptions so that I would have the opportunity to carefully listen and reflect on the various responses. These detailed high-quality descriptions provided the data used to analyze teacher perceptions of the district leadership, organizational integration activities, planning activities, and maintenance activities for the one-to-one laptop program. Teacher perception concerning district leadership’s ability to support a new technology program has been shown to strongly influence the level of acceptance and technology integration by teachers into their classrooms (Inan & Lowther, 2010). Following the proposed theoretical constructs for this study, I then began to analyze and code the data looking for commonality between teacher responses and their level of technology adaptation.

**Data analysis.** The transcriptions from the teacher and principal interviews were loaded into NVivo 11 software, and broad stroke coding was completed separating teacher and administrator responses. During the second round of coding, emerging themes were identified comparing responses from teachers and administrators for each theme. This type of “analytical coding” allowed me to continually analyze and attempt to find meaning from the responses (Merriam, 2009, p. 180). As emerging patterns appeared from the data, a third coding allowed me to disregard themes that were not dominant while aligning the remaining themes closely to one or more of the research questions and the theoretical framework outlined in Collins’s TLMPP model (Collins, 2009). Crosscutting themes were identified as the data were furthered reviewed. As Merriam (2009) explained, “The challenge is to construct categories or themes that
capture some recurring pattern that cuts across your data…. these categories have a life of their own apart from the data from which they come” (p. 181). The identified themes laid the groundwork for the final analysis and identification of key findings.

Additional data were analyzed and coded using the field notes taken during the individual interviews with school administrators. The individual interviews were analyzed to clarify the district’s implementation process of a one-to-one laptop initiative from the administrator’s perspective. Qualifying the activities for organizational integration, planning, and maintenance from the administrative perspective provided another viewpoint of the factors influencing the implementation of technology and relevancy for further study.

**Reliability and Validity**

To ensure validity, a triangulation method utilizing several data sources was chosen to provide a quality design and to increase the credibility of this study (Patton, 2002). The collection of detailed descriptive data from interviews with teachers, interviews with administrators, and artifacts that included school curricula, technology plan, lesson plans, and Apple Distinguished School application afforded me the opportunity to provide an in-depth analysis of the activities that influence a teacher’s level of technology adaptation in this school setting. The review of the artifacts provided further validity, adding clarity to some of the responses transcribed during the interviews. The interview methods chosen for data collection from individual teachers and administrators provided an opportunity to inform the research questions based on a review of the participants’ responses. These data gave me a deeper understanding of how this particular technology integration program had progressed. “Member checks” were used to allow some of the participants the opportunity to review and provide feedback on the preliminary analysis of the interviews and observations (Merriam, 2009, p. 217).
This process ensured my interpretation of the data collected from teachers at the entry phase, adaptation phase, and invention phase was aligned with the teachers’ perceptions of their personal level of technology adaptation.

Chapter III reviewed the research methods and procedures used in this case study. A complete description of the population sample, research design and methodology, instrumentation, data collection, and analysis techniques were discussed. Chapter IV will provide the findings, an in-depth analysis, and summary of the data collected.
Chapter IV

Analysis of the Data

Introduction

The purpose of this study was to examine the factors influencing the level of technology adaptation by middle-school teachers. Utilizing qualitative research techniques, I sought to answer the following question: To what extent does district leadership influence a middle-school teacher’s adaptation of technology using individual student computer devices? The district chosen for this study is in southern New Jersey and has an established one-to-one laptop program in their middle school. The program was started in 2009 and provided individual laptops to each middle-school student. This study was designed to explore teacher perceptions of leadership’s role in supporting the organizational integration activities, maintenance activities, and planning activities that directly impact the one-to-one laptop program. In addition to the focus on teacher perception, several key school administrators were interviewed, and a collection of artifacts including school curricula, planning documents, and the current technology plan provided further evidence to support the findings.

The conclusions developed from this data analysis will be significant for those seeking to improve the quality of technology integration and support of teachers in their adaptation of technology in instruction. Chapter IV provides a description of the data collected and an analysis of the findings for this study.

Data Collection

The strength of a qualitative study relies heavily on the value of the data collected and the ability of the researcher to find significant meaning through the analysis process. The data
collection for this case study focused on a particular setting bringing to light the nuances of a middle-school’s one-to-one laptop program and those factors that influence a teacher’s level of technology integration in the classroom. Qualitative data “focus on naturally occurring, ordinary events in natural settings, so that we have a strong handle on what ‘real life’ is like” (Miles & Huberman, 1994, p. 10). Having a better understanding of the factors that influence a teacher’s level of technology integration will benefit those individuals who are implementing or looking to sustain technology programs in classroom instruction. The research tool developed for this study utilized 10 guided questions to explore teacher perceptions about their school’s leadership and the activities used for the implementation of a one-to-one laptop program.

The following guided questions were used in semistructured interviews with the teachers selected for this study:

1. How would you define technology integration in terms of the one-to-one laptop program in your school?
2. What kinds of technology integration activities have you used in your classroom?
3. Describe the planning activities your district uses to support the one-to-one laptop program?
4. How has technology been integrated into your district’s curriculum planning?
5. Describe the professional development activities your district provides for technology integration.
6. Do you feel the professional development activities have supported you in your technology integration?
7. Describe the technology maintenance activities that support technology in your school.
8. Do you feel the technology maintenance activities have supported you?
9. Describe how district leadership supports the one-to-one laptop initiative.

10. What is your opinion of the district leadership’s support of the one-to-one laptop program?

District administrators were also interviewed using similar guided questions:

1. How would you define technology integration in terms of the one-to-one laptop program in your school?

2. What kinds of technology integration activities have you observed teachers using in the classroom?

3. Describe the planning activities your district uses to support the one-to-one laptop program.

4. How has technology been integrated into your district’s curriculum planning?

5. Describe the professional development activities your district provides for technology integration.

6. Do you feel the professional development activities have supported teachers in their technology integration of the one-to-one laptop program?

7. Describe the technology maintenance activities that support technology in your school.

8. Do you feel the technology maintenance activities have supported you?

9. Describe how district leadership supports the one-to-one laptop initiative.

10. What is your opinion of the district leadership’s support of the one-to-one laptop program?

Qualitative sampling was purposeful (Merriam, 2009; Patton, 2002). Nine teachers and four administrators were individually interviewed using the data collection instruments over a
period of 2 months during the fall semester. The teacher sample was stratified purposefully by level of technology adaptation. The administrators were identified by the district superintendent and solicited to participate because of their level of knowledge of the one-to-one program. As Miles and Huberman (1994) explained,

Samples in qualitative studies are usually not wholly prespecified, but can evolve once fieldwork begins. Initial choices of informants lead you to similar and different ones; observing one class of events invites comparison with another; and understanding one key relationship in the setting reveals facets to be studied in others. This is conceptually-driven sequential sampling. (p. 27)

The level of adaptation of technology for each respondent was identified during the interviews and based on their responses to the interview questions. In response to the prescribed questions and follow-up questions, teacher participants revealed their level of comfort with and knowledge of computer adaptation in their classrooms. The administrators were all seasoned educators with considerable knowledge of instructional technology and the district’s one-to-one laptop program. The interviews provided rich data for analysis and the opportunity to “achieve an understanding of how people make sense out of their lives, delineate the process (rather than the outcome or product) of meaning-making, and describe how people interpret what they experience” (Merriam, 2009, p. 14).

Interview data were then transcribed for analysis and loaded into NVivo 11 for coding and analysis. After reading through the transcripts, the data were separated into categories aligned to the research questions. Subsequent coding revealed patterns and themes within those categories that were used for analysis and interpretation to answer the primary research question:
To what extent does district leadership influence a middle-school teacher’s adaptation of technology in a one-to-one laptop initiative?

And five subsidiary questions:

- How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school?
- How do middle-school teachers perceive the role of district leadership in supporting the planning activities for a one-to-one laptop initiative?
- How do middle-school teachers perceive the role of district leadership in supporting the integration of technology into the curriculum?
- How do middle-school teachers perceive the role of district leadership in supporting professional development for technology integration?
- How do middle-school teachers perceive the role of district leadership in supporting the maintenance activities for technology?

The artifacts collected included copies of middle-school curricula for language arts and mathematics, pacing guides, Apple Distinguished School Applications, the 2013 District Technology Plan, and samples of lesson plans. These documents were reviewed and compared with the interview responses to questions concerning the planning, professional development, and curricular integration activities.

The Data Analysis section of Chapter IV lists the research question and themes identified for each question discovered through the coding process. A general exploration of each theme provides the analytical framework for understanding the impact leadership, planning activities, organizational integration activities, and maintenance activities have on the teachers using the one-to-one technology. The perceptions of the teacher respondents grouped by their level of
technology adaptation are discussed and provide the basis for final analysis and conclusions of the data collected.

**Data Analysis**

Understanding the relationship between teacher perceptions of district leadership regarding the organizational integration activities, planning activities, and maintenance activities supporting a one-to-one technology program and the level of technology adaptation by teachers in the classroom is central to the purpose of this research project. The following data analysis looks at how teachers perceive the events and outcomes of leadership decisions that impact their daily implementation of a one-to-one laptop program in their classrooms. An analysis of those teacher perceptions of committed leaders’ support of the planning activities, integration activities, and maintenance activities will help to better identify what factors have an impact on a teacher’s level of adaptation. Having the perspective from individual school administrators and a review of district artifacts provided further validity to the data collected on these topics.

The following analysis of the research questions examines overarching themes that emerged through the coding process. The first research question addresses the role of leadership in supporting the one-to-one laptop program, and identified themes are included in Table 4.

Research Question 1: How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school?
Table 4

*Themes for Research Question 1: Leadership*

<table>
<thead>
<tr>
<th>Guide Questions 9 &amp; 10</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator</td>
<td>Shared vision</td>
</tr>
<tr>
<td>Describe how district leadership supports the one-to-one laptop initiative.</td>
<td>Supported from the top down</td>
</tr>
<tr>
<td>What is your opinion of the district leadership’s support of the one-to-one laptop program?</td>
<td>Financial commitment</td>
</tr>
<tr>
<td>Teacher</td>
<td></td>
</tr>
<tr>
<td>Describe how district leadership supports the one-to-one laptop initiative.</td>
<td></td>
</tr>
<tr>
<td>What is your opinion of the district leadership’s support of the one-to-one laptop program?</td>
<td></td>
</tr>
</tbody>
</table>

**Leadership theme: shared vision.** A central theme identified in the discussions on leadership with both administrators and teachers was the shared vision for a one-to-one computer program led by the current school superintendent and his predecessor. All respondents spoke positively about the leadership’s support of the one-to-one program. The average years of experience in the district for teacher respondents was 17 years and for administrator respondents 13 years, and all the participants were familiar with the technology program. Teacher respondents E, I, M, L, J, and K participated in the early stages of technology expansion in the district. Administrators A, B, and H were able to describe how the program was initiated and the steps that were taken to support the change process from traditional classroom instruction to teaching students with personal laptops. The district is currently recognized as a “Distinguished Apple School” for its implementation of Apple technology in the classroom. As part of the
application process, the leadership had to share the district’s plan for supporting their vision and providing the resources necessary to sustain a technology-enriched environment for learning.

For the past 10 years the district has demonstrated a top-down commitment for implementing and sustaining a one-to-one laptop initiative for students in sixth through eighth grade. How that process evolved has impacted the success of the program and the level of adaptation by teachers in the classroom. Administrator A described the start of the program:

And what we did our first wave was to install Smartboards and interactive technology into the classrooms. Then quickly thereafter Phase 2 was to get laptops for all of our teachers. Which really there were no requirements or mandates it really was just to get them comfortable with that technology. So that first year really the teachers were it and that was a whole year of professional development. Now while that was going on we did have laptop carts available at each grade level but it was 2 to 3 depending on the building. So really Year 2 was that development, the PD surrounding teacher use of that technology, and then at the end of Year 2 was when we went to our first one-to-one initiative at the middle school. We are now in Year 7 and 8 at the middle school.

