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An Investigation of Educational Technology Sustainability Factors in New Jersey Elementary Schools and their Alignment with 2008 New Jersey School Technology Survey

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AN INVESTIGATION OF EDUCATIONAL TECHNOLOGY SUSTAINABILITY FACTORS IN NEW JERSEY ELEMENTARY SCHOOLS AND THEIR ALIGNMENT WITH THE 2008 NEW JERSEY SCHOOL TECHNOLOGY SURVEY

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ABSTRACT

AN INVESTIGATION OF EDUCATIONAL TECHNOLOGY SUSTAINABILITY FACTORS IN NEW JERSEY ELEMENTARY SCHOOLS AND THEIR ALIGNMENT WITH THE 2008 NEW JERSEY SCHOOL TECHNOLOGY SURVEY

Educational leaders struggle with how to develop and sustain an effective, current and affordable educational technology program that meets the needs of the 21st Century learner and increases teaching and learning effectiveness. Thus, this study aimed to extend the research and provide practical guidelines to assist leaders in sustaining an effective educational technology program, while at the same time offering insights on how to support teachers with the integration process.

The following guiding questions were used in this research study: (1) What are the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five?; (2) How do the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level – specifically kindergarten through grade five – align with the 2008 New Jersey Public Schools Technology Survey?; and (3) Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence

suggest about how the presence or absence of technology leadership influences effective technology integration?

The findings from the first guiding question resulted in 10 sustainability factors that aligned with current research: Leadership, Funding, Professional Development, Technical Support, Assessments, Technology Integration, Digital Content, Equitable Access to Technology, Connectivity and Communication/Shared Practices. The 10 sustainability factors were aligned to the New Jersey School Technology Survey instrument in order to analyze the existing data under the theoretical framework of "effective sustainability". An analysis of the 36 objective items from the 2008 New Jersey School Technology Survey revealed that all of the sustainability factors were included, although some factors were examined more than others. The analysis revealed that the sustainability factors most heavily assessed were: Leadership, Technology Integration, Equitable Access to Technology and Connectivity. There were a moderate number of questions assessing: Communication/Shared Practices. Funding, Professional Development, Technical Support, Assessment and Digital Content were slightly assessed. To answer question three, Pearson's Chi-square crosstab analyses were completed using two leadership questions on the New Jersey Public School Survey. Item #2 – Does district have a technology coordinator/director?, and Item # 4 – Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Both items were analyzed separately against the 36 objective items, including their subcategories. Item #2 resulted in 27 statistically significant differences between the observed and expected counts, and item #4 resulted in 17 statistically significant differences between the observed and expected counts. Six common statistically significant differences were present in both of the leadership positions at the district and local level.

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Dedication

To my parents, Sue and Carl, who instilled in me a level of confidence and a love of learning from a very young age. Your guidance provided me with the fortitude to pursue my dreams. I will always be grateful for the love, support, and the opportunities you provided me.

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CHAPTER I

INTRODUCTION

According to Collins and Halverson (2009), we are entering the third era of education called the lifelong-learning era, where the emphasis is on customizing individual education to the learners' needs, interests and abilities. Before the lifelong-learning era, there was the apprenticeship era and the universal-schooling era.

Most of the people in the apprentice era were self-taught; i.e., Abraham Lincoln. In the apprenticeship era, parents decided their son's occupation, and either the father or a friend trained him for that occupation. Daughters were taught tasks such as farming, running a store, household duties, midwife responsibilities, etc., by their mothers.

> One of the most revolutionary changes in the U.S. education system was the universal-schooling era, advanced by Horace Mann et al., and characterized by the State's taking over responsibility for educating our children from their parents. The prevailing view was that immigrant parents could not effectively teach their children American values and the English language. Mann argued that the education model of the industrial revolution would permit large groups of children to receive a common curriculum and common language, as well as social interaction, thus making it possible for all children to become successful Americans. Mann was advocating an equitable education for all.

In the lifelong-learning era, responsibility for education shifts back to the parents for young children and to the individual for older children through adult age. In this era, education can be accomplished through many different modes, including home schooling, distance learning, learning centers, educational videos, software, online subscriptions and tutorials using Internet-connected computer equipment, including smartphones (Collins & Halverson, 2009). The present home-schooling faction has the possibility of taking education responsibility from the State to the home (Collins & Halverson, 2009).

The Internet and online distance learning courses currently available provide individuals with the options for taking responsibility for their own education. Technologies are readily available for people to advance their careers and pursue their passions. As the lifelong-learning era continues, will New Jersey's curriculum standards movement be a constraint to the educational system? What will happen to learners who are not motivated to take advantage of technologies that drive the lifelong-learning learning environment?

According to Collins and Halverson (2009), changes in education occur in the following dimensions:

- Who is responsible for learners' education,
- What are the purposes and the content of their education,
- How are learners taught and assessed,
- What do we expect learners to learn,
- Where does learning take place,
- What is the culture in which learning takes place, and
- What is the relationship between teachers and learners?

(Collins and Halverson, 2009, pg. 91)

As the challenges facing our global environment become increasingly complex, our educators must provide a model of learning powered by technology (U.S. Department of Education, 2010).

Since President Clinton's national directive in 1996 to infuse telecommunication networks and technology into the nation's public schools, educators have struggled to provide technology-infused learning environments that will meet the challenging and quickly shifting demands of our global economy.

In 1996, Clinton's Technology Literacy Challenge placed responsibility for accomplishing the goals, listed below, on federal, state and local schools.

- All teachers in the nation will have the training and support they need to help students learn how to use computers and the information superhighway.
- All teachers and students will have modern multimedia computers in their classrooms.
- Every classroom will be connected to the information superhighway.
- Effective software and online learning resources will be an integral part of every school's curriculum" (US DOE,1996)

Fourteen years later, the U.S. Department of Education 2010 National Educational Technology Plan (NETP), Transforming American Education: Learning Powered by Technology recognized that "technology is at the core of virtually every aspect of our daily lives and work, and must be leveraged to provide engaging and powerful learning content and experiences, as well as resources and assessments that measure student achievement in more complete, authentic and meaningful ways" (U.S. Department of Education, 2010). According to the NETP, technology-based systems are fundamental in improving student learning, as well as generating assessment data that can be analyzed in efforts to improve the U.S. educational system (U.S. Department of Education, 2010).

The 2010 National Education Technology Plan (NETP) recognized that technology is central to our everyday lives and urged the U.S. education system to:

- Be clear about the outcomes we seek.
- Collaborate to redesign structures and processes for effectiveness, efficiency and flexibility.
- Continually monitor and measure our performance.
- Hold ourselves accountable for progress and results every step of the way (U.S. Department of Education, 2010).

The 2010 NEPT instructs school leaders to leverage their technology, in an effort to provide powerful learning experiences, meaningful content, resources, and assessments that measure student achievement in authentic, comprehensive ways. The NETP supports President Obama's two education goals:

- "We will raise the proportion of college graduates from where it now stands (around 41%) so that 60% of our population will hold a two-year or four-year degree by 2020.
- We will close the achievement gap so that all students graduate from high school ready to succeed in college and careers" (U. S. Department of Education, 2010).

The No Child Left Behind Act (NCLB) of 2001 places enormous accountability pressure on school districts. NCLB requires that all students demonstrate proficiency in reading and math, as measured on state assessments, by the end of the 2013-14 school years. Additionally, schools must meet their adequate yearly progress (AYP) performance targets, for student population as a whole and for various subgroups including ethnic minorities, as well as students with disabilities, economically disadvantaged and limited English proficiency (US DOE 2002).

The 2010 NETP requires data collection that provides information as to whether local school districts are meeting the national goals. The plan emphasizes the importance of data-driven decision making that results in better performance and efficiency. The New Jersey Department of Education responds to the nation's data collection mandate by requiring each public school in the State to complete the annual New Jersey Educational Technology Survey. This survey provides information that helps the State determine the effectiveness of its public school's educational technology program and its compliance with national goals.

An analysis of the information obtained by the New Jersey Technology Survey indicated that, by 2005, New Jersey schools had acquired the infrastructure that connected all instructional areas to a network and the Internet. However, the constant technology advancements cause school districts to continuously upgrade their network infrastructure and bandwidth, computer equipment, software and other related resources (Editorial Projects in Education, 2006). Funding the nonstop technology advancements is problematic for many schools.

Background

A recent study by Romano (2005) investigated the sustainability factors in New Jersey high schools and their alignment with the 2003 New Jersey Technology Survey. This research study focused on the elementary school level, specifically kindergarten through grade five, and analyzed data from the 2008 New Jersey Educational Technology Survey. The elementary grades are particularly important, since the majority of students entering first grade in the year 2011 have some experience with digital tools, including computers, video games, video cams, etc. In the year 2005, a 12th-grade student entered first grade in the year 1999, which was before technology was integrated in most public elementary schools.

Technology has advanced significantly in the past decade. Today, educational software can assess students' achievement by tracking their progress, build and send reports pertaining to students' progress, and make educational recommendations which was not generally the case a few years ago.

Statement of the Problem

In his State of the Union 2011 address, President Obama stated that "Maintaining our leadership in research and technology is crucial to America's success. But if we want to win the future – if we want innovation to produce jobs in America and not overseas – then we also have to win the race to educate our kids".