Administrator H was involved from the beginning of the district’s decision to become “technology enriched.” He felt the leadership from the current and previous superintendent provided the vision necessary to create a one-to-one program:

Again I’ll go back to the beginning starting with FD and with VP. We certainly would not have had as much technology without FD. We wouldn’t have been a one to one without VP. Possibly it would have but certainly it depended on who we had and if they
had a different vision it certainly would not have been one to one. It was probably one of his main focuses all along. I was glad because I had a similar vision.

Sharing their understanding of the importance of “buy in,” school leaders encouraged teachers to visit other one-to-one districts as part of the planning process. Teacher K was involved from the beginning of the program and talked about the opportunity to visit other schools and observe one to one in action:

So, we went to school districts to witness hopefully bringing it back here, a one-to-one program. And we were amazed by it. We were absolutely amazed. We knew it would be good because kids were at that maturity level where they would be respectful. But when we went to the high schools and went to the middle schools we were really shocked at how the kids maintained the computers and interacted with each other and the computers. It was very encouraging for us because it was everything we were hoping the kids would do and they did do.

Teacher M, a 24-year veteran of the district, felt passionately about the school leader’s commitment and vision:

I think because our superintendent had a vision years ago that we would have one-to-one computers, regardless of cost, it did get a lot of push back. But he pushed forward and we are cutting edge. I can’t even tell you. So, I really can’t say enough about our district administration and that sounds so self-serving but they have really, really had a vision for us and I think it sets us apart.

Teacher C expressed her thoughts on the leadership’s support: “I think it’s great. I think we are a little bit ahead of the curve.”
Administrator H felt the decision to give teachers laptops “smoothed the transition” and allowed teachers to plan how they would adapt their lesson plans to the one-to-one technology. All four administrators felt giving teachers a laptop prior to the start of the program was a huge plus. Administrator A offered thoughts on teacher laptops:

The best thing we did was allowing the teachers that first year to play. They played with the technology and there was absolutely no administrative expectations in Year 1. And we allowed them to take it home and they kept them for the summer.

Administrator B was a teacher in the district when the program first started and talked about how the teachers felt empowered having their own MacBook laptops and receiving direct support from the Apple instructors. Teachers had their own laptops for a full year before the students, providing teachers the opportunity to get comfortable with the new technology. Teacher K explained how the leadership got teachers to support the program: “If you have the right backing and you have administration on your side and you have the IT, the teachers will come.” A shared vision for the one-to-one laptop program was one key theme for the district leadership’s support of the program.

**Leadership theme: support from the top down.** Establishing and maintaining a one-to-one laptop program for over 500 students requires support from all levels in a school district. Not only does the school board, community members, teachers, and parents need to have buy in, the district leadership must be able to transfer that overall support into generating a successful program. Supportive leadership has been shown to be vital for the success of a comprehensive change in a school’s instructional program. Administrator A explained that the board of education has been behind the technology program from the very beginning: “I am very fortunate because any initiative I have asked for their support, has been supported…..We did our
homework and we made our pitch and even with some of the individual backlash the board has always supported our initiative.” Several administrator and teacher respondents spoke about how support existed from the top down in their school district.

Administrator B talked about how support encompassed the community: “And I um think we are fortunate not only to have the one to one but to have a community and district board of education that believes in the importance of it.” This thought was also shared by Administrator G: “Sure I mean we are so fortunate that from the top level, the board, all the way down that they have the commitment to maintain this.” The importance of leadership supporting teachers was explained in the discussion on leadership with Administrator G:

Sure, I would think it would start with supporting teachers. But before that I think it starts with you know believing in it. If you don’t believe in its use then it’s not going to trickle down. And then having genuine excitement when teachers come to you with new stuff. And going there and saying I want to come see what you are doing and supporting them as well. Because at the end of the day people are not going to be willing to go outside their comfort zone if they don’t think you care. If they don’t think you’re genuinely interested when they are pushing the envelope, you know what I mean.

When teachers were asked their opinion of district leadership’s support of the one-to-one program, Teacher D responded: “From the top down, with the superintendent who has the support of the board. I know it has been a lot more successful than people anticipated.” After explaining the district policy is not to let students take laptops home, Teacher D described how over the years there has been very little community resistance to the program or how it has been implemented: “It’s something that is ongoing and they want to support it in the future.” Teacher E gave a veteran teacher’s perspective of leadership’s vision and support:
Um well they um are always willing to upgrade. They’ve supported getting Smart Boards for every classroom so I guess financially um and you know our district administrators are all really into it and are tech savvy so that also helps because I think our superintendent is certainly the person who has pushed this through for everything that he does that’s his primary push.

This response was probed further with the follow-up question: “So having school leaders such as your principal or the superintendent who understand the technology do you feel that is a real positive thing when you are trying to do such a program in your school?” Teacher E’s response was:

Oh yeah you have to. You can’t, you could never do it without everyone being involved. And the only stumbling blocks you have is the willingness of the teachers or support staff to learn how to use it. And um that is usually that would ease that tension to sometimes move a little slower realizing that not everyone is an iPhone expert when some of us still have a land line. [Laugh]

Teacher E explained that along with the support provided by school leaders, the expectation for using the laptops and software was sometimes challenging due to the variation in the technology learning curve of different teachers and staff. This topic will be further explored in the analysis of the data by the teacher’s level of adaptation.

Teacher F related support to the ability to try new methods or software and having the ability to be creative with his lessons. He felt the leadership was very supportive because of the freedom given to teachers to implement the technology at their own level of comfort. Teacher M felt supported due to having the technology and the means to use it in the classroom: “And you
can because they give us the tools to learn. And they give us the opportunity to use it.” Overall the teacher respondents valued the support for the one-to-one program and felt there was commitment on all levels to sustain the program in the future.

**Leadership theme: financial commitment.** The financial commitment necessary to implement a one-to-one laptop initiative was assumed by the board of education prior to the establishment of program. Administrator A elucidated how the board commitment evolved:

> Now there were some struggles, now we were asking the board to free up thousands of dollars for something some people didn’t think was necessary. In our community, we have a lot of our children’s parents and grandparents who went to our schools and they went to the old elementary school and it didn’t have air conditioning or technology and they turned out ok. But we survived that, we did our homework and we made our pitch and even with some of the individual backlash, the board has always supported our initiative. That means everything.

Those expenses have evolved over the years, and the district leadership has continued to maintain the equipment necessary to support the technology program. All four administrators interviewed recognized the importance of providing the financial resources necessary to maintain the program and felt the district leadership and school board ensured those resources were allocated in the district budget. One such planned activity involved recycling older laptops down to the younger grade levels then upgrading laptops in the middle school. This allowed the one-to-one program to expand to the lower elementary grades in the district. Older laptops were also given to non-teaching staff and board members with the idea that everyone in the district would understand and be able to use the available technology.

Administrator G talked about the importance of financial commitment to sustain the
program. The district has ensured that the computers and wireless for the Internet have been upgraded as needed. Administrator G explains:

So, from that point that there is a commitment from the top level I think that it goes a long way. Because you couldn’t, you’re going to die on support, if you’ve got kids working on 15-year-old computers that take 10 hours to load something. You know what I mean.

Administrator B described how that support transfers into longevity: “We have the financial stability because it’s not that we buy them and we have them forever, we have recycled down.”

The support from the board of education, school business administrator, and superintendent was there from the beginning as Administrator H pointed out:

And putting things in perspective so the support was always there. And the financial support needs to be there too. Whether it was DY or LR who were the BAs at the time. That needed to be there as well. I don’t think it would have worked without that support.

Teachers appreciated the financial commitment as well. Teacher K referred to the board support as “a priority in spending,” and Teacher E felt that the district is “always willing to upgrade” the computers. Teacher M spoke of the commitment as part of the school’s vision:

I think because our superintendent had a vision years ago that we would have one-to-one computers, regardless of cost, it did get a lot of push back. But he pushed forward and we are cutting edge. I can’t even tell you.

Teacher D participated in the school’s application to be a Distinguished Apple School and provided her perspective:
Maybe I don’t know but I think it’s the willingness is there to adapt and it’s a willingness from administration, it’s a willingness from the board. Just in terms of supporting and allocating the funding it’s been amazing what they have been able to do.

In terms of providing support to purchase new technology or switch out older equipment and software, Teacher F explained his perspective of the leadership support:

Yeah, they are, they got our back. And then every year they ask hey have you guys found anything new that you want us to look into to buy for you. Here is what you are already using, what don’t you need anymore? So let’s see what we can swap out. So yeah they have our backs.

Financial commitment from the top down and led by a shared vision were the identified themes for teacher perception of leadership’s support of the one-to-one laptop program. All administrator and teacher respondents viewed the one-to-one laptop program as “a priority of the district” with financial resources being dedicated to support and maintain computers for each teacher, staff member, and student. Teachers explained they were required to use their personal laptop for clerical activities such as posting grades and taking attendance. Finding ways to integrate the one-to-one student laptops in the classroom was left to the individual teacher’s comfort level and personal instructional choices.

According to the Collins (2009) model, the technology leadership, management, and policy pyramid had three sides arising from a base of committed leadership. One side consisted of the planning activities that support the implementation of a technology program. The perceptions of teacher respondents concerning the district leadership’s support of the planning activities are explored in the guided questions for Research Question 2.
As explained in Ertmer (1999), planning activities such as master scheduling, access to computers, teacher preparation time, teacher training, and maintenance can serve as potential barriers to integration if not addressed properly during the planning stages of a technology program. The following themes listed in Table 5 were identified in the interviews of teachers and administrators for Research Question 2: How do middle-school teachers perceive the role of district leadership in supporting the planning activities for a one-to-one laptop initiative?

Table 5

*Themes for Research Question 2*

<table>
<thead>
<tr>
<th>Guide Question 3</th>
<th>Theme</th>
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<tbody>
<tr>
<td>Administrator and Teacher Describe the planning activities your district uses to support the one-to-one laptop program?</td>
<td>Support for teachers is key Administration and Technology Department driven</td>
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</table>

**Planning activities theme: support for teachers.** A common theme identified from administrator responses to Guide Question 3 was the importance of supporting teachers during the implementation process of the new one-to-one program. Administrators A, B, and H described the shift from the establishment of a technology program in the district via Smartboards, Internet access, and laptop carts to executing a one-to-one laptop program in the middle school. The three veteran administrators stressed that the planning activities included the infrastructure needed to support the program, laptops for all teachers, professional development to learn how to use the laptops, and maintenance activities to keep everyone “up and running.” The goal was to allow teachers to use the laptops and become familiar with them before the students. Administrator A felt making the program “non-threatening” and “avoiding frustration” increased teacher confidence with the laptops. Administrator H described his part in planning:
And I was there in addition to my other duties to make sure things ran smoothly. So, if there was a glitch the whole idea was to make sure the glitch didn’t happen too long because we didn’t want to lose the teachers. We didn’t want to lose their momentum. We didn’t want them to get kind of frustrated and say forget these computers I’m going back to what I always did. So that was a major part that was the best thing we did. We just made it available. We gave them support as they needed it.

During the initial planning stages, teachers and administrators visited other schools with one-to-one technology and brought back well-grounded practices to incorporate in the school’s policies and procedures. All respondents felt giving teachers a personal laptop to become familiar with the technology before their students was one of the most valuable strategies used in the initiation of the program. Teachers were included in the initial planning phase and writing the application for Distinguished Apple School. Teacher D was a member of the Technology Committee during the initial planning of the one-to-one program. When probing Teacher D on his views of district planning today, he was asked to explain how the district plans for the goals to support the policies and procedures for technology. He felt the teachers were supported and responded: “I would say there is a fair amount of communication between administration and technology personnel to the faculty and then faculty to the kids.” As the technology program has matured the planning activities have changed their focus from development to sustainability with the technology department and administration leading the transformation.

Planning activities theme: administration and technology department. Early planning activities centered on providing technology that was accessible and reliable along with specific trainings to support teachers in their adaptation to the new laptop program. As the planning activities progressed, the involvement of teachers evolved. Teacher K was on the
original planning committee and in responding to my probing question: “When they first started the one to one did they have like a technology planning committee to plan for the integration?” explained:

We did and then I guess too many chefs in the kitchen? I think when everybody had ideas of where they thought this was going I guess the administration had to finally say this is what we are doing and how we are going to do it. And that’s fine because I think we were kind of like blowing the process up because we all had an opinion of what we wanted it to be and how big and how small. And he (superintendent) has been very receptive to pushing this further and further.

Three of the administrators, the superintendent, curriculum supervisor, and academic achievement officer currently sit on the technology committee. The three district technology specialists who are referred to as the technology department also participate in monthly technology meetings. The middle-school principal was not directly involved in the technology committee meetings; however, he considered himself very “tech savvy” and intimately involved with teachers and technology support for instruction. All four administrators viewed planning from the technology committee as focused on long-term goals and sustainability for the one-to-one program. The administrators and technology committee also considers feedback from teachers. Administrator G felt planning was “really now in the teachers’ hands as PLC groups” and “we make decisions based on their feedback because they’re the ones using it every day.” Administrator H explained teachers meet weekly before school in professional learning communities (PLCs) and provide feedback to the committee:

In terms of the district’s program they have a tech committee that meets monthly and um and they do a lot of the strategic and long-term planning of what we are going to do to
support and continue to maintain the program. But in terms of what we do to support teachers it’s really on an individual basis and what they need at this point…. So weekly teachers are given the opportunities to meet with their PLCs.

In the discussions on planning, several teachers described decision making as being exclusive with district administration and the three individuals referred to as the technology department making all of the decisions. Teachers D, I, J, and K explained that the technology department was very knowledgeable and maintained the program’s equipment and software. Veteran Teacher I described the beginning of the program: “Ok I think in the beginning it was the kind of thing where you are constantly struggling with what you can provide but still safeguard the kids. So, it was like a trial and error thing.” Teacher I felt the planning continues to evolve because “it’s a long-term process.” Teachers C, E, and F were not fully aware of the process for planning activities during the current school year. Teacher C described it as “informal,” and Teacher F was not sure of the planning process as a newer teacher, but added “when we want stuff they get it.” Teacher K’s vision of administrator support details how planning occurs:

Again, I think I’m going back to what I earlier said, I don’t think that they…. They give us the tools, the clinics like operating your Cloud and making sure everything is clean on your desktop and they’ll show us Google classroom, but it’s not much. But I kind of like that. It means the more comfortable a teacher is with it, the more they get to run with it. I like that it’s not forced down our throats. There are some teachers who are openly not a big fan of the computers and they use them rather infrequently. And then there are others who use them religiously. So, we have minor little things like I was part of, we just got a new system Genesis, which is lesson plans. It’s the grade book. It’s the attendance. It’s
everything, and I was part of that, learning how to use the program, then I turnkey it and teach it to my fellow teachers. But it’s very limited.

Overall the teachers’ knowledge of how leadership supports planning activities was limited to their personal interactions with the technology department, and the administrative decisions impacted them personally. Teacher D sums up planning this way:

Then again this is on a district level with teachers and everything? It almost feels like at this point its self-running. There’s not, we don’t have to get together at the beginning of the year and introduce the whole thing again. Especially the kids start getting their own laptops in fourth grade so at the elementary schools they are already used to having their own laptop…. But in all honesty there really is not a lot of things now that have to change since now the program has been running for several years.

As required by the State of New Jersey, the district had a 3-year technology plan that outlines the goals, activities, and budgeting for technology. This document, the 2010–2013 Technology Plan, verified the historical planning discussed in the interviews and activities used to develop the plan. Teachers, parents, students, administrators, and board members participated in creating the district technology plan. Although the middle-school teachers and the principal in the middle school were not directly involved in the current technology planning activities, those who did the day-to-day planning did use surveys and collect information from other stakeholders to ensure the infrastructure, maintenance, and logistics of the program were adequately supported.

Organizational integration activities formed the second side of the technology leadership, management, and policy pyramid model (Collins, 2009). This study focused on the following organizational integration activities related to the one-to-one program: the integration of
technology into the curriculum and professional development activities for teachers to support technology integration. In addition to guide questions concerning curriculum and professional development, each respondent was asked to define technology integration and give examples of how teachers have implemented the one-to-one program in the classroom. Although the data collected on classroom integration of technology were rich, teachers had minimal knowledge of the process used for planning curriculum. The information gathered on professional development revealed an evolution in the methodology used to design professional development from the early years of the program to the present. Overall the organizational integration activities have transitioned as the one-to-one program became established as part of the instructional program. This information helps to define how these activities prepared teachers in the beginning of the program and continued to support them as the program matured.

I chose curriculum as one of the organizational integration activities because of my assumption that the district would use the curriculum to “drive instruction,” a common practice in most school districts. On review of curricular documents for language arts and mathematics, I found one distinct section for the inclusion of technology and three other sections with suggestions for integrating technology into instruction. The Technology Integration section gave suggestions for projects, multimedia presentations, and software applications. Under the Suggested Materials & Resources section, various software and Internet links were listed. The Monitoring/Assessment section included software that could be used for monitoring student progress, assigning remediation, and assessment. Teacher L had talked about the software available to assist with special education students, and under the section Differentiation suggestions were included for technology-based supports. Data collected relevant to Research Question 3 provided a deeper understanding of teacher perceptions of leadership’s support for
the integration of technology into their instructional practice. Table 6 identified an emerging theme for integration of technology into the curriculum. Research Question 3 asked: How do middle-school teachers perceive the role of district leadership in supporting the integration of technology into the curriculum?

Table 6

*Themes for Research Question 3*

<table>
<thead>
<tr>
<th>Guide Question 4</th>
<th>Theme</th>
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</thead>
<tbody>
<tr>
<td>Administrator and Teacher How has technology been integrated into your district’s curriculum planning?</td>
<td>Continuous transition</td>
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</table>

**Organizational integration activities theme: continuous transition.** Teacher viewpoints on the integration of technology into the curriculum were quite varied when asked the question: How has technology been integrated into your district’s curriculum planning? The district for this case study has had the same superintendent for over 10 years. However, the position of supervisor of curriculum has changed numerous times over that same time period. The theme of continuous transition emerged after speaking with the teacher respondents who felt the changes in supervisors had impacted the curriculum planning. In addition to the administrative changes, the integration of technology into the curriculum experienced continuous transition with the implementation of technology upgrades that have occurred since the inception of the one-to-one laptop program.

Teachers C, D, K, M, J, and I were familiar with the curriculum planning. Teacher C explained that during discussions in PLC meetings, teachers in his department focused on the curricular content but rarely talked about how they used technology. Teacher D was aware that
the curriculum guides had been rewritten and were available in the Google Docs. Teacher K had written curriculum and said there was a section to add technology applications in each unit of study so the technology activities suggested are embedded into the curriculum. Teacher J talked about the curriculum planning over time:

I know before we were one to one we had installed Smartboards in all the classrooms and the teachers were given laptops, and I think that was the beginning of the push to go to one to one. So, from there we started to develop laptop carts and certain teachers were given those to check out from their rooms, and then we went to one to one. As far as the plan, it didn’t just happen it was over several years.

According to Teacher M, all of the curriculum was online and available for teachers to access. Teacher I explained that curriculum work does include the integration of technology, but it is not required: “Well honestly we are supposed to use it every which way we can. So, it’s not like we just say let’s develop curriculum and just specify it ‘technology.’ It ‘technology’ becomes second nature.”

However, some teachers had limited knowledge of how technology was integrated into the curriculum planning. Teacher E stated: “I don’t think there is any formal curriculum it’s just assumed that we are going to be using it [technology].” When Teacher F was probed about how technology was integrated in the curriculum he replied, “The only way I would know, because I don’t do the curriculum, is that I know it’s been integrated because our unit tests, they are all on Study Island.” Study Island is a web-based math program that provides instructional materials and assessments. Teacher L had little knowledge of curriculum planning for technology but observed teachers were using technology every day for lesson planning, instruction, and communicating with students. From the teachers’ perspective, the curriculum planning for
technology was in constant transition with the changeover of various administrators who had overseen curriculum and instruction.

The administrators gave a different perspective of the curriculum planning. All four administrator respondents said the curriculum could be found in an online format and was accessible to all teachers. Administrator A defined the integration of technology into the curriculum as “seamless,” meaning the use of technology was a natural part of all instructional planning and not necessarily specified in the district curriculum. He stated, “We don’t have a piece of our curriculum that says technology” and further explained:

We don’t use or say *Go Math* or *Journeys* is our curriculum, we say it’s a primary resource. And this is a struggle because some of your veteran teachers are going to say we don’t have a curriculum because we don’t have a reading series. That’s a hard statement to hear, but you know that is their reality. So, we have to at least acknowledge that.

Planning for the integration of technology in the curriculum comes from the recommendations that are made by teachers and administration. The digital curriculum allows continual upgrading as new technology resources are identified, and this curriculum is available to all teachers, staff, and even parents. Administrator B described how technology is infused and modified to coordinate with the curriculum:

The teachers love it because everything is right there, and if they are home they can access it. We are in the process of updating our curriculum guides so if they need it, everyone can see the updated version. In the actual curriculum guides we do have places for technology and enrichment activities so the teachers’ work can be put in.
Administrator G explained, “So in terms of that true integration piece on how’s the technology facilitating learning, again that’s up to the teacher on how they are going to use that in my opinion.” Administrator G had similar thoughts on teacher input:

But it became more of a culture thing, and that’s what people did. We had a lot of teachers sharing what they did with technology and shared activities. And as that grew out a lot of the web-based stuff like Google Docs and things like that have grown, and so there is a lot more sharing as far as curriculum. The more the teachers do electronically for even non-instructional things they think of more instructional things they can do as they get comfortable with that.

As a result of my review of the data related to the organizational integration activities concerning curriculum, I assessed that there was not clear direction from the administration on how teachers should use the curriculum. The teacher responses revealed an inconsistency in teacher perception of the leadership support for curriculum development and implementation. Teacher respondents gave a variety of examples of how technology was integrated into their instruction but limited information on how technology was integrated in the school’s curriculum planning.

The themes identified for Research Question 4 provided a deeper understanding of the kinds of professional development activities for technology that were provided for teachers and how these activities impacted a teacher’s integration of the technology in the classroom. Emerging themes for professional development activities are outlined in Table 7 for Research Question 4: How do middle-school teachers perceive the role of district leadership in supporting professional development for technology integration?
Table 7

Themes for Research Question 4

<table>
<thead>
<tr>
<th>Guide Questions 5 &amp; 6</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator</td>
<td>Professional learning communities (PLCs)</td>
</tr>
<tr>
<td>Describe the professional development activities your district provides for technology integration.</td>
<td>Teacher-driven professional development</td>
</tr>
<tr>
<td>Do you feel the professional development activities have supported teachers in their technology integration of the one-to-one laptop program?</td>
<td>The learning curve</td>
</tr>
<tr>
<td>Teacher</td>
<td></td>
</tr>
<tr>
<td>Describe the professional development activities your district provides for technology integration.</td>
<td></td>
</tr>
<tr>
<td>Do you feel the professional development activities have supported you in your technology integration?</td>
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</table>

When the district introduced laptops to the teachers, several in-service days were provided with Apple instructors so teachers would be as comfortable with their personal laptop as any other instructional tool. Administrator A explained the district added Smartboard technology during the first phase in upgrading the district technology program. Then during the second phase teachers were each given an Apple MacBook laptop, “which really, there was no requirements or mandates it really was just to get them comfortable with that technology. So that first year really the teachers were it. It was a whole year of PD.” Administrator H felt that the success of the one-to-one program relied on giving the teachers the laptops and professional development before the students, “but what smoothed that transition was all of our teachers had laptops.” He explained teachers had lesson plans ready when the one-to-one laptops were rolled out to the students the following school year. Over the course of the 10-year implementation of
the technology program, the professional development activities have evolved. The district had scheduled five professional development days during the current school year according to Administrator B. The 3 days in the beginning of the school year used for professional development were “more administrative” and “nuts and bolts” as Teacher D described with sessions in “teacher evaluation, assessments, and the student management system.” These trainings were required and took up a good portion of the total professional development time scheduled by the district. The 2 remaining days were designated for instructional technology workshops given by technology specialists, administrators, and other teachers from the district. Teachers had the option of choosing from these workshops or travel to an out-of-district training. In addition to the professional development days, a common planning period was included in the master schedule to provide teachers the opportunity to meet weekly for professional development activities that included instructional technology.