The U. S. Department of Education National Educational Technology Plan, 2010, calls for schools to leverage their technology in order to provide powerful learning experiences, meaningful content and resources as well as assessments that measure student achievement in authentic, comprehensive ways). This plan states that the U.S. Department of Education will promote: "(a) higher student academic achievement through the integration of advanced technologies, including emerging technologies, into curricula and instruction; (b) increased access to technology for teaching and learning for schools with a high number or percentage of children from families with incomes below the poverty line; and (c) the use of technology to assist in the implementation of state systemic reform strategies" (U.S. Department of Education, 2010, p.ii).

Accountability for outcomes relating to student achievement has escalated in the U. S. educational system. Educators continuously strive to ensure that U. S. students are ready to compete in our 21st Century global environment. President Obama's goals in the 2010 NETP indicated that the "U. S. will lead the world in the proportion of college graduates by 2020, thereby regaining our leadership and ensuring America's ability to compete in a global economy" (p.). However, according to Arnie Duncan, the current United States Secretary of Education, in his November 2010 letter addressed to Congress, the United States currently ranks ninth out of 36 developed nations in college completion rates (US DOE, 2010). As stated in the 2010 NETP, "to achieve this goal, we need to leverage the innovation and ingenuity this nation is known for to create programs and projects that every school can implement to succeed" (U. S. Department of Education, 2010, p.). The U.S. Department of Education's 2010 NETP indicates that our nation's schools must integrate advanced technologies, in order to "improve student learning, accelerate and scale up the adoption of effective practices, and use data and information for continuous improvement" (U. S. Department of Education, 2010, p.).

At a New Jersey Department of Education meeting held at Bergen Community College, Paramus, N. J., on October 20, 2010, Sandra M. Alberti, Director of Math and Science Education, NJ DOE, stated that, in 2014, New Jersey school districts will be required to administer State standardized assessments online. To successfully administer online assessments, every school district must have adequate technological resources – infrastructure, equipment, and Internet bandwidth.

Although New Jersey school districts have spent millions of dollars to infuse technology, according to the 2008 N. J. State Technology Report Card, the overall New

Jersey score relating to technology integration is a C, which is slightly less than the national grade of C+ (Editorial Projects in Education [EPE] Research Center, 2008). Specifically, the results for New Jersey schools indicated that access to technology scored a C, use of technology scored a B-, and capacity to use technology scored a C (EPE Research Center, 2008).

Therefore, the problem is that effective educational technology integration that meets the needs of all learners, and promotes higher-level thinking skills required for success in the 21st Century, continues to be a national and state goal. Although educational technology goals are set at a national and state level, the support structure required to accomplish these goals are not always adequately provided – thus leaving the local school district to struggle to fund these initiatives.

Research data indicate that technology integration in New Jersey has scored less than average nationally (EPE Research Center, 2008). Effective leadership and communication is vital to the establishment and maintenance of the underlying conditions necessary to support educational environments with technology (Brooks-Young, 2002).

The focus of this study was to investigate the essential factors necessary to integrate an effective educational technology program that improves learning, creativity, higher-level thinking and productivity skills required in the 21st Century. For education leaders, developing an understanding of these essential factors can assist in identifying and implementing effective ways to improve their district's educational technology program.

Purpose of Study

Educational leaders struggle with how to best apply school resources to develop and sustain an effective educational technology program that meets the needs of the 21st-Century learner and increases teaching and learning effectiveness. For example, with so many options available, school leaders must factor in a myriad of constraints, including resources, time, and professional development, to name a few, before making decisions to incorporate and maintain such technologies as a one-to-one laptop initiative, mobile laptop carts, an iPad or iPod touch rollout, desktop computers, wired and/or wireless networks, or some of each.

The purpose of this study was to research the current literature base, in an effort to identify the essential factors needed to sustain an effective contemporary educational technology program, to examine the New Jersey Department of Education's Public School Technology survey which guides technology programs in its public schools, and to explore the degree to which the identified sustainability factors align with New Jersey's Technology Survey.

To accomplish this goal, I inductively examined the significant literature that influences and leads the way for contemporary educational technology integration in schools. I then synthesized, organized and categorized the criteria to determine the essential factors that lead to a sustained and current educational technology program. "For scholarly inquiry, qualitative synthesis is a way to build theory through induction and interpretation (Patton, 2002, p. 500). According to Patton (2002), qualitative synthesis is a method used to identify and extrapolate lessons learned. Researchers are able to "synthesize lessons from research studies and generate generic factors that contribute to program effectiveness" (Patton, 2002, p. 500.). In other words, I explored the essential sustainability factors that guide effective technology integration in schools by inductively analyzing the influential literature and research studies over the last decade.

I was interested in the essential factors that influence educational technology integration at the elementary level in New Jersey schools, kindergarten through grade five.

Significance of the Study

This study, which focused on New Jersey Public School districts at the elementary level, specifically kindergarten through grade five, identified the essential factors necessary to sustain an effective educational technology program through a process of synthesizing and analyzing relevant literature relating to educational technology integration. The essential factors identified will assist boards of education, educators and policymakers in the areas of leadership, management and policy for both long- and short-range planning of their educational programs. At the same time, the essential factors identified in this study may help school leaders to assess and analyze their educational technology program and take appropriate actions about areas in their existing program that can be modified.

For New Jersey education leaders in a time of budget crisis, understanding the essential factors necessary to sustain a successful educational technology program may assist in the development of a district technology budget, as well as in the assignment of appropriate technology leaders and technology staff. At the research level, this study contributes to the knowledge about effectively and financially leading and integrating school educational technology programs.

Guiding Questions

The New Jersey Department of Education's technology assessment tool is the New Jersey Technology Survey. I analyzed and evaluated the New Jersey Technology Survey, at the elementary level – kindergarten through grade five – to interpret the alignment between the survey and the essential factors necessary to sustain an effective educational technology program.

1. What are the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five?
2. How do the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five, align with the 2008 New Jersey Public Schools Technology Survey?
3. Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence suggest about how the presence or absence of technology leadership influences effective technology integration?

Sustainability Factors

The New Jersey Department of Education (NJ DOE) is vigorously moving forward with its 2009 Core Curriculum Content standards. According to the NJ DOE, the revised standards facilitate indepth learning in all content areas through the systematic and transparent integration of 21st-Century knowledge, skills, and themes; global perspectives; cross-content connections; and technology. Consequently, successful implementation of the revised standards requires rethinking of traditional curricular and assessment approaches, as well as the creation of 21st-Century learning environments in which teachers and students work across and beyond traditional disciplines and boundaries as engaged co-learners, critical and creative thinkers, and problem solvers. The expectation that local school districts integrate technology into its educational programs is extremely demanding on student achievement scores and school budgets.

This study examined the alignment between the New Jersey Technology Survey and the essential factors for sustaining a successful educational technology program in New Jersery public schools, with a focus on kindergarten through grade five.

A review of the current literature reveals the following sustainability factors:

1. Leadership
    a. A leadership that inspires a common vision, plan and policies to ensure a comprehensive and broad technology integration that enhances productivity and professional practices.
    b. A leadership that fosters a culture that is supporting and empowering to educators as they integrate technology into the curricular design,

instructional strategies and learning environments that maximize teaching and learning.

2. Funding
    a. The process for acquiring funds that ensures the integration of effective resources, including instructional and administrative applications, software, maintenance, support, professional development, connectivity and infrastructure.
    b. The percent or allotment of the school budget spent to ensure the integration of current and sustained technology-based resources and the elimination of a digital divide.
3. Professional Development
    a. The level of differentiated professional development opportunities provided for staff to build capacity and contribute to the infusion of 21st Century skills into curricula and instructional practices including technology, content, and pedagogical knowledge (Technological Pedagogical Content Knowledge [TPACK]).
    b. The strategies, incentives and time required for staff to receive technology integration through a variety of delivery modes.
4. Technical Support
    a. The established resources and processes available to maintain an effective educational technology program at the district/school level.

b. The personnel, both inhouse and outsourced, available to provide efficient technical support and maintain an effective educational program.

5. Assessments

a. The assessments implemented at the district/school level that measure technology expertise and competencies of specific goals and standards.

b. The techniques used by the school/district to analyze assessment data as a guide for continuous improvement of its educational technology program.

6. Technology Integration

a. The infusion of 21st Century skills in curricula through a process of combining technology resources/skills, pedagogy, and content to enhance learning and instructional practices.

b. The degree to which the most effective technology tools are chosen by staff and students and used to problem solve, analyze, synthesize, obtain and present information.

c. The goals and strategies in place to ensure that students acquire essential technology skills and expertise required by national and international technology curriculum standards.

7. Digital Content

a. The digital content, including software, videos/podcasts, and online resources, that the district/school acquires to support the teaching and learning standards across the curriculum.

b. The degree to which digital content is utilized to support higher-order thinking skills, creativity, expression, collaboration, and to acquire information.

8. Equitable Access to Technology

a. The goals and strategies in place that ensure that all students and staff have equitable access to digital classrooms including Internet, multimedia computers, mobile devices, digital content, online resources, and expertise that provide effective learning experiences for learners.

b. The policies in place that eliminate the digital divide within the school community.

9. Connectivity

a. The degree to which the network equipment and infrastructure, both wired and wireless, supports the school's communication and technology needs.

b. The degree to which connectivity ensures the implementation of the Children's Internet Protection Act (CIPA).

10. Communication/Shared Practices

a. The technology tools available to the school for the purpose of collaborating and communicating important information with the educational community, including: videoconferencing, emergency notification systems, parent portal for student grade book/homework/attendance information, web pages and electronic social networking.

b. The resources and processes in place to network and establish connections with other educational institutions for the purpose of sharing information and practices.

Limitations

The limitations are listed below to clarify points that I had no control over.

First, the study relies on the honesty and accuracy of the school personnel who completed the survey items included in New Jersey 2008 Educational Technology Survey. In most cases, the person completing the survey is the district and/or building technology coordinator or administrator in charge of educational technology.

In addition, the 2008 New Jersey Educational Technology Survey database was sent to me by a secure e-mail from the New Jersey Department of Education's technology supervisor. The database received was in a Microsoft Excel worksheet format. I had no control over the accuracy of the data contained within the database.

However, these limitations are not unlike the challenges encountered with self-report data collections that are reliant on truthful and candid responses by survey participants.

Definition of Terms

Automate - According to Zuboff (1988), automating tasks adds technology onto what users already do.

CEIFA - Comprehensive Education Improvement and Finance Act of 1996 P.L. 1996, c.138: According to the New Jersey Legislature Joint Legislative Committee on Public School Funding Reform (CEIFA) is the current State law on school funding.

Chi Square Crosstab Analysis: According to Johnson and Christensen (2008), Chi- Square is a "statistical test used to determine whether a relationship observed in a contingency table is statistically significant" (p.). It is used to analyze the statistical significance of an association between a categorical outcome and a categorical determining variable.

DFG – District Factor Grouping: "The New Jersey Department of Education introduced the District Factor Grouping system (DFG) in 1975. This system provides a means of ranking school districts in New Jersey by their socioeconomic status (SES)" (N. J. Department of Education: http://www.nj.gov/education/finance/sf/dfgdesc.shtml).

Digital Fabrication: Personal digital fabrication is the automation of a digital design into a physical object through a personal computing fabrication system (Bull et. al., 2010).

EPE Center: According to *Education Week*, "The EPE Research Center is a division of Editorial Projects in Education, the nonprofit organization that publishes *Education Week*. With a staff of full-time researchers, the Research Center conducts annual policy surveys annual policy surveys, collects data, and performs analyses that appear in the Quality Counts and Diplomas Count annual issues of Education Week. The Center also manages the Education Counts database of state policy indicators, releases periodic special reports on a variety of topics, and contributes data and analysis to coverage in Education Week" (http://www.edweek.org/rc/).

ICT – Information and Communications Technologies: The merging of information and communication technology. The merging of telephone networks with computer networks through a single telecommunication line.

Informate: According to Zuboff (1988), "technologies that shift firsthand knowledge to the learner and provide information to anyone with the skills to access and understand it" (p.).

Interactive whiteboard: is a device that connects to a computer and projector and projects the computer desktop onto the whiteboard. The whiteboard's interactivity allows users to touch the board to control the computer desktop. The interactive whiteboard is used in classrooms for students to interact with.

No Child Left Behind (NCLB): According to the Online Encyclopedia Britannica, "No Child Left Behind Act of 2001, U.S. federal law aimed at improving public primary and secondary schools, and thus student performance, via increased accountability for schools, school districts, and states. The act was passed by Congress with bipartisan support in December 2001 and signed into law by President George W. Bush in January 2002. NCLB introduced significant changes in the curriculum of public primary and secondary schools in the United States and dramatically increased federal regulation of state school systems. Under the law, states were required to administer yearly tests of the reading and mathematics" (http://www.britannica.com/EBchecked/topic/965899/).

Student Response System: According to Smarttech technologies, "interactive response systems give instructors instant and accurate insight into student learning. Using the systems' handheld remotes, receiver and powerful assessment software, instructors can pose impromptu questions or prepare tests in advance. Students respond instantly, using the remotes, their own computers or mobile devices, and the software automatically tallies and summarizes results. This instant insight means instructors can adjust their instruction accordingly" (http://www.smarttech.com/us).

TPACK Framework: "Technological Pedagogical Content Knowledge (TPACK) attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge. At the heart of the TPACK framework is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). The TPACK framework builds on Shulman's idea of Pedagogical Content Knowledge" (http://tpack.org/).

CHAPTER II

A REVIEW OF THE LITERATURE

This chapter provides a review of the current literature relating to educational technology, as well as a review of important technology documents such as the current National Educational Technology Plan, the most recent New Jersey Educational Technology Plan, Bergen County Distance Learning Technology Plan and the 2008 New Jersey School Technology Survey.

Although the school technology initiative came directly from the U.S. DOE, the individual states play an important role in assisting schools to build and sustain effective educational technology programs by providing financial and policy support (Bushweller, 2010).

The New Jersey Department of Education expresses its vision for educational technology through its Educational Technology Plan. The current New Jersey Educational Technology Plan provides guidelines for the purpose of assisting educational leaders with the planning of educational technology programs designed to promote students' academic achievement and success using 21st Century skills. Educational technology is deeply embedded in the New Jersey Core Curriculum Content Standards. New Jersey collects information about technology integration in its public schools through its annual Educational Technology Survey.

The New Jersey Education Technology Plan states that effective educational technology programs are grounded by:

1. Professional development
2. Administrative support and vision

3. High speed and well-maintained infrastructure
4. Technology access for administrators, students and staff

A National Center for Education Statistics (NCES) study taken in 2003, entitled Technology in Schools, Suggestions, Tools and Guidelines for Assessing Technology in Elementary and Secondary Education, offered a resource to guide educational technology in schools. The major areas identified for educational leaders who are responsible for assessing the needs and effects of educational technology are:

1. Technology Planning and Policies
2. Finance
3. Equipment and Infrastructure
4. Technology Applications
5. Maintenance and Support
6. Professional Development
7. Technology Integration

Background

The directive to infuse technology and telecommunications networks into education came directly from the Office of the President of the United States, and from the U.S. Department of Education. In February 1996, President Clinton set technology literacy as a national priority, and issued four goals which outlined and defined the process of reaching the goals.

The National Goals were:

- All teachers in the nation will have the training and support they need to help students learn using computers and the information superhighway.

- All teachers and students will have modern multimedia computers in their classrooms.
- Every classroom will be connected to the information superhighway.
- Effective software and online learning resources will be an integral part of every school's curriculum (U. S. Department of Education, 1996).

At that time, President Clinton stated: "We know, purely and simply, that every single child must have access to a computer, must understand it, [and] must have access to good software and good teachers and to the Internet, so that every person will have the opportunity to make the most of his or her own life" (U.S. Department of Education, 1996).

President Clinton's 1996 national goals emphasized: improving capacity through professional development, hiring technology support personnel, incorporating online and distance learning, acquiring modern computer equipment, and building a technology infrastructure for a wide area network with sufficient bandwidth for connectivity to the Internet for all computers in the district. These goals laid the foundation for districts' technology programs and included many of the essential sustainability factors still inherent today.

Fourteen years later, technology integration in schools is still mandated, and is as important. The 2010 National Educational Technology Plan provides five goals for states and their local public school districts. These goals address five essential educational technology sustainability factors:

1. Learning
2. Assessment

3. Teaching
4. Infrastructure
5. Productivity

(U.S. Dept. of Education, 2010).

The plan also calls for the nation to "use the best and most inclusive modern technology to power up the core functions of learning, teaching, assessment and continuous improvement efforts" (U.S. Department of Education, 2010).

According to the current literature, it has been apparent to educational leaders that technological opportunities within classrooms bridge instructional efforts to the world of the 21st Century. Since students are empowered through the use of technology to acquire their own knowledge, they must have the ability to access, analyze, and communicate information effectively. However, according to Cuban (2001), there was no evidence that using information technologies resulted in an increase of student achievement.

According to Brush and Hew (2007), barriers exist districtwide which prevent successful technology programs. As is often the case, districts acquire and install technologies, only to discover existing implementation barriers, such as,

- lack of funding
- ineffective leadership
- poor school structure planning
- inadequate technical support
- inadequate access to available technology
- inadequate time for professional development and implementation

- inadequate time to learn, practice and develop lessons utilizing the new technology.
- inappropriate teacher attitudes and beliefs
- lack of knowledge and skills (Brush and Hew, 2007).

In many cases, these barriers become apparent during the technology integration process (Brush and Hew (2007). According to Wiggins and McTighe, (2005), barriers within the curriculum easily identified when a design process such as Understanding by Design (UBD) is used. This backward design process helps identify desired outcomes.

The sustainability factors required at the elementary level are:

1. Leadership

    a. A leadership that inspires a common vision, plan and policies to ensure a comprehensive and broad technology integration that enhances productivity and professional practices.

    b. A leadership that fosters a culture that is supporting and empowering to educators as they integrate technology into the curricular design, instructional strategies and learning environments that maximize teaching and learning.

2. Funding

    c. The process of acquiring funds that ensures the integration of effective resources, including instructional and administrative applications, software, maintenance, support, professional development, connectivity and infrastructure.

d. The percent or allotment of the school budget spent to ensure the integration of current and sustained technology-based resources and the elimination of a digital divide.

3. Professional Development

c. The level of differentiated professional development opportunities provided for staff to build capacity and contribute to the infusion of 21st Century skills into curricula and instructional practices, including technology, content, and pedagogical knowledge (TPack).

b. The strategies, incentives and time required for staff to receive technology integration training through a variety of delivery modes.

4. Technical Support

a. The established resources and processes available to maintain an effective educational technology program at the district/school level.

b. The personnel, both inhouse and outsourced, available to provide efficient technical support and maintain an effective educational program.

5. Assessments

a. The assessments implemented at the district/school level that measure technology expertise and competencies of specific goals and standards.

b. The techniques used by the school/district to analyze assessment data as a guide for continuous improvement of its educational technology program.