**Professional development activities theme: professional learning communities.** A common theme, professional learning communities (PLCs) revealed one of the major attributes of the current professional development activities in the district. The school administrators fully supported the weekly planning time for teachers built into the master schedule which they called PLCs. Administrator B explained that during those 30- to 60-minute meetings teachers have the opportunity to share how they are using technology in their grade level or discipline. PLCs give teachers time to mentor their colleagues or turnkey a training that they have attended outside the district. Teachers can also request professional development from the technology department during PLCs such as learning a new software or remediation on a technology application. Acting as a technology trainer, Administrator G uses the PLC time to support teachers by setting up workshops:
So, I’m excited we just built for this building a common planning period per grade level so we’re really starting to get individual workshops where I can offer like I found this really great new tool if you’re interested come sign up to learn it. And it’s been successful so far. So, I am excited to bring some more stuff back to and just to keep it infusing and keep it going.

Giving teachers the ability to choose what trainings they would like to attend and then share their knowledge with others is very powerful according to Administrator H.

Teachers E, F, I, K, and L all spoke favorably of the PLC and the opportunity to share and mentor practical applications for instructional technology. The middle-school PLCs were divided by subject area with small groups of fewer than eight teachers. Some had very few participants depending on the number of teachers in a grade level or subject area. Veteran Teacher C felt that PLC time was not significant for technology planning and was mainly used for lesson plans and test preparation. His PLC group of three teachers met every couple of weeks and for short periods of time, “um theoretically once a week but practically um every couple weeks. And more like 15 minutes.” How the time was spent in PLCs each week was not mandated at the time of this study, so activities and discussions were up to the teachers in the group. Teachers used the time in PLC to share their technology-integration activities used in the classroom. PLCs also provided time for the technologically advanced teachers to mentor those who requested assistance with the technology. Administrator B shared his thoughts on PLCs and planning professional development:

So as a district we decided Wednesdays are the days for PLCs. So those meetings are anywhere from 30 minutes to an hour and they [teachers] come up with things they want
to share. Someone keeps notes and they send the notes to us. We might see that everyone wants help in this area so we know what to plan for what they need.

One significant theme that emerged for professional development activities was teacher-driven professional development due to the opportunities given to teachers to choose their own path for edification of technology skills.

**Professional development activities theme: teacher-driven professional development.**

Professional development was provided through a variety of methods, but teachers had to make the effort to become engaged in these opportunities. As Teacher M explained: “Professional development has changed over the past few years as to what it is geared to, what you need. They are getting away from telling us what to do, and we tell them what we need.” Teacher E mentioned that a teacher would sometimes organize a small group and then turnkey a technology application. She also stated the district technology department staff provided individualized trainings when teachers requested assistance with technology. Besides full-day in-services and the PLCs, teachers had many other options for professional development. Administrator A shared how teachers had the flexibility to turnkey:

Right now one of the requirements for our Type A teachers who want to get that 4 (on their evaluation) and are using instructional technologies can share what they are doing formally and informally, and will either present at a conference or will take over a PLC, and say: “I am going to teach the eight of you this topic and you can use it or don’t use it it’s up to you.” It’s all teacher driven with administrator support.

As Administrator G explained: “We see a lot of teachers who become a mentor for another teacher because there is that comfort level and they kind of walk them through that.” Teacher L felt that the resources within the district were all that was needed:
Ah no. No I have not gone outside. Now tomorrow I am going to a PARCC language arts writing workshop all day. But I haven’t necessarily not gone for one that is only technology probably because I don’t want to…. Anything that I want to know about technology, there are so many people here that could tell me and help me that it just doesn’t interest me enough to go to a workshop. And it must be because I’m old school.

Teacher L had been with the district for over 30 years and seemed hesitant to explain how she used technology. However, after several probing questions she revealed many technology integration activities being used in her classroom.

The leadership support was there, the technology resources were there, but the availability of specific professional development for one-to-one technology has been limited. Several teachers felt the district does not provide enough trainings to support their adaptation of the one-to-one laptops in the classroom. Teachers J and K were highly motivated to use technology but reported there were limited opportunities for one-to-one trainings. These teachers felt their level of experience with technology exceeded the average teacher, and most of the outside workshops and trainings available were for specific kinds of software applications. As Teacher J explained: “We have had some professional development on how to set up our websites so there’s been that. But not necessarily how to use the laptops to benefit the students. I have not seen that kind of professional development.” Teacher K stated his opinion on available professional development:

It’s not much and it’s not much because, and I’m not faulting the administration, but there’s not much out there. At the teacher’s convention, you could go there and become a certified teacher in Google Classroom, but I went and I was already way past what they were certifying and there wasn’t many. And I guess there was a lack of one-to-one
school districts. There just isn’t that big of a market for offering professional development for a school.

Teacher K advised: “Most of the stuff we do here we have learned in house. We have gotten away from relying on professional developments to be the teachers of us.”

The district leadership’s position was to support teachers who want professional development, but it was up to the teacher to make it happen. As Administrator A explained: “It’s really à la carte throughout the year either in house or out of district. We have never said no to professional development that has any relativity to your position.” How teachers chose to adapt to the available technology was closely related to their own preferences for professional development and their position on the technology learning curve.

**Professional development activities theme: the learning curve.**

Preference for individualized technology training was shown to be closely related to a teacher’s perception of his or her ability to use technology. The nine teachers interviewed varied in their level of experience with technology, with four teachers at a high level of technology adaptation and two teachers at the lowest level. These teachers admitted they had not fully embraced the change to a computerized classroom. The other three participants were using technology and willing to learn more but had some concerns about the district’s professional development. As the analysis of the data continued, a pattern emerged showing professional development was primarily teacher driven in this district. Examining the teacher responses through the lenses of their level of adaptation of the one-to-one technology program revealed an interesting correlation. How teachers perceived their own level of technology adaptation was related to their location on the technology learning curve.
The district’s professional development had transitioned from primarily large group presentations on one topic to the current practice of giving teachers more autonomy in choosing professional development options. Administrator H shared this change:

But to be honest it’s been my experience from what I’ve seen that most of what teachers do that is good in technology has not really come from the district. It’s really come from the teachers, and if you can get the teachers to work with one another and share their ideas to me that is where it really is, where the power is. Usually we will have formal tech professional development activities. It’s very hard to tier them. And everyone is at a different spot. So, if I want to go see a Google Docs it’s like well I already know that. You know or that going back to the old days oh well we are going to have a presentation on Excel and like some people weren’t ready for Excel and their heads were about to explode. So, it’s kind of like you have to allow people to learn at the level that they are at.

Administrator A explained how the levels of adaptation were not strictly related to years of teaching experience:

Yes, sure I am not even equating that to years of experience because some of our most fluent and proficient teachers integrating technology are our teachers who have been here 30 years, and some of our newest teachers are the least proficient are on the younger level. I think it’s a comfort level and a willingness to change from what you are accustomed to. So do every one of our teachers use technology? Yes, but if they were allowed, would they unplug? Yes.
He further explained that the district has tried to support teachers with professional development to improve their skills but has had difficulty getting those unwilling teachers to make the effort to expand their knowledge:

We have never said no to their requests, but these are not the ones who are requesting professional development. We take the time to survey, and if we are setting up professional development, and you are not telling us that you need more. It must be a two-way street. If they are struggling with something, we don’t know about it.

Teacher E, a veteran teacher at an intermediate level of adaptation, discussed how professional development has affected teachers at different integration levels:

Uh we’ve whole staff development are usually geared to if we get a new major program. Or when we got the laptops. So, in other words in the last 2 years we got On Course so the people from On Course came and instructed us on how to use it. Then sometimes we also have a small group of teachers and we will get the instruction, then we turnkey it, we pass it into our smaller groups. The most recent thing we’ve done and we had Genesis this year. And it was open your laptops and kind of thrown at us. [Laugh] And a lot of it is kind of that way. Now I mean they don’t take a lot of time for it. So, if you are not on the cutting edge or not willing to play with it and learn it it’s difficult. So sometimes it leaves your older teacher in the dust if they are not interested or they can’t keep up with it. We also have the IT people who like with Google classroom we would have morning mini sessions with a half hour here half hour there come in show us something on it and say in 3 weeks we’ll come back and we’ll meet again and I will show you what’s next or what you want to learn. The only other professional development we get is when we reach out to the IT people. The IT people are wonderful.
A participant advanced in technology adaptation, Teacher K, shared his thoughts on professional development for new teachers:

It’s like good luck. And again, it’s going back to the more you feel comfortable with it. The new kids coming out of college love it, they embrace it. And I really think it is put back on to the teacher and you use it as much as you think you should. And there is a lot out there to use.

Most of the teachers interviewed gave examples of how professional development had supported them, but many felt the trainings were too quick and did not give them enough time to absorb the information presented. When asked about his thoughts on professional development support for teachers, Teacher D’s response was:

I would say so and again I do wish there were more; and I think it would help some of the more not recalcitrant, but they just don’t have the time. Like it is easy for me to sit there and say it’s not that hard to go out and learn about this new feature or this new thing, but I’m not grading 100 papers. I’m not responsible for giving grades to all these kids. So as a classroom teacher I think it is a little more difficult. It’s easier for you to have someone to sit down and find different things and presented to them versus for them to have to find it. I’m not saying it’s not that you don’t need to take any professional responsibility to keep up with technology works or what’s being offered. But it’s just easier when you might have other people presenting it.

Having enough time seemed to be a common complaint from teachers C, E, and M. When asked if professional development had supported her, Teacher E, a teacher at the adoption phase, shared
her concerns:

I think that is something that has always been a sore spot with all the faculty. There’s a great divide between the ones who know and the ones who do not know all the time. Um and sometimes it can be a struggle and it’s been frustrating at times. I don’t think that even though I know a lot about the things I use I probably use 10% of what I could use. Uh my Smart Board could probably do, could probably run around and sing to me. But since I do not have the time to learn all the bells and whistles on it, I use it at a minimal level. If you want, well if you walked in and you were not technology based you would think wow. You could really wow someone. But when you think about what could really be done and that’s been an issue with the faculty. Quite frankly they gave us the Apples one day and then said ok play around with them. And I was afraid I would blow it up [laugh] until you know you can’t lose something.

Teacher C discussed his frustration during professional development trainings:

Because with technology you can’t just say go to upper right corner and just click this button, and then do this over here, then you’ll hit this thing and you’ll get a dialogue box. And he does this, I really like the guy and he does this because it’s so easy for him and he is 30 years younger than me. So, but for us older teachers we are just looking at each other.

When asked about having the opportunity to actually do what the presenter was teaching he said: “Well our laptops are there, but he’s like five steps ahead of us and we’re going ‘What button?’”

When probed further, he explained how upset he was with the methods used by the district to present information: “Now I also understand J has half an hour to squeeze all this in, and it is
almost an impossible task. But the um I wouldn’t say that I am really that satisfied with the way we have been taught to do stuff.”

Teacher C, a teacher at a low level of adaptation, relied on district trainings and did not go beyond what was offered by the district. He also felt the time provided in PLCs was not productive for learning new ways to adapt to one-to-one technology. Teacher L who was in the adoption phase explained that whatever training she needed was available in the district. When asked about going to out-of-district professional development she replied, “Ah no. No, I have not gone outside. Now tomorrow I am going to a PARCC language art writing workshop all day. But I haven’t necessarily not gone for one that is only technology, probably because I don’t want to.” She did explain her PLC provided the opportunity to share how technology was being integrated during instruction with her grade partners.

Teacher M was an experienced teacher who had fully adapted to the one-to-one program but felt she was still learning about technology. When asked how she thought if the professional development had been successful, she replied:

Yes and no. I think the professional development that we have had as a district wide usually involved an entire day learning one new thing. My own daughter is does professional development for businesses and it is all computer based. And their philosophy is a little different. So, it would be more webinar based and or they would create a program and you would watch it for an hour a day instead of 6 hours at a time. It is very hard for anybody to learn or absorb if you can’t learn and use. And we teach it to our own children, but we don’t practice it when it comes to what we need to learn. So, a lot of what we learn, we learn from other teachers helping, and we learn by trial and error. And we learn by trying, by trying to do it. I feel like I’m on TV.
Many of the teachers with many years of experience in the district expressed frustration with the professional development. Teacher I had over 15 years experience in the district and was at the adoption phase for adaptation. She shared her thoughts on professional development:

Yeah, I mean I think we could do more and I think it could always be ongoing. And I also think as I said I wish someone would make a book, truly that just has everything that we have the ability to do but don’t always remember the directions or don’t want to bother somebody. You don’t want to look stupid in front of the kids. That’s a big thing if you are older. If you are younger I think young kids don’t really care so much or they are so much better at it that it doesn’t matter.