6. Technology Integration

    a. The infusion of 21st Century skills in curricula, through a process of combining technology resources/skills, pedagogy, and content to enhance learning and instructional practices.

    b. The degree to which the most effective technology tools are chosen by staff and students and used to problem solve, analyze, synthesize, obtain and present information.

    c. The goals and strategies in place to ensure that students acquire essential technology skills and expertise required by national and international technology curriculum standards.

7. Digital Content

    a. The digital content, including software, videos/podcasts, and online resources, that the district/school acquires to support the teaching and learning standards across the curriculum.

    b. The degree to which digital content is utilized to support higher-order thinking skills, creativity, expression, collaboration, and to acquire information.

8. Equitable Access to Technology

    a. The goals and strategies in place that ensure that all students and staff have equitable access to digital classrooms, including Internet, multimedia computers, mobile devices, digital content, online resources, and expertise that provide effective learning experiences for learners.

b. The policies in place that eliminate the digital divide within the school community.

9. Connectivity

a. The degree to which the network equipment and infrastructure, both wired and wireless, supports the school's communication and technology needs.

b. The degree to which connectivity ensures the implementation of the Children's Internet Protection Act (CIPA).

10. Communication/Shared Practices

a. The technology tools available to the school for the purpose of collaborating and communicating important information with the educational community, including: videoconferencing, emergency notification systems, parent portal for student grade book/homework/attendance information, web pages and electronic social networking.

b. The resources and processes in place to network and establish connections with other educational institutions for the purpose of sharing information and practices.

Leadership

Leadership is often considered the most significant factor influencing successful technology integration and furthering educational goals. Possessing the latest and greatest technologies is not going to increase student achievement or change the teaching and learning process. It takes a strong instructional and technological fluent leader to model how to effectively and innovatively integrate technology. According to Fullan (2001), there must be a "sense of purpose", effective strategies, accountability, and assessment to the extent that those involved feel a sense of moral purpose. Schools that have energetic and committed leaders have made considerable progress with their educational technology program (Senge, 2000). A district educational technology vision, along with policies that support the vision, that guides the integration process to meet the goals in the technology plan is an important component of the educational technology program (Frazier & Bailey, 2004). Classrooms will improve in a sustainable way if the school as a whole improves. Additionally, schools depend on the district and community for funding and support (Senge, 2000).

Information and communications technologies (ICT) have changed the way we interact, communicate and learn. According to the 2010 National Educational Technology Plan, today's educational leaders face political and technological challenges that involve increasing social equity and opening the core practices of schooling to information technologies. The 2010 National Technology Plan, Transforming Educational Technology Learning Powerered by Technology, states that this type of change will be successful only if we have educational leaders in the federal government, states, districts, and schools that understand the benefits of the new technologies. Within schools, there is a push for emerging technology and a pull of the critical national need to radically improve our education system (U. S. DOE, 2010; NTE, 2010). School leaders must understand that American schools as they exist today are a 19th Century invention trying to cope with a 21st Century society (Collins & Halverson, 2009). Just as educational leaders in the 19th Century developed a public school system that addressed the needs of urban families during the industrial revolution, today's leaders face a challenge that deals with the emergence of new structures for teaching and learning outside of the school. Resistance to change is a major factor inhibiting educational technology programs, especially since technology is inherently imbued with change (Collins, 2009). In order to achieve real change, school leaders must understand the leverage points that can move the system and possess the organizational skills to bring together the resources and skills necessary to create change (Collins and Halverson, 2009).

Funding

It is a challenge for school districts to provide the necessary funding required to acquire the resources and training necessary to prepare New Jersey children to be successful in the 21st Century. At a time when state funding has been drastically cut from many of the nation's school budgets, paying for educational technology and current technologies requires creativity and ingenuity on the part of the districts.

The National PBS Survey (2012) revealed that 63% of teachers indicated that funding is the principal barrier to technology integration. In addition, 70% of teachers in low-income communities cited funding as their greatest obstacle.

Acquiring and maintaining technology requires a financial commitment. Technology budgets should include adequate funding for connectivity, infrastructure, cabling, network equipment, maintenance and support, telecommunications, Internet access, administrative and instructional equipment, applications, new and existing instructional software, service subscriptions, online content services, professional development, and training materials. Frazier and Bailey (2004) developed a sample allocation formula which allocates technology funding: hardware, 35%; software, 15%; contracts and services, 10%; professional development, 20%; support and maintenance, 10%; upgrades and other needs, 10%.

Generally, computer equipment in school districts have a life cycle of five years, although laptops have a shorter replacement cycle than desktops (US DOE, 2003). Therefore, acquiring and maintaining an educational technology program in schools requires allocating and reallocating resources. In order for technology to become an effective tool for the school district, technology budgets must adequately replace obsolete technology (US DOE, 2003). The costs of providing a comprehensive educational technology program that includes the necessary technology implementation components, along with curriculum integration, is significant.

Currently, many school districts are considering how they will implement wireless technology. The costs of integrating and maintaining a wireless network and acquiring mobile hardware such as iPods, iPads, smartphones, e-books, and netbooks, along with the other necessary components, requires creative technology funding. In most cases, ongoing, sustained professional development that focuses on changing teachers' mind-sets and transforming the curriculum to support the wireless environment is necessary (Ash, 2010). According to Ash (2010), school wireless infrastructure expenses, including cabling and access points, will be between $75,000 to $125,000; and wireless upgrading costs should be budgeted every two to three years. President Obama's 2010 American Recovery and Reinvestment Act (ARRA) provided funding for technology such as mobile technologies and wireless infrastructure to school districts.

In the United States, there are three major sources of school funding – federal, state and local funding – with the highest percentage of financial support coming from state sources. The United States spent billions of dollars to integrate technology into schools, through federal, state and local technology initiatives (Trotter, 2007). Under the Federal Communication Commission landmark order of 1997, virtually every k-12 public school district was eligible to receive discounts that ranged from 20 to 90% for telecommunication services, Internet access and internal connections (Trotter, 2007). By 2007, The United State's E-Rate program provided $19 billion for telephone and Internet service to its private and public schools (Trotter, 2007).

The No Child Left Behind Act mandated that both states and school districts provide funding for educational technology professional development. However, President Bush's 2002 endorsement of the No Child Left Behind Act redistributed school technology funding. By 2007, President Bush had reduced the country's k-12 technology funding from more than $700 million to $272 million (Trotter, 2007).

Funding is a huge issue in New Jersey schools, and it requires its public school districts to creatively find ways to leverage their technology. New Jersey's State Constitution states that "Legislature shall provide for the maintenance and support of a thorough and efficient system of free public schools for the instruction of all children between the ages of five and eighteen years, in addition to its moral obligation to ensure that all children, regardless of where they reside, receive the skills and knowledge necessary to succeed as productive members of society" (N. J. Constitution Art. VIII, Sec. 4, Par.1). In addition, "Every child in New Jersey must have an opportunity for an education based on academic standards that satisfy constitutional requirements. Public funds allocated to this purpose must be expended to support schools that are thorough and efficient in delivering those educational standards" (NJ DOE 2008).

The New Jersey School Funding Reform Act of 2008 rescinded the sections of the New Jersey Department of Education (1996) "Comprehensive Educational Improvement and Financing Act of 1996" (CEIFA P.L.1996, c.138), which established the State aid formulas that supported school district programs. It presented a fair, equitable, and predictable funding formula based on student characteristics, regardless of the community in which a student resided.

For the 2010-11 school year, New Jersey's School Funding Reform Act modified funding for public schools. State aid increases were capped at 0% for all districts, and education adequacy aid was held at fiscal 2010 levels (http://www.state.nj.us/ education/stateaid/1011/). District budgets were held at a 2% budget cap. Beginning on July 1, 2011, educational technology funding – Enhancing Education Through Technology (EETT) dollars were eliminated. Therefore, no formula or competitive funding that filters through the NJ DOE to local districts from the federal government were available (NJ DOE, 2011).

Districts may find funding from educational foundations, local businesses, and grants. Collins (2009) identified various funding sources available:

- Grants: U.S. Department of Health and Human Services
- Foundations: The Foundation Center, Purchase order financing and factoring: Applied Capital, Inc.; Gateway Financial Nonprofits: Power Greater DC Region;
- Federal programs such as E-Rate

(Collins, 2009, pp. 76).

Professional Development

The integration of educational technology best practices into the curriculum to enhance teaching and learning is an essential part of professional development.

President Clinton's first pillar (goal) of the Technology Literacy Challenge Fund was to provide all teachers with the training and support they need to help students learn through computers and the information superhighway (Frazier & Bailey, 2004).

Secretary of Education, Arne Duncan (2010) posed an essential question facing the U. S. as it transforms its educational system: "What should learning in the 21st Century look like?" One of the assumptions listed under the Learning Powered by Technology section of the U. S. Department of Education's National Educational Technology Plan 2010, titled Transforming Educational Technology Learning Powerered by Technology indicates that "effective teaching is an outcome of preparing and continually training teachers and leaders" (Duncan 2010, p.5).

The NETP 2010 refers to professional development as an essential component of educational technology integration. The NETP, Transforming American Education: Learning Powered by Technology (2010), states that school districts must "embrace a strategy of innovation, careful implementation, regular evaluation and continuous improvement" (p.3). The NETP's Goal 3 of its Model of Learning Powered by Technology is "Teaching: Prepare and Connect states that educators will be supported individually and in teams by technology that connects them to data, content, resources, expertise and learning experiences that can empower and inspire them to provide more effective teaching"(p.).

In Goal 3.4, the 2010 NETP presented recommendations that districts must provide professional learning experiences powered by technology to educators, in order to increase capacity in digital literacy. This will enable teachers to create compelling assignments that improve learning, assessment and instructional practices (U.S. Department of Education, 2010). According to Goal 3.4, just as technology helps us engage and motivate students to learn, technology should be used in the preparation and ongoing professional development to engage and motivate educators in what and how they teach." This will require synthesizing core principals and adopting best practices for the use of technology in preparing educators" (p).

Professional development for teachers and administrators enhance the fluid integration of technology in the instructional delivery process. Dickard (2003) referred to professional development as one of the technology sustainability challenges. Ideally, educators have consistent access to high-quality professional development that supports teaching and learning and includes skills development, and integration and management strategies. The characteristics of high-quality professional development include ongoing support for a long duration with follow-up support (Martin et al., 2010). In order to incorporate the power of technology in their teaching, it is essential that teachers are technologically proficient (Mouza, 2008). This proficiency includes a teacher's technology skills, but also encompasses critical issues related to pedagogy and attitudes toward technology (Garthwait & Weller, 2005; Mouza, 2008). Gaps in technology understanding influences program and curriculum development decisions and prevents technology from being used in ways that would improve instructional practices and learning outcomes (US DOE, 2010).

Professional development programs are effective when teachers' content and pedagogical content knowledge are enhanced and result in a deep change in pedagogical practices (Lawless & Pellegrino, 2007; Guskey & Yoon, 2009). Generally, professional development that focuses on technology integration focuses on technology skills - and not on technology, pedagogy and content (Yun-Jo & Reigeluth, 2011). However, because of competing school initiatives, funding and time constraints, sustained professional development activities are not always possible. Cuban (2001) found that technology training was rarely offered at suitable times for teachers, and they were frequently expected to attend trainings on their own time. Building skills and confidence levels is difficult when training is offered on a voluntary basis (Brinkerhoff, 2006), since only those teachers interested in the integration process will participate.

Technical Support

For educational technology to reach its potential, technology experts must be available (US DOE, 2003). In order to have sustained educational technology integration, it is essential that educators have convenient, consistent and frequent access to computers for the successful integration of technology into the curriculum, along with adequate technical support. If teachers worry that computers will break during critical times in the classroom and that they will not know how to fix them, they will become resistant to using technology (Fuller, 2000).

In addition, an educational technology lead person is required to lead the educational technology initiative. According to the New Jersey Department of Education, educational technology leaders are an important component of the technology puzzle. As indicated in the New Jersey Facility Guide (2009), educational technology leaders require a vision of what 21st Century teaching and learning environments looks like. The educational technology leader should understand how the infrastructure, hardware, software, procedures, and policies fit together in the district's educational technology program (Frazier & Bailey, 2004).

Technology users require technical support. Ideally, timely technical assistance would be available to assist teachers to use the technology and ensure consistent, reliable functioning of the school's technology resources. Ongoing equipment maintenance and support is necessary for technology to function properly, especially since software updates, enhancements and software fixes are frequently required. As educators rely on the use of technology in their educational programs, districts should employ a technology coordinator who is responsible for the maintenance and support of the district's technology. The technology coordinator's overall responsibility includes maintaining the network infrastructure, Internet access, equipment, applications, help desk, upgrades, data backup and the district's communication system (Frazier and Bailey, 2004). Collins (2009) broke maintenance down into several areas: daily maintenance, weekly or monthly maintenance, semiannual maintenance and annual maintenance. The technology support "rule of thumb" is to have one technician or support person for every 50 computers. However, in most cases, this is not the norm for school districts (US DOE, 2003).

Assessments

Assessments include continuous assessments of the district's technology resources and their instructional effectiveness. Tracking the level of technology integration can be achieved with student and professional development assessments. The assessment data analysis will:

- guide and direct procurement, policy and curriculum decisions
- Inform the effectiveness of applied learning strategies
- Ensure that the vision for technology use maintains the appropriate direction.
- Identify potential problems

As technology is constantly changing, it is imperative that the district assess how effective its technology holdings are. Successful school leaders require, and rely on, accurate information to guide their decision-making process. Some districts decide on the technology to purchase with the funding they have, rather than developing strategies to achieve desired learning outcomes (Basham et al., 2010). Before acquiring technologies, assessments should be made as to whether the technology is connected to the districts goals, and whether the staff has the capacity required to implement them.

The NJ DOE provides Core Curriculum Content Standards (CCCS) in all discipline areas and grade levels that detail what students are expected to know and be able to do. New Jersey has also developed high-stakes assessments in many content areas. The NJ DOE's expectation is that districts will administer New Jersey standardized assessments to students online in the 2014-15 school year (NJ DOE, 2010). Therefore, districts must assess their technology holdings and ensure that they have adequate bandwidth, network infrastructure and current computers to effectively accomplish this task.

"The climate of accountability in the early 21st Century has heightened the awareness of stakeholders at all levels of the education system to the need for data" (Pierson & Borthwick, 2010, pg 126). Student assessment data are a valuable source of information and should be collected, analyzed and used to improve student achievement. The Enhancing Education Through Technology section of The No Child Left Behind Act (NCLB) mandated that United States schools will document the technology literacy of eighth-grade students, beginning with the 2006-2007 school year. The 2010 NETP requires that districts use technology-based assessments that will provide data that will drive "decisions on the basis of what is best for each and every student, and that, in aggregate, will lead to continuous improvement across our entire education system (US DOE, 2010). A draft Technology Literacy Framework was developed by The National Assessment Governing Board (2009) for the purpose of developing the 2012 NAEP computerized assessment which will assess students' technological literacy (Hohlfeld, Ritzhaupt & Barron, 2010).

It is difficult to measure many technology literacy skills using traditional standardized assessment methods (Apple Computer, Inc., 1995; Russell & Higgins, 2003; Wenglinsky, 2005). A learning program that incorporates technology-based formative assessments aimed to provide data regarding student knowledge can be utilized for diagnostic purposes. These learning programs provide useful information for modifying learning conditions and teaching practices (Black & William, 1998). Technology-based assessments that capture students' inputs and collect student-learning data can be designed to continually improve learning outcomes and productivity. Over time, the system learns more about students' abilities and can provide increasingly appropriate support (US DOE), 2010).

Professional development assessments must evaluate how well the professional development (PD) activity prepares teachers to use technology in ways that are aligned with multiple teaching and learning strategies (Pierson & Borthwick, 2010). Assessing the effectiveness of educational technology professional development (ETPD) must go beyond receiving feedback about the level of satisfaction that the participants felt about the workshop presenter. Effective and meaningful assessment of ETPD requires that the PD activities are designed in a way that is consistent with what we know about teaching and learning Pierson & Borthwick, 2010).

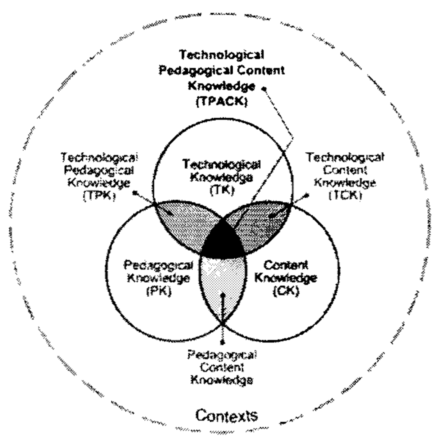
Technology Integration

Technology integration is generally viewed as the process of integrating technology resources for instructional purposes. Technology integration is the process of integrating computers/smart devices, Internet resources, software, network and infrastructure with technology based practices such as collaboration, communication, research, and remote access in a way that is routine, seamless, efficient and effective. Technology integration has the promise to improve student achievement. According to Yun-Jo and Reigeluth (2011), Problem Based Learning, a learner-centered approach, was proven to be significantly more effective than traditional learning in the areas of long-term knowledge retention, teacher and student satisfaction and improvement in performance. However, short-term retention was more effective with traditional instruction. The integration of computer/laptops/smart devices will assist in changing instructional methods from teacher-centered to student-centered. When technology integration is effective and successful, the teacher no longer is the provider of all information but facilitates learning and fosters self-motivation with multifaceted assessments. Technology integration can have positive effects on youngsters' critical thinking, analysis and scientific inquiry when individual learning styles are matched with technology programs (Schmid, Miodrag & DiFrancesco, 2008)

According to the National Puiblic Broadcasting System (PBS) survey (2012), teacher respondents indicated that the top three reasons to integrate technology in the classroom include an increase in student motivation (77%) reinforcing and expanding on content being taught (76%), and responding to a variety of learning styles (76%) (PBS, 2012).

The technology should become an integral part of how the classroom functions, and as accessible as all other classroom tools" (Kozma, 2003). The US DOE (2002) suggested that "technology is a tool or a means to an end goal, but is not the end in itself" (p75). Technology integration is often described as the process of teaching technology and other subject content simultaneously. The U. S. Department of Education and the The International Society for Technology in Schools (2000) National Educational Technology Standards (NETS) for students, states that "effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information and present it professionally"(p.). Such 21st Century skills as as information gathering, communication and problem solving are critical thinking skills.