Administrator B had experience both as a teacher and an administrator in the district. He indicated that “the hardest part is not just having the technology but having the time to play with it and experiment with it.”

Three teachers who were at the innovation phase for adaptation for the one-to-one program gave positive responses when asked if the professional development had supported them. Teacher J responded:

Absolutely for me it has. I’m part of several PLNs. There is an organization called ISTE International Society of Technology Education. So, I am a member of that. And I’m always going through online presentations, webinars, and keeping in touch.

Teacher F appreciated the support as a newer teacher:

Yes, I do especially because you are opened to it now. So, if somebody says I want you to use this, and you’ve got to go figure it out on your own, you look at two things and if
you don’t figure it out you throw it away. So, they kind of just sit you down and kind of talk you through it. And it’s good.

And Teacher J added how the district had supported him: “Yes. There is. Stockton offers ETTC. So, we’re constantly getting emails from them. Our curriculum office forwards them to us and encourages us to go.” The availability of professional development opportunities provided teachers with many different options to receive training, but a teacher’s perception of the leadership’s support of professional development varied as did their levels of adaptation of technology.

The maintenance activities used to support or sustain a technology program make up the third side of the technology leadership, management, and policy pyramid model (Collins, 2009). The fifth research question posed: How do middle-school teachers perceive the role of district leadership in supporting the maintenance activities for technology? The emerging themes in Table 8 demonstrated a strong commitment from the leadership to provide the maintenance activities necessary to sustain and support the one-to-one laptop program.
As part of the technology leadership, management, and policy pyramid, maintenance is dependent on the planning activities and organizational integration activities that provide the finances and logistics to be successful, but maintenance is really the superglue that holds the pyramid together.

**Maintenance activities theme: effective as superglue.**

When teachers were questioned about maintenance support, the accolades quickly translated into the theme effective as superglue. All nine teachers indicated the district leadership had provided the resources necessary to sustain and support the one-to-one laptop program. The district wide one-to-one program had over 900 laptops and 500 iPads serviced by three full-time technology specialists referred to as the technology department. Maintenance activities were a priority, and as Administrator A indicated, if teachers did not have maintenance support, “we’d be dead in the water.”
Teacher K discussed the importance of having a reliable technology department to maintain the laptops:

I can honestly say without those gentlemen sitting in that room right there we would not have a laptop program. I would think we would have started out with Apple because Amanda was an incredibly good sales person and Apple does an amazing job. But we eventually probably would have went to Chromebooks because we weren’t having the success. These weren’t easy to maintain. They’re not easy at all. It’s hours upon hours. I know they dedicate the whole summer to getting these imaged and mirrored and everything. I say we probably would have gone to a Chromebook and the problems would have just started to happen, online textbooks are not available on Chromebooks and it would have been a problem. And you would have teachers not using it. It would have been the end of our program I believe.

Being a teacher who relies on every student having a working laptop, Teacher F appreciated the quick turnaround for maintenance when there is an issue: “Luckily for me and my class. I don’t really want to say too much and jinx myself since I haven’t had a major one, but it’s been quick.”

Teacher K agreed and described the support:

Our IT is the best IT in the country. They are amazing. My wife teaches at another school district and the things I witness that she goes through. I kid you not. Our IT and their ability to stay on top of it. An email or a phone call and they are responding in seconds. They are quick to help us and to show us.

When asked about maintaining the laptops and updates, Teacher L responded:

I would assume it’s those magic people behind that closed door. Those closed doors. I know it’s done over the breaks. I know it’s done over the summer time. The one year we
had to come in and leave our computers for a short time. So, they were cleaned out and maintained that way. This year we were taught ourselves how to clean it out and maintain it, store things properly. But there’s a whole team here that does all that for the kids.

Teacher J explained how even students assist in updates:

Is that as far as how do our laptops stay functional? We have a fantastic crew of three guys that maintain the district’s computers and most of it is done mobile, mobile management. So, when an update is due they push it out and it’s up to the teachers and students just to hit the update button and it updates the computers.

Many teachers commented on the quick turnaround time for maintenance assistance. Teacher E shared:

Oh, they are wonderful. We have a program I think it’s called Technology Dude we have a program but if we have a problem we send them an email and register it and normally within an hour they’ve either come helped us out or figured out the problem and solved it.

And Teacher C added: “Well It’s been great because you know I can email them I can call them and I can grab them and usually you now one of these guys answers immediately…. So, I am very happy with those guys.” Teacher D has assisted with maintenance and explained the technology department’s use of a helpdesk:

So, daily they could be here, they could be down at the other schools. And we have a helpdesk software that I have access to, so I can go in and issue tickets, pick up tickets. So, if kids come to me and I keep track of what I do. Then, I start a ticket if it’s stuff I can’t do. So, in terms of that they can always tell you what’s being done or what types of
fixes because they can look. [For example] We have had more issues with this software or if it’s a hardware thing. And then it’s not all just that thing the one-to-one devices and laptops, it’s all the other technology that affect it, the wiring, the Smartboards, the network. So, but in terms of that I would say it’s a pretty good program keeping everyone running.

Not only was the technology department considered extremely effective, they were also highly respected for their congenial manner and willingness to share their knowledge with the teachers.

**Maintenance activities theme: knowledgeable and caring**

Teachers gave many reasons why they felt supported by the technology department who were essential to the performance of maintenance activities. All nine teachers reported feeling supported by the maintenance activities and expressed the service went beyond routine maintenance. Teacher M shared her thoughts:

> Oh my God they are the best. Our tech guys are the best. Our tech guys are very very good. They have to be good to work with all these women. [laugh] And I don’t mean because we are just women, but just with anybody…. They are very patient. They are very kind. And they will come down and help you with something that is the simplest and they never make you feel like you are intruding.

The support was further explained by Teacher E:

> They are very willing to come in and show you anything…. well yesterday I had to get my iTunes program back…. It took no time, but if I had to search for it and do it myself it would have taken days. So, they are very helpful. Yes, they are gold.
Feeling supported and knowing someone was always available was very important to Teacher C who was slowly adapting to the technology. She explained that the tech department might be secluded but were always accessible. She shared:

There is an unmarked door. And this is where the computer guys are and they are all extremely patient, are truly wonderful and they know everything. And so, whenever we have a computer malfunction, which happens daily so like I can’t print, I lost my stuff and you know that kind of stuff. And you know I know a few tricks, but when I run out of them I send for them down there. These guys are fantastic and I think we could use more of them.

The perception of the teachers concerning the leadership support for maintenance was very positive as all participants gave numerous examples of how they valued the support of the technology department. A review of the District Technology Plan 2010–2013 indicated the district’s commitment to support the development of technology infrastructure and hardware so that the use of technology could continue to expand. All four administrators viewed maintenance as a key activity and critical to the success of their technology program.

After analyzing the data collected from the interviews and artifacts concerning planning activities, organizational integration activities, and maintenance activities, I next sought to examine more closely the outcomes of those factors influencing a teacher’s level of adaptation. Looking at how respondents defined technology integration and then examples of individual teacher adaptation of the one-to-one program allowed me to identify certain analytic themes across the various data sources (Miles & Huberman, 1994). These themes led to my final interpretation of the data and the subsequent key findings.
When the one-to-one laptop program was introduced in the middle school, teachers were given autonomy in deciding how and when they would implement the new computers. Teachers were expected to adapt at their own rate to a new instructional model with individual student laptops as a tool for instruction. This model was vastly different from the more traditional teacher-centered direct instruction method used by teachers. Instruction became more student focused with each student actively involved in the lesson, using a laptop as their tool.

To further identify factors that may have influenced their instructional decisions aligned to Research Question 1: How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school? each teacher’s perception of technology integration and their personal integration practices were examined. Administrators were asked to define integration and give examples they had observed in the classroom. Responses for Guide Questions 1 and 2 revealed the following themes in Table 9.

Table 9

Themes for Research Question 1: Integration Activities

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<tr>
<th>Guide Questions 1 &amp; 2</th>
<th>Themes</th>
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<tr>
<td>Administrator</td>
<td>It’s like a pencil</td>
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<tr>
<td>How would you define technology integration in terms of the one-to-one laptop program in your school?</td>
<td>Integration aligns to adaptation level</td>
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<tr>
<td>What kinds of technology integration activities have you observed teachers using in the classroom?</td>
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<tr>
<td>Teacher</td>
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<tr>
<td>How would you define technology integration in terms of the one-to-one laptop program in your school?</td>
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<td>What kinds of technology integration activities have you used in your classroom?</td>
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Organizational integration activities theme: it’s like a pencil.

If you look at the one word to describe it... it’s routine for us. We’ve established a culture where it’s not a novelty. It’s as equally as exciting and or boring as a pen or pencil. It’s just what you use to learn in 2016.

The intent was not to mandate how the laptops were used but to allow teachers to adapt at their own pace. Here is how Administrator G viewed technology integration:

I guess when technology integration especially with the one-to-one laptop program is successful it becomes like electricity it’s everywhere, but it’s nowhere. You don’t even know it’s there. You begin to take for granted that it’s there. Um and therefore it should become a tool to aid in the, you know, the whole school day, but it doesn’t become something that takes top priority. It doesn’t become something that we build or design to make sure we learn how to do something on this computer or that computer. I feel that if it’s done successfully the laptop just becomes a tool that helps kids and teachers do more than they ever could do before. It just becomes one of those things you begin to question how did I ever do this before I had a computer?

Administrator B viewed technology integration as a complete part of everyday instruction: “It’s always one of our priorities as a district.” He further explained: “To me it means it’s not just put everything away we are using the laptops now. It’s language arts, it’s math, it’s reading. Every class, every day and for every subject laptops are present in the classroom.” Administrator H was involved from the inception of the idea to add individual laptops for students. His analogy of a pencil was an effective description of the district leadership’s viewpoint of integration:
It was always that idea to view the laptop as nothing more than a pencil. So, in a way it really sounds dismissive, but it really puts things in context. That the computer is just a vehicle for greater learning. It doesn’t replace anything. It isn’t the focus of instruction. It’s just another tool. It’s a very powerful tool um so the integration was how do we get students and teachers to use it, but not just for the sake of using it. That it almost becomes, you don’t give it a second thought, because it’s like a pencil. No one thinks about the pencil when they’re doing math problems, but you need one to do it. And that’s sort of our direction with the one-to-one laptop program, and I believe that it was successful in that type of implementation.

From the teachers’ perspectives, technology integration was a complete change in the way instruction was presented. Teacher D expressed how the laptops were part of the school culture: “It’s been a part of everything and anything that you would do regardless of subject and grade level.” Teacher E shared: “It’s so well integrated that it’s hard to define that because there isn’t a moment we don’t use it…… It’s almost it’s just part of the nature of the school.” Teacher C could not define technology integration but explained: “So I have them write on the laptops every day. So, when I say every day, I mean 180 days a year.”

Teachers responded favorably when questioned about the integration of the technology as a tool for instruction. As Teacher F indicated:

You know we use it, the one-to-one laptops. They offer us a variety of things and we use it to differentiate our lessons. Everyone [student] is at different skill levels. The one-to-one gives us more freedom and gives us more tools. Now it’s not just a book they open, but now they have access to all these different resources.
Teacher I felt the program was “amazing” and spoke of the advantages for students: “What I noticed with the laptops, well I guess it gives the kids more control over their learning in a certain fashion.” When describing integration Teacher L responded, “We are trying to integrate technology in all of the subject areas. That’s so the kids are using the computers for research, for typing all of their papers. It seems to me to be just about everything.” Teacher K expressed: “I’d like to say it’s an option, but I guess each teacher is different. And that is allowed here, but they do encourage us to include it in our everyday program.” Just as varied as the way teachers defined the integration of technology, the versatility and level of adaptation revealed underlying perceptions that influenced each teacher’s use of the one-to-one laptops with their students.