Technologies such as smartphones and other wireless devices, Internet-connected interactive whiteboards, document cameras and student response systems, which simplify the assessment process and assist in monitoring student achievement, significantly change the teaching and learning process. The "Big Ideas" of what teachers need to know to successfully integrate technology into their teaching has been studied frequently (Wiggins & McTighe, 2005; U.S. DOE, 2010). The TPACK framework depicts how effective technology integration combines three components of the learning environment: content, pedagogy, and technology each of which are influenced by context factors such as culture, socioeconomic status and school organizational structures Thompson & Schmidt, 2010). "Tpack is defined as knowledge that results from teachers' concurrent and interdependent understanding of content, general pedagogy, technology, and learning contexts" (Thompson & Schmidt, 2010, p.). Tpack's complexity explains why integrating technology in k-12 schools has been only minimally successful (Harris, Mishra & Koehler, 2009, pg 213).



http://tpack.org/

Although accomplishing technology literacy through integration is complex and not easy to learn, it is the reason why technology is deemed an important component of our educational system. Technology and knowledge together drive productivity in a knowledge economy. The combination of production, distribution, new knowledge and information contribute to increased productivity and new high-paying jobs (Kozma, 2003)

Digital Content

Digital content is an innovative tool and a resource that supports learning. Digital content – including streaming videos, content, interactive lessons, real-time assessments, and online professional development - provide multiple ways to deliver content, and increase retention and understanding.

The educational implications of digital content are increasingly important and relevant to k-12 curriculum. Just as the information age impacted the 20th Century through personal computers, current and emergent technologies change the way we teach and learn in the 21st Century (Bull et. al., 2010). Flexible environments that encourage communication, collaboration, production, and innovation effectively support student learning of core content knowledge, and help to develop critical 21st Century skills.

E-learning offers digital curriculum as an option for students in kindergarten through grade 12. In many cases, online learning is used as a mixture of digital curriculum and traditional classes (Viadero, 2009). At one time, teachers felt threatened by online education. However, they feel more comfortable with the hybrid model, which consists of a blend of digital curricula and face-to-face learning. Some current research shows that online learning has as good, and sometimes better, student achievement results than classes taught in person. Adaptive intelligence technology, which is often a part of digital content, provides opportunities for students to skip content they have mastered and focus on concepts they need to work on (Viadero, 2009).

Informal learning settings can be leveraged to support highly engaging and effective hands-on and inquiry-based science, technology, engineering and mathematics (STEM). Partnership for 21st Century Skills provides strategies to guide students to develop critical thinking, problem solving, communication, collaboration, creativity and innovation. Children in the United States commonly tend to engage in playing digital games (Lenhart et al., 2008). Digital games engage learners in subject matter, while offering a way to understand difficult concepts and develop problem-solving skills. Through Project Tomorrow 2008 Youth Teach 2 Learn program, high school students teach elementary students science and mathematics lessons. According to Dede, Ketelhut and Nelson (2004), game playing has its greatest impact on the bottom third of students.

A 2008 Schools and Generation Net survey indicated that 75% of K-8 teachers obtain instructional resources from the Internet. However, according to this survey, seven out of ten principals indicated that high-quality online resources do not always align with states' curricular standards. Therefore, many state education agencies offer instructional materials that meet their curriculum standards (Manzo, 2009).

Excitement continues to grow about the potential of emergent technologies. One of these emergent technologies introduced at the 2010 The National Technology Leadership Summit (NTLS) was "digital fabrication." Personal digital fabrication is the automation of a digital design into a physical object through a personal computing fabrication system (Bull et al., 2010). Digital fabrication may soon impact curriculum in K-12 schools. In fact, digital fabrication is an effective way to teach engineering principles.

Equitable Access to Technology

Equitable access to technologies refers to the access that educators and students have to current technologies – computers, network, software, digital content and the Internet. Ideally, access to current technologies, software and the Internet is available to all students and faculty 24/7. Powerful computers provide access to a vast array of educational resources; however, technology initiatives that install technology into classrooms without considering how the contexts for learning need to change are not very effective.

National findings reported by Ansell and Park (2003) indicate that, in 2002, the access to technology in United States averaged 5.6 students per Internet-connected computer. The National Center for Education Statistics (2006) found that, although in 1994 few American classrooms were connected to the Internet, by 2004 Internet access was practically universal. Hightower (2009) indicated that the majority of school districts have Internet-accessible interactive whiteboards and online assessments. The National PBS Learning Media Survey (2012) indicated that fewer than two-thirds of teachers (59%) have access to an interactive whiteboard, while 93% of teachers responded that they believed that interactive whiteboards enrich classroom education. The same survey revealed that 81% of survey respondents believed that tablets enrich classroom education. The survey indicated that teachers' attitudes are universal and transcended grade level and socioeconomic level.

The EPE Center's 2008 technology report indicated that New Jersey schools were slightly behind the nation's scores in the areas of technology access, use, and capacity. New Jersey received a C in the Access to Technology category, a B- in the Use of

Technology category, a C in the Capacity to Use Technology, and an overall grade of C. The average of the 50 states in the U.S. was C+. The same report indicated the following breakdowns:

Technology Counts 2008 Grading Breakdown		
Access to Technology	**New Jersey**	**United States**
Percent of Students With:		
Access to computers - 4^{th} gr.	96%	95%
Access to computers – 8^{th} gr.	90%	83%
Number of students per:		
Instructional computer	3.9	3.8
High Speed Internet connected computer	3.6	3.7
Use of Technology	**Does NJ have policy?**	**# of States with Policy**
Student Standards include technology	Yes	48
State tests students on technology	No*	5
State has established a virtual school	No	25
State offers computer-based assessments	Yes	27
Capacity to Use Technology	**Does NJ have policy?**	**# of States with Policy**
NJ Includes technology in its:		
Teacher standards	Yes	44
Administrator standards	Yes	35
Initial teacher-license requirements	No	19
Initial administrator-license	No	9

requirements		
Teacher-recertification requirements	No	10
Administrator-recertification requirements	No	6
Overall Technology Score	**NJ Points Awarded**	**Ave. State points awarded**
Access to technology	75.0	75.3
Use of technology	79.5	80.1
Capacity to use technology	72.7	75.5
Total Score: Average of 3 categories	75.7	76.9

(Education Week – Technology Counts 2008 NJ State Technology Report p 2-6.)

*The Technology Counts 2009 report indicated that New Jersey began testing eighth-grade students on technology in the 2008-09 school year. The 2009 technology report also stated that it "dropped its overall grades and does not include state-by-state indicators for technology, because updated national and state level data on that topic are no longer available" (Hightower, 2009).

Education Week (2010), shifted from reporting data on a state level to a district level for the 2010.

Technology Counts 2010 Breakdown
(Education Week – Technology Counts 2010 Technology Report)

% of public schools districts with written Acceptable Student Use technology policies	Cell Phones 88%	MP3 players/ IPods 72%	Wikis and/or Blogs 52%	Social Media 76%	E-Mail 84%	Other Internet Use 92%
% of public school districts Offering various technology resources to all or some elementary students	Online Curricula Elementary All – 47% Some – 19%	Distance learning Over Internet Or through video conferencing Elementary All – 30% Some – 22%	Remote access to district software Elementary All – 9% Some – 10%	Email accounts used for schoolwork Elementary All – 11% Some – 21%	Electronic storage space on a server Elementary All – 62% Some – 17%	Online access to library catalog databases Elementary All – 72% Some– 6% Databases All – 60% Some–10%
% of public school districts Offering various technology resources to some or all teachers	Online access to Electronic administrative tools Elementary All – 87% Some – 6%	Online Curricula Elementary All – 66% Some– 14%	Opportunity for distance learning Elementary All – 64% Some– 13%	Online Student Assessments tools Elementary All – 73% Some– 12%	Server Space for Own Web pages Elementary All – 82% Some– 5%	Access to online district resources Elementary All – 92% Some– 3%
% of public school districts Offering various technology resources to some or all teachers	Remote access to school software Elementary All – 44% Some– 11%	Access to course management and delivery software Elementary All – 57% Some– 12%				

According to the Technology Counts 2007 report, a digital divide exists between disadvantaged children and children residing in higher socioeconomic conditions. Although schools have broad access to computers in schools, the majority of disadvantaged students do not have access to current technological resources such as computers, Internet and online tutoring in their homes, leaving underprivileged children further behind than ever (Collins & Halverson, 2009). One way to understand the amount of technology accessible to students in their home is to develop and administer a simple survey, either in class or home, to determine the type of technology resources available.

Portable technology tools such as mobile devices – i.e., smartphones and iPads – can be an affordable way to implement a one-to-one initiative. Mobile devices promote anytime, anywhere learning. According to Manzo (2010), the research on mobile computing is promising, but it is based on small samples. It is hard to tell, at this point, how effective mobile computing devices will be in the classroom learning process until large-scale results are available (Manzo, 2010).

According to the PBS Learning Media Survey (2012), of the 91% of survey respondents that indicated they have access to technology in their classrooms, only 22% said they have the level of technology they need for integration purposes. The survey also revealed that the technology resources utilized in the classroom most often include website (56%), online images (44%), and activities/games (43%) (PBS, 2012).

Connectivity

A school district's computer network with access to the Internet is an indispensable resource that greatly expands the efficient use of resources and supports the educational program. The implementation of an effective technology infrastructure for teaching and learning has been difficult for many districts (Barron et al., 2003). However, access to the district's network, the cloud, and current technologies - including software, computers, and Internet with broadband bandwidth - is essential for students and educators to use technology as a powerful classroom tool. A district's infrastructure that effectively supports the district's connectivity needs includes:

- The percentage of instructional areas that are connected to a network and the Internet.
- The ratio of instructional personnel to Internet-connected computers.
- The ratio of staff (support staff and administrators) to Internet-connected computers.
- The bandwidth available to each building for access to the Internet and videoconferencing.
- The bandwidth available to each computer for access to the Internet and videoconferencing.