**Organizational integration activities theme: integration aligns to adaptation level.**

Sandholtz et al. (1997) described three levels of computer adaptation by teachers. The first is the entry phase: This is classroom instruction that remains consistent and teachers struggle with the implementation of technology. The second phase is the adoption phase: The teachers begin to use technology in the classroom mainly to provide instruction on computer skills then start to increase integration and use technology during instruction. Teachers gain confidence. The third phase is the invention phase: The teacher is willing to try new methods and ways to integrate technology in the classroom.

The data from this study revealed those phases were not static but reached through the evolution of a teacher’s application of the technology in individual pedagogy. The following discussion focuses on the relationship between a teacher’s level of adaptation and the actual integration activities that were described by teachers in their interviews.

None of the middle-school teachers were in the first level or entry phase, and only one teacher fell between the first and second level due to the limited integration of the technology.
Teacher C used the laptops for writing assignments and sometimes for Internet research. He remarked, “Most of the time my stuff is personally generated. Like almost all my writing prompts are personally generated.” He preferred printing out student work for grading but admitted, “When we had them write their second and final draft it took forever, but now with technology we are always working with multiple assignments in one day.”

Teachers I and L were on the second level or adoption phase. These teachers had been in the district several years and had shown increasing confidence in the use of the technology. An interesting observation about colleagues influencing each other’s adaptation level was shared by Administrator G:

So, if another teacher knows all this stuff and the kids are coming from language arts and we just did this great thing and they come to science class and the computer is closed every day. The kids talk and the kids want to use it [computer]. So that teacher feels like they must do something and they have that personal network that they can go and work with other teachers.

Teacher I described her progress with adaptation of technology:

Yes, I wish there were things that I could do with it. That were, well when we first got them I was scared out of my mind. I think a lot of us older teachers felt that way we were afraid we would break it. That was our biggest fear that we would break it. And now I know better, but there are some things that I need to learn personally to make my skills even better. Sometimes I don’t have the time to do that, a lot of it and what’s happened lately is I find a lot of the younger teachers are more helpful with that. I’ll say ‘J’ I don’t know how to do that can you help me? So, the thing is with technology is that you have to use it constantly so you don’t forget it.
As with other teachers at the adoption phase, Teacher I was willing to try new things but still hesitant when in front of her class. She explained:

But you don’t want to get up there and feel like an idiot when you can’t find something. And they [students] always know how to do something better than you do. And I’m ok with that to a certain extent. So, if I’m in a good mood you can come up and do all you want but if I’m in a mood where I feel like I don’t want to look stupid in front of these kids, I hate that, and I will back away from it.

Teacher L shared a variety of software programs used with her students for language arts for reading and writing activities. She admitted being a bit “old school” and explained, “They write everything first and then they can choose which one they type to practice that typing.” She was concerned students needed to be able to write as well as type.

Teachers M and E, both veteran teachers, fell somewhere between Levels 2 and 3 on the integration continuum. Both teachers used technology extensively, but as Teacher E expressed, “Well um I’m very good. [Laugh] I still have a lot of things to learn.” She explained that she was always willing to learn a new program but sometimes gets frustrated with trainings, “and um that is usually that would ease that tension to sometimes move a little slower realizing that not everyone is an iPhone expert when some of us still have a land line [laugh].”

In addition, Teacher M used the laptops everyday with many different applications. She shared her thoughts on some of the pros and cons of the one-to-one program:

I guess I have used any kind of…. any kind of technology out there. Our superintendent was on board 100%. Sometimes jumping in with both feet, but in the big picture this computer can take the place of any paper or pencil that we would ever use. And it is
while I think it’s not always perfect and good, I’m not sure being on a computer all the time is good for your brain. I don’t know I’m not a scientist but it does keep all your children’s work in one place. And while I do have papers, I have everything on here. So, it’s time stamped, the history I know when they have gone on. I know if they’re up too late. I know if they are cheating.

The teachers at Level 3, the invention phase, were found to be the most innovative and made themselves available to assist other teachers with support and trainings. These teachers took the lead during common planning time, (CPTs), attended out-of-district workshops and turnkeyed presentations in professional development. Teachers D and J assisted teachers and students with any minor technology problems. After explaining the multiple ways he used technology for his social studies classes, Teacher K expressed how he felt about real-time data from the Internet, “and that’s something you can’t get from a textbook. That is, for me history and the computer, it’s bread and butter. It’s easy for me to integrate.”

All nine of the teachers in the middle school were using the one-to-one technology but not at all of the same levels of integration. Administrator G responded to a question about different levels of integration with these thoughts:

No, I would say different levels. Part of it comes from comfort level of using it, um, to a belief of what needs to be done in the class. Um some teachers use it strictly for lack of a better word as a word processor, it’s here we type our papers and such all the way to the other extreme. So, I would say levels. But that’s something that we have set up since the beginning to allow them to take the computers home, work on it, use it, it’s yours. You want to push each teacher past their comfort zone, but you’ve got to know each teacher’s comfort zone is different and that’s where you are going to push them.
Even when the barriers to integration were addressed, teachers continued to adapt to a level that fit their comfort zone. No matter what level the teacher was at in their adaptation to the one-to-one laptop program, all nine respondents favored having the access to computers for instruction and felt the program was an asset to the district. Administrator G explained the emphasis was on learning and not the computer:

The focus is on the kid’s learning and the technology is just there to assist and aid in that. So, it’s just part of the network of everything. You know what I mean. It’s like a pencil or paper it’s just there. And the kids don’t realize and the teachers don’t realize all the great things they are doing and how it’s assisting them in their learning.

In summary, Chapter IV provided a comprehensive analysis of the data collected during this study. Using the framework from Collins’s (2009) technology leadership, management, and policy pyramid, the guided questions focused on teacher perceptions of leadership’s support of the planning activities, organizational integration activities, and maintenance activities for a one-to-one technology program in a middle-school setting. The nine teachers and four administrators shared their observations and thoughts on the adaptation to the one-to-one laptop program for instruction in Grades 6 through 8 and in all subject areas.

The teachers expressed their feelings towards the district leadership and brought to light that support was from the top down for the planning activities, organizational integration activities, and maintenance activities necessary to sustain the program. Having a strong leadership team with a shared vision provided stability to the program and allowed the district to expand one-to-one computers for all students in the district. Not all teachers were on the same level of technology adaptation, but teachers recognized the administrators gave them the freedom to integrate the technology at their own pace. The administrators interviewed emphasized their
priority was supporting teachers and avoiding frustration during the implementation of the program. Planning was initiated by the district leadership and included members of the technology department. Planning included more stakeholders including teachers in the beginning of the program but has evolved to a small group of administrators, staff, and the technology specialists. Teacher requests and suggestions were taken under advisement when the committee made decisions concerning the organizational integration and maintenance activities.

Curriculum development was in constant transition as the technology program evolved in the district. The curriculum integrated technology, with teachers and administrators guiding revisions as new software or activities were realized. Analysis of the teachers’ perceptions of professional development provided another viewpoint of the organizational integration activities. Administrators shared the availability of district trainings and adjustments to the master schedule to provide weekly meetings for professional learning communities (PLCs). Teacher-driven professional development was identified as a key theme, and numerous examples described how teachers participated including: sharing at PLCs, mentoring, turnkey trainings, out-of-district trainings, and district professional development days. A cross-cutting theme emerged, identifying a correlation between teachers’ level of adaptation and the types of professional development activities they pursued. Professional development choices were based on a teacher’s relative position on the technology learning curve, with advanced teachers seeking more professional development. Teachers who were at a lower level of integration depended more on the district trainings, mentoring, and support from their peers.

The maintenance activities formed the third side of the pyramid and effectively acted as the “superglue” that held the technology program together. The technology department staff maintained the laptops and were described by teachers as knowledgeable and caring. Both
teachers and administrators identified the maintenance activities as a key attribute supporting the success of the program. Throughout the discussions, laptops were equated to a pencil simply described as a tool available for instruction at the teacher’s discretion. Finally, the data revealed levels of technology adaptation for each of the nine teachers determined the integration activities utilized by the teachers in their classroom.

Chapter V provides a summary of the findings, theoretical and policy implications, and recommendations for future research.
Chapter V
Discussion, Conclusion, Recommendations

Introduction

My purpose for undertaking this study was to examine the factors influencing the level of technology adaptation by classroom teachers in a middle-school setting. Technology has become increasingly prominent in public education with the influx of computer software, hardware, and devices available for classroom instruction. Student management systems monitor grades, attendance, assessment data, and lesson plans; software is used for personnel records, bookkeeping, and budgeting, and state and federal reports are all completed online. School districts and state governments have adopted online assessments completed on individual student computers and used as the chief determinant of student annual yearly progress. Zhao (2009) spoke of the virtual world “as real as the physical world, psychologically, economically, politically and socially” (p. 128). The skills and knowledge to live productively in the virtual world must be addressed by our educational system (Zhao, 2009). The findings from this case study of a middle school with one-to-one technology adds to that body of knowledge supporting school leaders who must navigate through these changing times.

Using a qualitative research design, I analyzed data collected from personal interviews with nine middle-school teachers to review their perceptions of the implementation process and outcomes of a one-to-one laptop computer program in their school. Interviews with four district administrators and artifacts related to the technology program provided a deeper understanding of the descriptive themes that emerged from the data. This evidence was then used to determine the factors that had influence on teachers’ adaptation to a one-to-one laptop program in their
classrooms. Chapter V provides a summary of the findings, a discussion of the theoretical implications, and recommendations for future research. I begin with a summary of the problem and the qualitative methods used in this study. A thorough discussion of the key findings is then followed by suggested implications related to theory and practice. The chapter concludes with recommendations for future study.

**Summary of the Problem and Methods**

School districts are challenged today to provide students with 21st century skill sets that include expertise with computers. Moving far beyond the early years of word processing on a desktop computer, today’s student must be proficient in Internet research and manipulating a variety of computer devices. Children as young as my two-year-old granddaughter can open apps on an iPad and play computerized games. Classroom teachers are confronted with the fast pace of our digital world and asked to adapt their traditional instructional practice and integrate technology. Pressure from state mandates for testing, school board members, and parents to be part of the digital age has challenged local school districts to find ways to increase technology while managing the expense (Lim et al., 2013). In addition to local and state requirements, the 2016 National Education Technology Plan indicated efforts need to continue to focus on closing the achievement gap by improving technology skills to insure students were college ready and successful in college matriculation (U.S. Department of Education, 2016). As school leaders implement technology programs in their districts, having knowledge of the factors that influence successful technology integration by teachers will be of value in the planning and implementation process. Inan and Lowther (2010) identified teacher perceptions of leadership support, professional development effectiveness, technology availability, and technology maintenance as key factors in teacher technology adaptation. The intent of this study was to
contribute to the body of knowledge by closely examining and presenting findings that identify those key factors influencing a teacher’s level of adaptation of a one-to-one laptop program in a middle-school setting.

Collins’s (2009) technology leadership, management, and policy pyramid (TLMPP) model provided the theoretical framework for this study. The pyramid is supported by a foundation of committed leadership with three sides: planning activities, organizational integration activities, and maintenance activities sharing equal importance for the success of a new technology. The primary research question focuses on leadership’s role:

To what extend does district leadership influence a middle-school teacher’s adaptation of technology in a one-to-one laptop initiative?

As Collins (2009) indicated with his model, a “foundation of committed leadership” is necessary to support the activities forming the sides of the pyramid (p. 17). He further explained the three sides of the TLMPP model uphold the goal of excellence while recognizing the importance of the human relationships involved in a change process. When implementing a new technology into a school district, one must consider the kind of leadership and relationships that exist in the organization.