U.S. schools have come a long way since President Clinton's 1996 technology challenge for schools to acquire Internet access, connectivity and a network infrastructure (US DOE, 1996). New Jersey's 2003 Educational Technology Plan envisioned statewide interconnectivity, where all students and teachers had Internet access whenever needed and teachers were computer-savvy and able to prepare students with 21st Century technology skills (Trotter, 2007). New Jersey's technology survey indicated that, by 2002, the state had one multimedia computer, on average, for every 4.4 students, and 90% of public classrooms were connected to the Internet (Ansell & Park (2003).

In 2010, the New Jersey Office of Information Technology (OIT), which is the central information technology organization that oversees the state's technology infrastructure received funds from the American Recovery and Reinvestment Act to gather and verify data regarding the type of broadband services (high-speed connection that transmits data, voice, and video over the Internet or a privately owned network) throughout the State. The study used a web-based survey requesting that public institutions - including hospitals, municipalities, libraries and school districts - give information regarding the availability, downstream and upstream speeds, location and technology type of broadband services it has.

In 2010, the focus was on wireless infrastructures. Districts were struggling to install a wireless network infrastructure that supports mobile devices such as smart phones, and other wireless devices (Trotter, 2007).

Arne Duncan stated, in his 2010 National Technology Plan, that "the model of learning calls for using technology to help build the capacity of educators by enabling a shift to a model of connected teaching" (US DOE, 2010, pp. 10). Duncan indicated that "Technology should be leveraged to provide access to more learning resources than are available in classrooms and connections to a wider set of "educators," including teachers, parents, experts, and mentors outside the classroom. It also should be used to enable 24/7 and lifelong learning" (U.S. DOE, 2010).

Goal 4 of the 2010 National Education Technology Plan, "Infrastructure: Access and Enable," states:

4.1 Ensure students and educators have broadband access to the Internet and adequate wireless connectivity both in and out of school. "Adequate" is defined as the ability to use the Internet in school, on the surrounding campus, throughout the community and at home" (p. 17).

4.2 Ensure that every student and educator has at least one Internet access device and appropriate software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school.

4.3 Support the development for use of Open Education (p. 17).

As the technology landscape shifts due to advancements with portable technology tools such as mobile devices for learning, there are many questions that need to be answered. Before school districts adopt a wireless technology initiative, questions and challenges must be addressed. They are: costs for installing a wireless infrastructure, how to manage security, cost and time associated with curriculum integration and the level of training required to train the teachers. Some people believe that use of mobile devices such as iPads and smartphones in the classroom have the potential to make a powerful impact on student achievement; however, there is relatively no proof that this technology will actually raise student achievement levels.

Communication/Shared Practices

The Communication factor includes communication modes such as shared practices, community support and communications sent electronically such as emergency alerts, social networking, videoconferencing, web pages, e-mail, and accessibility to student's online grade books by parents.

As a best practice, educators collaborate and share best practices about essential and exemplary ways to use and integrate technology, both in the classroom and as communication and productivity tools.

According to the 2012 National PBS survey, teachers in affluent communities have greater parental and school board support for tech in the classroom compared to those teaching in low-income communities. Thirty-eight percent vs. 14 percent cited high levels of parental support and 38 percent vs. 21 percent for school board support.

A 21st Century learning setting includes a variety of components that collectively support 21st Century teaching and learning. Technologies have transformed the way people work: interacting with the Internet, writing memos, sending emails, using spreadsheets, statistical analysis programs that analyze problems and visualize data, presentation applications, marketing with digital video applications, and communicating with social networking (Collins & Halverson, 2009). Online learning environments across the world increase opportunities for teaching and learning. Videoconferencing, social networking and blogging allow students and teachers to collaborate and learn from experts around the globe and help prepare them for a global work environment. Social networking is a valuable tool used with online courses and videoconferencing, because it compensates for the lack of in-person contact and interaction while increasing online communication. According to Fadel & Trilling (2009), social networking and other Internet communication tools will allow learners and teachers to share their expert traits and qualities. Social networking in the forms of MySpace, Facebook, and YouTube was first launched in 2005 (Boyd, & Ellison (2007).

Goal 3.2 of the NETP's goals and recommendations indicates the following:

"Leverage Social Networking Technologies and platforms to create communities of practice that provide career-long personal learning opportunities for educators within and across schools, preservice preparation and inservice educational institutions, and professional organizations" (US DOE 2010).

The National Education Technology Plan (2010) states that collaboration and investment is necessary for success. The plan reveals that transforming the United States' educational system will take leadership at all levels of our education system. The plan places emphasis on building partnerships with higher education institutions, private enterprises and not-for-profit entities, and states that building capacity for transformation will require an investment. The American Recovery and Reinvestment Act of 2009 (ARRA) will help achieve the NTEP's vision to accelerate deployment of Internet services to strategic institutions.

The National Education Technology Plan has asked the national research center to focus on grand challenge problems, which they identify as "important problems that require bringing together a community of scientists and researchers to work toward their solution" (US DOE, 2010 pp. xv). The plan indicates that efforts must be coordinated at the national level. The grand challenge problem in education is to establish an integrated end-to-end real-time system for managing learning outcomes and costs across our entire education system" (US DOE, 2010 pp. xv).

Grand Challenge Problems:

1.0 Design and validate an integrated system that provides real-time access to learning experiences tuned to the levels of difficulty and assistance that optimized learning for all learners and that incorporates self-improving features that enable it to become increasingly effective through interaction with learners.

2.0 Design and validate an integrated system for designing and implementing valid, reliable, and cost-effective assessments of complex aspects of 21st Century expertise and competencies across academic disciplines.

3.0 Design and validate an integrated approach for capturing, aggregating, mining and sharing content, student learning and financial data cost-effectively for multiple purposes across many learning platforms and data systems in near real time.

4.0 Identify and validate design principles for efficient and effective online learning systems and combine online and offline learning systems that produce content expertise and competencies equal to, or better than, those produced by the best conventional instruction in half the time and half the cost (US DOE, 2010).

National Technology Plan

President Obama, in his address to Congress on February 24, 2009, presented the nation with a goal: "By 2020, America will once again have the highest proportion of college graduates in the world". The 2010 NETP emphasizes that America needs a public education system that provides all learners with learning experiences that are engaging and empowering. The plan states that schools need to be "incubators of exploration and invention" that foster excellence, which comes from today's information, tools, and technologies. The Plan indicates that we must embrace a strategy of innovation.

The U.S. Department of Education (2010), in its National Educational Technology Plan, stated that "Just as in health, energy, and defense, the federal government has an important role to play in funding and coordinating some of the Research and Development challenges associated with leveraging technology to ensure the maximum opportunity to learn…Implementing the plan depends on the broadband initiatives of the American Recovery and Reinvestment Act of 2009, which are intended to accelerate deployment of Internet services in unserved, underserved, and rural areas and to strategic institutions that are likely to create jobs or provide significant public benefits" (p.). These initiatives are the Broadband Technology Opportunities Program of the Department of Commerce's National Telecommunications and Information Administration, the Rural Development Broadband Program of the Department of Agriculture, and the interagency National Broadband Plan developed by the Federal communications Commission (FCC)" (US DOE, p 6, 2010).

The NETP posed five goals and provided recommended actions to meet the goals:

1.0 Learning: All learners will have engaging and empowering learning experiences, both in and outside of school that prepare them to be active, creative, knowledgeable and ethical participants in our globally networked society.

2.0 Assessment: Our educational system at all levels will leverage the power of technology to measure what matters and use assessment data for continuous improvement.

3.0 Teaching: Professional educators will be supported individually, and in teams by technology that connects them to data, content, resources, expertise, and learning experiences that enable and inspire more effective teaching for all learners.

4.0 Infrastructure: All students and educators will have access to a comprehensive infrastructure for learning when and where they need it.

5.0 Productivity: Our education system at all levels will redesign processes and structures to take advantage of the power to technology to improve learning outcomes while making more efficient use of time, money and staff (US DOE, 2010).

Educational Technology Plan for New Jersey

In March 1999, New Jersey Governor Christine Whitman put forth benchmarks for New Jersey Schools, in an effort to accelerate the delivery of voice, video and data. The benchmarks aimed at expanding the "scope, quality, richness and diversity of curricula in all New Jersey public schools and contribute to redefining of teaching and learning in the state (NJ DOE, 1999). The benchmarks which were to be achieved by 2002 were:

- Educational technology will be fully infused into the school's curriculum and instruction.
- All counties will continue to implement and update technology plans for the implementation of technology.
- All local school districts will continue to implement and update biennially their local technology plans to address core elements of successful school technology activities, including facilities planning, maintenance and

upgrading equipment, implementation strategies, staff development, spending and evaluation plans.

- All teachers will have the skills and knowledge needed to use educational technology as an effective tool to support achievement of core curriculum content standards.
- All classrooms will have fast and reliable Internet access.
- All school districts will have high quality, highly informative, user-friendly websites.
- All districts, schools and classrooms will be connected to high-speed voice, video and data networks.
- All school buildings will have the equipment and infrastructure necessary to provide distance-learning opportunities to all students.
- The multiple distance-learning networks throughout the State will be connected.
- The ratio of multimedia computers to students will be 1-5.
- All teachers will have e-mail.
- All educators and students will have access to effective and engaging software and online resources as an integral part of every school curriculum.
- All school districts will have the equipment necessary to access satellite transmissions.
- All school construction projects will include a backbone distribution system.