Focusing on those relationships between teacher and administrator reveals the importance of teacher perceptions of leadership’s support of a new technology initiative. Having district leadership activities that define and support technology goals, encourage support on all administrative levels, and effectively communicate the importance of the technology initiative have been linked to successful teacher technology adaptations (Miranda & Russell, 2011). Fullan (2001) explained leaders of change must address the culture of the change and not just the
structure of the change. Leaders who support their organizations by cultivating trust, providing information, and sharing expectations have a greater likelihood to develop a positive change culture (Fullan, 2001). Kotter (1995) described an effective transformative leader as one who establishes a vision, collaborates, communicates, empowers, sets goals, and encourages innovation. Teachers rely on their administrators to be technology leaders providing a sense of security and understanding of the technology (Ertmer et al., 2002).

Understanding the role of leadership’s influence on a teacher’s adaptation of a new technology program was fundamental to this study, and after careful review of the relevant literature, five subsidiary questions were created:

- How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school?
- How do middle-school teachers perceive the role of district leadership in supporting the planning activities for a one-to-one laptop initiative?
- How do middle-school teachers perceive the role of district leadership in supporting the integration of technology into the curriculum?
- How do middle-school teachers perceive the role of district leadership in supporting professional development for technology integration?
- How do middle-school teachers perceive the role of district leadership in supporting the maintenance activities for technology?

Focusing on those factors that influence the decisions made by the classroom teacher in the implementation of a one-to-one laptop computer program, I sought to answer these questions. In addition, how does teacher perception of district leadership’s support of the activities that are necessary for the program influence their level of adaptation?
I began this case study at a middle-school with 500 students located in an elementary school district in southern New Jersey. The district was chosen because a one-to-one laptop program had been in place in the middle-school for more than 7 years. All students received their laptop each morning during homeroom and carried the laptop with them to class throughout the school day. Using a qualitative research design, nine middle-school teachers and four district administrators were recruited to participate in my study. Semistructured interviews were conducted at the school and scheduled over the fall semester at times that were convenient for the teachers. In addition to the guide questions, probes were used to follow up when further detail or clarification was needed (Merriam, 2009) during the interviews. By using a conversation-type format, I could create a comfortable environment, and teachers spoke freely about their thoughts and experiences at the school with technology. My intent was to utilize teacher participants at each level of computer adaptation, but I discovered that all of the teachers were at least partially at the adoption phase, with many of the subjects between the adoption and innovation phases. Data collection included the transcripts from the nine teacher interviews and four administrator interviews that took place during sessions lasting from 45 to 60 minutes and recorded with an electronic recording device. In addition, a review of artifacts included fieldnotes, copies of middle-school curricula for language arts and mathematics, pacing guides, Apple Distinguished Schools Applications, the 2013 District Technology Plan, and samples of lesson plans. These documents added further validity to the observations and interpretations made from the teacher and administrator transcripts.

Broad-stroke coding was used first to get a sense of how teachers viewed the district leadership and the activities that supported the one-to-one program. During the second round of coding I grouped the responses by guiding question then combined similar responses to identify
the emerging themes for the administrator transcripts and the teacher transcripts separately. As the themes were analyzed from both data sets, some of the repeated themes were discarded. Certain analytic themes (Miles & Huberman, 1994) emerged as I considered how teacher respondents defined technology integration and shared their individual methods of technology adaptation. Overarching themes, aligned to one or more of the research questions and theoretical framework outlined in Collins’s technology leadership, management, and policy pyramid model (Collins, 2009), were identified during the final analysis. These themes led to my final interpretation of the data and the subsequent key findings.

**Key Findings**

The interviews with nine middle-school teachers who were actively participating in the one-to-one laptop program brought to light several reoccurring themes. This sample provided a diversified group of teachers at varying levels of computer adaptation who shared their perceptions of leadership and the activities that supported their integration of technology. Focusing on those district leadership activities, which influence a teacher’s level of adaptation, I identified key findings related to the five subsidiary questions. The following discussion addresses those findings.

When considering Subsidiary Question 1: How do middle-school teachers perceive the role of district leadership in supporting a one-to-one laptop initiative in their school? a key finding from the data identified that teachers recognized and valued the leadership’s shared vision for technology in the district. All of the teacher respondents viewed the district leadership as the driving force behind the success of the technology program. Teachers revealed how this vision was shared by the entire school community including parents, board members, teachers, and administrators. Specifically, the one-to-one laptop program was viewed as a top priority
both financially and for classroom instruction. A review of the supporting documents and interviews with four administrators reinforced this finding. Teachers valued the support given by the district leadership and responded favorably when asked if the leadership had supported them in their integration of technology. The perception of leadership support through a shared vision had a positive effect on the teachers’ choice to adapt to the one-to-one program. All nine teacher respondents participated in the one-to-one technology program and were free to integrate technology at their own level of adaptation.

When considering Subsidiary Question 2: How do middle-school teachers perceive the role of district leadership in supporting the planning activities for a one-to-one laptop initiative? district leadership’s role in planning activities emerged consistently as essential for a teacher’s successful implementation of a technology initiative. Leadership’s planning for maintenance and organizational integration activities had a direct impact on how teachers chose to integrate technology in the classroom. The data exposed that teachers were not fully aware of how planning activities came about but knew that the administration and technology department were responsible for much of the district planning that supported their technology integration. The administrators’ comments during the interviews and documentation review indicated support for teachers was considered very important to the leadership of the district and considered in the planning activities for technology. School leaders wanted teachers to feel confident with using the computers and avoid any frustration due to maintenance issues.

When identifying specific organizational integration activities for this district, I considered professional development and curriculum planning. These activities were considered in Subsidiary Question 3: How do middle-school teachers perceive the role of district leadership in supporting the integration of technology into the curriculum? and Subsidiary Question 4:
How do middle-school teachers perceive the role of district leadership in supporting professional development for technology integration? The planning for the professional development activities was divided into mandated compliance trainings on the district level and individual teacher professional development. In my analysis of the data, professional development choices by teachers were aligned to the teacher’s level of adaptation. The data collected on curricular activities included interview transcripts and the curriculum documents. These artifacts verified comments made by teachers and administrators that technology was integrated into the online curriculum, and the suggested activities or projects in the curriculum were used at teachers’ discretion. A second key finding recognized the value of leadership having knowledge of a teacher’s level of adaptation when planning for organizational integration activities such as professional development and curricular activities.

A level of adaptation was identified for each teacher, and common attributes were associated with each of the three levels: the entry phase, the adoption phase, and the innovation phase. Most teachers were not clearly in one phase, as adaptation of technology was not static, so their integration of technology was a progression over time. My analysis took this into consideration, and levels were determined from a review of the literature, the responses given by the teachers, and comparison of data from administrators and district artifacts. What became apparent about these data was a correlation between a teacher’s level of adaptation and the teacher’s position on the technology learning curve that emerged as a theme for professional development. As well, a teacher’s level of adaptation predicated a teacher’s integration of technology, a theme identified for technology integration. The cross-cutting theme, level of adaptation, is closely associated with a teacher’s methods of integration and personal choices for developing their computer skills. Considering a teacher’s level of computer adaptation provides
leadership with a valuable insight when planning organizational integration activities for a technology program.

None of the nine teachers in the study were in the entry phase, and through discussion with administrators and review of the district technology plan, there were currently no teachers at this level in the middle school. Teachers at the entry-adoption phase had their preferred pedagogical methods in place, and technology was only integrated for particular uses in the classroom. They did not want to deviate from traditional practices, such as writing with pen and paper, which they felt were critically important to student learning and performance.

On the other end of the adaptation spectrum were the teachers at the innovative phase. Their enthusiasm for the one-to-one program was apparent as they were eager to do whatever they could to expand their integration of technology. Innovative teachers were high on the technology learning curve. These teachers felt supported by the leadership, which provided them access to technology, professional development, and the maintenance necessary to sustain the program. However, most of the teachers interviewed felt the district could do more to support them with professional development.

Teachers who were transitioning from adoption to innovation were also willing to try new applications of technology but found the professional development was sometimes too quick and a bit frustrating. Two veteran teachers at this level of adaptation demonstrated a high interest in technology integration but felt the younger teachers were much quicker at learning technology. The other two teachers with over 20 years experience were at the adoption phase and had similar feelings about the younger teachers. All of these teachers were found to be in the middle of the learning curve for technology. When considering the level of adaptation and age of the participants, there were no correlations identified in the data set. However, this
finding points out that having knowledge of a teacher’s level of adaptation would be of value in planning professional development and other curricular activities for teachers.

Support for teachers was identified as an underpinning factor in the leadership’s planning and maintenance activities that resulted in successful teacher technology integration. A new technology initiative needs to be supported by those planning, organizational, integration, and maintenance activities that have been identified as necessary for success (Collins, 2009). This finding seemed particularly aligned with Subsidiary Question 5: How do middle-school teachers perceive the role of district leadership in supporting the maintenance activities for technology? revealed the critical role of maintenance activities. In all of the interviews with teachers and administrators maintenance activities stood out as the “superglue” holding the program together. Without effective maintenance activities, any technology application is doomed to fail. The planning and maintenance activities were designed to ensure there was consistent access to technology and the Internet for staff, students, and teachers at all times. This included efficient planning for the continual maintenance and servicing of the computers. Leadership planning for effective maintenance was one of the strongest indicators for activities that supported successful technology integration. While affirming the literature on leadership and teacher perceptions, these findings shed light on the importance of teacher level of adaptation when making key decisions for a technology program in a middle school.

The overall consensus throughout the interview data was that the use of laptops in this district was nothing more than an additional tool to assist teaching and learning, like a pencil. The theme “like a pencil” was identified in the discussion of technology integration activities. Teachers were encouraged to integrate technology as a tool for instruction at their own level of comfort with the one-to-one laptops. Not considered a major finding on its own merit, the use of
technology as a tool was part of the district leadership’s vision and will be addressed under leadership in the implications for theory and practice.

**Implications for Theory and Practice**

This case study identified key factors associated with middle-school teachers’ adaptation to a one-to-one laptop program. One theoretical implication identified from the findings was the impact change leadership has on the teachers in a middle school adapting to a new one-to-one computer program. The change from traditional classroom instruction to the one-to-one laptop program was led by effective leadership that carefully planned and implemented the change. One of those qualities described by Fullan (2001) is the ability to build moral purpose within the organization. Moral purpose supports sustainability and increases creativity while expanding and meeting goals with passion and purpose. The theme of shared vision (Ertmer et al., 2010) was expressed by the respondents throughout the data collection. Merriam (2009) defined culture as “the beliefs, values, and attitudes that structure the behavior patterns of specific groups of people” (p. 27). One of the qualities of transformational leadership (Fullan, 2001; Kotter, 1995; Waters, 2010) observed in this case study was that the superintendent had facilitated the change by developing a culture within the middle-school community that embraced the one-to-one technology program. As Administrator A explained the transformation, “This has developed from the culture. Never have I had to mandate to an administrator you have to do this.” All the administrators demonstrated proficiency in technology and could assist teachers in their technology integration. As teachers and staff used the laptops, Administrator H described the technology change as “a culture thing and that’s what people did.” By creating a shared vision and developing a culture that supported the one-to-one program, a change leadership proved to be successful in transforming and sustaining the one-to-one program.
Committed leadership (Collins, 2009) was the foundation and the support system for the technology initiative that was central to this case study. The teachers in this study talked about the commitment of the leadership from the top down, and as Teacher F explained, the administration “has our backs.” Teacher beliefs and attitudes (Ertmer, 2005; Palak & Walls, 2009; Zhao & Frank, 2003) have been shown to strongly impact their instructional decisions related to computer integration in the classroom. Leadership would benefit from having knowledge of those district-level activities (Miranda & Russell, 2011) linked to successful teacher technology adaptation.

The findings showed that support for teachers was considered a priority by the district administration and impacted their decisions for school-level factors affecting adaptation (Bebell et al., 2010) such as professional development, leadership support, technical supports, computer access, and computer availability. School leaders created a support system for teachers in the beginning of the one-to-one program with specific trainings for the laptops, access to the laptops, and making sure technical support was available. Administrators A, B, and H linked the success of the program to the fact that each teacher was given his or her own laptop to keep, and they were free to take them home at night. Successful teacher technology adaptations are linked to district leadership activities that define and support technology goals, encourage support at all administrative levels, and effectively communicate the importance of the technology initiative (Miranda & Russell, 2011). Using leadership strategies framed with a human resource lens (Bolman & Deal, 2008), this case demonstrated consideration was given to critical needs, roles, talents, and values of those affected by the change.

Understanding what gets teachers beyond their comfort level and feeling confident enough to be innovative has been a challenge for school leaders. The findings related to those
leadership decisions associated with maintenance, planning, and organization integration activities have theoretical significance when studying the impact on teacher adaptation. Teacher-level factors (Lim, 2007; Tondeur et al., 2008) such as teacher perceptions and attitudes (Inan & Lowther, 2010) have been found to impact their level of technology integration. According to research by Sandholtz et al. (1997), two domains have been linked to several studies on technology integration. Teachers who have confidence and are comfortable with technology (first domain), such as Teacher K, are willing to be innovative and take risks (Glickman, 1985). Teacher K was at the highest level of adaptation and explained the district was willing to provide any professional development that would support his integration activities.

A key finding from this study pointed out that having knowledge of a teacher’s level of adaptation would be of value in planning professional development and curricular activities for teachers. The levels of support both general and technical (Sandholtz et al., 1997) are important to teachers such as Teacher M who was willing to try new things but got frustrated if a training moved too fast. Teacher support was identified as an important consideration in the findings for the planning and maintenance activities. All teacher and administrator respondents were very familiar with the technology department, explained the department’s role in technical support, and shared that the technology specialists were very knowledgeable, caring, and willing to assist teachers with technology.

These findings have several implications for practice when school leaders are seeking to implement technology adaptation in their districts. Today school districts are called upon to use technology for administrative tasks such as state and federal reports, bookkeeping, teacher evaluations, online student assessments, student information management, and many routine tasks. Teachers use technology to communicate with parents and students, write lesson plans,
create tests, design instruction, and provide differentiated lessons for diverse student populations. Identifying those critical teacher needs (Hew & Brush, 2007; Palak & Walls, 2009; Tondeur et al., 2008; Zhao & Frank, 2003) that, with support, result in positive computer integration outcomes will contribute to the body of literature supporting those making the decisions. As seen in this study, school-level factors influencing integration (Bebell et al., 2010) include professional development, leadership support, technical support, computer access, and computer reliability. Two leadership decisions identified in the study that led to the success of the program were giving teachers their own laptop at the beginning of the program and allowing teacher autonomy in the implementation of the technology.

In addition to supporting teachers’ needs, leadership must be cognizant of those barriers that prevent integration. Looking at the positive outcomes in this study for integration, several activities would be considered essential for success. One is understanding teacher beliefs and attitudes associated with their level of adaptation (Ertmer, 2005; Palak & Walls, 2009; Zhao & Frank, 2003). Studies indicate the level of experience with technology and a teacher’s willingness to be innovative are strong predictors of technology adaptation (Inan & Lowther, 2010; van Braak, 2001). Leaders who consider where teachers are with their level of adaptation (Sandholtz et al., 1997) and the factors influencing adaptation (Schrum & Levin, 2012) will be better equipped to avoid the barriers that may hinder progress in adaptation. Teacher perception of their ability level, their readiness to use new technology strategies, preferred instructional strategies, and perception of how technology will impact student learning were found to be strong predictors of how teachers adapt to technology (Inan & Lowther, 2010). As discussed in the findings, professional development activities should be structured to support teachers at their level of adaptation, and sharing knowledge through mentoring and professional development has
been shown to increase the quality of technology integration by teachers (Hew & Brush, 2007; Kopcha, 2012). As Administrator H expressed so eloquently during his interview:

The computer is just a vehicle for greater learning. It doesn’t replace anything. It isn’t the focus of instruction. It’s just another tool. It’s a very powerful tool um so the integration was how do we get students and teachers to use it, but not just for the sake of using it. That it almost becomes you don’t give it a second thought because it’s like a pencil.

The findings from the administrator transcripts emphasized that the leadership’s shared vision for technology was to consider the laptop as an additional tool for learning, like a pencil. Implementing one-to-one technology was a priority because the leadership felt having a tool such as a laptop would be more effectively used if each student had their own laptop. Teachers with a student-centered or constructivist approach to instruction were found to have a higher level of computer adaptation (Palak & Walls, 2009; Tondeur et al., 2008). Individual laptops provided the opportunity to implement a variety of student-centered activities and methods of instruction shared by the teachers interviewed for this study. School leaders who value a student-centered approach would benefit from thinking of a laptop as no more than an expensive pencil.

Finally, consideration of a well-planned maintenance program and system for technical support to support a technology initiative was a key finding in this study. As with other support activities, teachers respond favorably when they believe the barriers to their integration have been addressed (Kidd, 2009).

These findings affirm the literature that has identified several teacher perceptions that influence their level of computer adaptation in the classroom. As well, this study supports the
research on leadership that indicates the importance of a shared vision when implementing a new initiative. Aligning with Collins’s (2009) technology leadership, management, and policy pyramid model, the committed leadership of this middle-school was observed providing the activities teachers needed to feel secure in their transition from traditional teaching methods to a one-to-one laptop program. However, the literature has not identified, specifically, the importance of teacher level of adaptation when leaders are making decisions. My data revealed leadership should consider teacher level of adaptation when planning activities such as professional development to support teachers in their technology integration. These findings are applicable in a variety of educational settings where a new technology innovation or program is being implemented that will require technology integration by teachers in their classrooms.

**Policy**

The findings shared from my study are significant for those school leaders seeking ways to improve how technology is being integrated into their districts. Technology requires a huge financial commitment and can no longer be ignored as society has moved to the digital age. Technology continues to be central to many state and federal mandates for reporting and assessment in addition to the call for eliminating the digital divide and giving equal access to technology for all citizens. The recent 2015 reauthorization of No Child Left Behind (Every Student Succeeds Act [ESSA], 2015) continues to place technology as a key component for student preparation for success.

For New Jersey school districts, this study has policy implications as new regulations for monitoring student achievement, online assessment, and teacher effectiveness have been put into place and require administrators, staff, teachers, and students to be adequately prepared to use computers. School administrators need to become technology leaders and provide assurance to
teachers as they look for clarification and understanding of the technology changes (Ertmer et al., 2002). A successful program must begin with committed leadership that shares the vision for the technology program.

The findings suggest that districts should consider developing a policy for technology with a shared vision for what the technology will look like, how the technology will be implemented, and who will use it. This study showed communicating the vision was critical in getting board support, community backing, and teacher confidence in the process used to implement the program. Having a shared vision brought the school community together in support of the laptop program and gave the superintendent the backing needed to budget and plan for the infrastructure, computers, and maintenance.

The findings showed that activities for supporting a technology program must consider the supports teachers need to become successful in the adaptation. The implications for policy are that inclusive planning activities (those that include administrators, staff, and teachers) provided the best choices for designing the program. For example, after researching other districts with successful programs, a policy made computer access for teachers a priority in the initiation of the program. In the study, leadership agreed that giving teachers access to technology first and providing the professional development support allowed a smooth transition to the laptop computers. The district gave teachers a year to become familiar with the technology before giving students their own laptops.

The importance of considering a teacher’s level of adaptation when planning professional development has implications for policy as well. School districts look for ways to improve instruction by providing professional development activities. Professional development was one of the important activities that have a positive effect on the level of technology integration used
by teachers in the classroom. Recommendations for improving professional development included consideration of the teacher’s level of adaptation and the methods in which professional development are offered. Teachers can be at a variety of integration levels, and this impacts their confidence level and willingness to acquire new information or skills for technology. How leadership makes and implements integration decisions such as professional development directly impacts curricular and instructional planning and practice (Kidd, 2009).

**Recommendations for Future Study**

The following recommendations are shared for possible future research:

1. The sample size of teachers and administrators was limited in this study. It is recommended future research be conducted in a larger school so that the sample size of teachers and administrators could be expanded. With a larger sample size, more details on teacher and administrator perceptions would be available for a similar analysis.

2. The middle school chosen for this study was in a semi-rural district in southern New Jersey. It is recommended that future research be conducted in urban and suburban settings to get a different perspective on how technology integration is supported in different communities. Computer access focusing on the digital divide might also be considered to compare computer integration across different locations.

3. Qualitative research methods were used in this study. It is recommended that a larger data set be collected for teachers from multiple schools and consider an analysis that includes age, gender, and level of adaptation. This information
would be useful in determining if age or gender influence technology adaptation by teachers.

4. Inan and Lowther (2010) suggested there is a need for further qualitative studies that include rich data collections from classroom observations. This option was not available for this study. It is recommended that a similar study include classroom observations to get a better understanding of how technology is integrated in the classroom.

5. Using Collins’s (2009) technology leadership, management, policy pyramid as a framework, it is recommended to conduct a study by examining the perceptions of school leaders who are making the decisions that drive the activities supporting technology integration.

6. As technology challenges continue to grow in public schools, finding connections between student outcomes on state online assessments and student access to computers would be valuable data. It is recommended a study look at the computer activities provided by classroom teachers for students and compare student assessment data from those classrooms considering the different levels of technology integration.

**Concluding Remarks**

Identifying those factors influencing the level of technology adaptation by teachers in a middle-school setting might be of value to school leaders making policy decisions for their districts. Having had the experience of a classroom teacher and a school leader, I value having a wider perspective of those activities that support successful integration of technology. Collins’s (2009) technology leadership, management, and policy pyramid model (TLMPP) provided a
framework that considered how committed leadership acts as a foundation for organizational changes such as implementing a technology program. Understanding the connection between a leader’s actions and teachers’ perceptions is valuable when making decisions that will impact an organization. This connection has been shown to influence a teacher’s level of adaptation (Lim et al., 2013). The TLMPP model is constructed from three identified areas supporting successful technology: planning activities, organizational integration activities, and maintenance activities. Observing this case study through this lens, teachers and administrators provided rich data to explain how leadership had influenced teacher’s perceptions of those activities. Of interest was how the school community valued the leadership’s shared vision for technology in the district. Both teachers and administrators felt the success of the laptop initiative was the direct result of the commitment of the leadership.

The key findings identified in this study provide implications for policy, practice, and future research. The first finding suggested that teachers recognize and value the leadership’s shared vision for technology in their district. Hew and Brush (2007) proposed shared vision as one strategy that helps overcome the barriers to technology integration. Teachers’ perceptions of leadership and leadership support have been found to have positive influences on teacher adaptation. Leaders who communicate their vision and develop a culture for change have been found to be more successful in leading change in an organization (Fullan, 2001). The district examined in this case study had developed a culture of change that extended from the school to the parents and community.

School leaders have the responsibility for the planning activities that determine daily school operations and the organizational integration activities directing teachers and students.
Having knowledge of a teacher’s level of adaptation when leadership is planning organizational integration activities such as professional development was identified as another finding. Professional development has been identified as one of the activities supporting teachers in their adaptation to technology (Hew & Brush, 2007; Inan & Lowther, 2010; Penuel, 2006). Planning and executing professional development that aligns with teachers’ needs should be the goal of any school administrator, as these decisions are linked to pedagogical and fiscal accountability.

As a key finding, support for teachers was identified as an underpinning factor in the leadership’s planning and maintenance activities supporting technology integration by teachers. Although this may sound a bit redundant, the viewpoint of the district’s leaders stressed that support for teachers was a primary concern when decisions were made for implementing the technology program. Teacher transcripts relayed a perception that the leadership wanted teachers to be successful with technology. Teachers felt particularly supported because the technology worked. Maintenance, in my personal experience and in experiences shared by other school administrators and teachers, tends to be a huge barrier to technology integration. Studies indicated providing technical support has a positive effect on technology integration (Collins, 2009; Inan & Lowther, 2010).

As educators continue to decipher what technology applications are best for organizational and instructional needs, the digital world continues to evolve at warp speed. When one considers the policy implications for technology integration for a middle-school setting, the viewpoints vary from the traditionalists who prefer to use pen and paper to the digital natives who already have tweeted about their next new discovery. In considering these challenges, I agree with Zhao (2015) who emphasized the importance of school leaders promoting student competence in using technology and not just adding technology to enhance
curriculum and instruction. I believe some school leaders do get this. Providing teachers with technology support while giving them autonomy with technology integration, allowing students to use technology as “a pencil,” and encouraging innovation are valid approaches for moving students towards digital competency.
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