- Schools will have educational technology coordinators (NJ DOE, 1999).

The NJ DOE's 1993 technology plan, "Educational Technology in New Jersey: A Plan for Action," required every public school district to implement technology in an "effective and equitable manner". The goals of New Jersey's 2003 Technology Plan stressed that "All students, no matter which district or school they attend, will be able to achieve the Core Curriculum Content Standards because they will have unlimited access to people, to a vast array of curriculum and instruction, and to information and ideas - no matter where they exist" (NJ DOE, 2003). By 2004, the NJ DOE added computer and information literacy standards to its core curriculum content standards (CCCS). New Jersey's 2007 technology plan, which focused on "the role of educational technology in promoting students' academic achievement," included leadership strategies for preparing students for success in the 21st Century. It stated that "the richness of educational technology is grounded by professional development, administrative support and vision, high-speed and well-maintained infrastructure, schoolwide access for administrators, students and staff, all leading to increased academic achievement and global skills."

To assist with the implementation of the state's technology initiative, New Jersey established technology councils at the state and county level. In 1997, a New Jersey State Distance Learning Coordinating Council, led by the NJ DOE, was established and provided five goals:

- Access and equity to new technologies for all students in all schools.
- Professional Development: effective preservice and inservice for teachers.
- Content and software (including online services): selecting and using high quality materials to teach content in a variety of subjects;

- Infrastructure and financing: planning, designing and paying for technology infrastructure to meet current and future, anticipated needs;
- School business operations: taking full advantage of technology to conduct business and operate schools" (Bergen County NJ DOE, 1999).

In 1998, New Jersey's 21 counties established county distance learning coordinating councils, whose charge was to develop a County Distant Learning Technology Plan by April 1999. The county plan provided guidelines for school districts to develop their districtwide technology plans (Bergen County, NJ DOE, 1999).

The goals established for each County Distance Learning Council by the NJ DOE were:

- "Inform the State Distance Learning Coordinating Council of issues and needs identified by local and country distance learning planners;
- Guide the development of local school district plans to insure that they comply with and support the development of a countywide network;
- Facilitate countywide and/or regional shared services and resources with the Educational Technology Training Center activities;
- Coordinate county initiatives with statewide distance learning initiatives; and
- Approve the local education agencies' distance learning network plans" (Bergen County, NJ DOE), 1999)

In 2011, reviewing and approving a local district technology plan remains the responsibility of the State's County Distance Learning Coordination Council. At the local level, district technology plans are developed as required by NJ DOE and submitted to the County Distance Learning Councils for approval. Once approved, these local district technology plans serve as qualifiers to apply for state and national technology funding.

New Jersey's current Technology Plan of 2007 called for school leaders to implement its vision that "All students will be prepared to meet the challenge of a dynamic global society in which they participate, contribute, achieve, and flourish through universal access to people, information and ideas" through four goals. The plan requested that district leaders implement technologies that will meet New Jersey educational technology goals listed below:

Goal 1: All students will be prepared to excel in the community, workplace 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 (NJ DOE, (2007).

New Jersey School Technology Survey Form

The 2008 NJ Public School Technology Survey Form is a survey instrument that collects data through required school and technology contact information and 39 survey items – 36 objective and 3 open-ended - and reports on the following 39 categories by county:

a. Percent of Schools With a Web Site
b. Teacher Skill Levels
c. Schools With District technology Coordinator/Director
d. Schools with a Technology Coordinator
e. Leadership and Support for Technology Integration
f. Supervision and Evaluation of Educators Addresses Effective Use of Technology
g. Address and Evaluate Whether Technology Has Been Effectively Integrated Into the Curriculum
h. Technology Support
i. Online Professional Development
j. Acceptable Use Policy (AUP) for Teachers and Administrators
k. Technology Curriculum and Integration
l. How Teachers Are Using Technology in the Classroom
m. School-Wide Use of Technology
n. Students Participate in Online Courses
o. Acceptable Use Policy (AUP) for Students
p. Video Conferencing

q. Support for Students Who do Not Have Access to Technology at Home

r. Use Bridge Service or Portal to Video Conference

s. Type of Connectivity for Video Conferencing

t. Schools with a LAN, Wireless Network

u. Schools with a WAN

v. Student to Computer Ratio

w. Classrooms with Internet Connections

x. Internet Filtering/Monitoring Software

y. Using Technology Tools in the Curriculum and Learning Activities on a Daily Basis

z. Using the World Wide Web on a Daily Bases As Part of Curriculum

aa. Collaborate in School on Projects on an International Level through Electronic Means

bb. How Students Use Technology in Our Schools

cc. Support the School's Technology Infrastructure.

dd. Open Source Software

ee. Thin clients, One to One Computer Initiative

ff. Obsolete Computers

gg. School-Based Connectivity

hh. Support for Students Who Do Not Have Access to Technology at Home

ii. School Offering Educational Technology Activities/Programs to Families and Community Members

jj. Outreach to Parents Using Electronic Means kk. Describe School's Best Educational Technology Practices and Include a Website Link

ll. Describe How State Educational Technology Unit Can Best Support Your School with Grant Information and Resources; Online Technology Assistance; Sharing Best Practices; Other

mm. Describe or add any information that you feel is valuable for us to know

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The purpose of this study was to examine the significant factors that sustain an effective technology integration program in a public school district, with a focus on the elementary level. A review of the literature revealed that, although schools have spent enormous amounts of funding on computers and related peripherals, technology is often not used as an effective educational tool in the classroom (Bauer & Kenton (2005). Many barriers still exist in schools that prevent effective technology integration (Brush & Hew, 2007).

This study is a replication of Romano's (2005) research study that investigated educational technology sustainability factors and their alignment with New Jersey's 2003 Educational Technology Survey at the high school level. According to Johnson and Christenson (2008), the literature defines *replication* as "research examining the same variables with different people in different ways" (p. 22), and stated that replication provides stronger evidence of the resulting research findings.

This chapter provides an overview of the research design and procedures utilized in this study. I explored the literature and research and synthesized the material, in order to generate new ideas and discover important factors about the phenomenon of sustaining an effective educational technology integration program. Johnson and Christensen (2008) indicated that science and empirical research focus on the value of explanation, and several objectives in the field of educational research exist. One of these objectives is exploration, and is defined as "attempting to generate ideas about a phenomenon"

(Johnson & Christensen, 2008, p. 23). Johnson and Christensen (2008) stated that exploration is an especially important phase of research, because ideas about a phenomenon must be generated in order for research to progress.

This inductive analysis and creative synthesis study were designed to determine the salient factors required by a school district to develop and sustain an effective and contemporary educational technology program. Patton (2002) defined *inductive analysis* and *creative synthesis* as the "immersion in the details and specifics of the data to discover important patterns, themes and interrelationships. Inductive analysis and creative synthesis begins by exploring, then confirming; guided by analytic principles rather than rules; ends with a creative synthesis" (p. 41). According to Creswell (2009, p. 63), the inductive process of building from the data to broad themes to a generalized model or theory includes gathering information; asking open-ended questions; analyzing data to form themes or categories; looking for broad patterns, generalizations or theories from themes and categories; and then creating generalizations or theories from past experience and literature.

In an effort to identify the sustainability factors, I examined the recent literature and research studies, categorizing common themes and trends, and then worked back and forth between the literature and the meaningful and salient categories until a comprehensive set of sustainability factors were established. This design, which utilized analytical principles as a guide to explore the research findings, was best suited to answer research questions which framed the development of this study. The research findings were then synthesized and compared to the New Jersey Department of Education

Technology Survey instrument, in order to describe the existing data under the theoretical framework of "effective sustainability".

This research study focused on the essential factors that result in effective technology integration programs. To accomplish this, I focused on the critical actions required to sustain and advance an educational technology program. In an effort to identify the sustainability factors, I reviewed meta-analyses works of Li and Ma (2010), Cuban (2001), Dickard (2003), Pearson et al.(2005), Pflaum (2004), Schacter (1999), and Sivin-Kachala and Bialo (2000); and the synthesis work of Romano (2005), Guskey and Yoon (2009), as well as the 2007 New Jersey State Educational Technology Plan, The 2003 National Center for Educational Statistics, Brush and Hew (2007), 2010 National Education Technology Plan, and 67 other scholarly literature of the past decade relating to educational technology programs.

I synthesized the studies into themes, then categories, and eventually into sustainability factors by using the following process: Initially, I carefully reviewed the research studies and identified text segments that were meaningful to technology integration. I developed a coding system that identified themes that were emerging in the literature and coded the text with labels that identified the themes that were emerging from the literature. In some instances, codes were linked to other codes, and in other instances codes were not used. I reviewed the studies several times to become familiar with the content and to understand the details of the studies. At times, it was necessary to code a segment of text into more than one category. Within each theme, I identified subtopics. Eventually, I reduced the themes to 10, which were identified in this research study as "sustainability factors".

Guiding Questions

1. What are the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five?
2. How do the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five, align with the 2008 New Jersey Public Schools Technology Survey?
3. Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence suggest about how the presence or absence of technology leadership influences effective technology integration?

Research Design

I examined the research and literature base of the past decade to identify the significant factors that are fundamental to the establishment and sustainability of current, high-quality educational technology programs. The criteria I selected for inclusion were:

1. Studies that were peer-reviewed, empirical studies
2. Research that was assessed as methodologically sound
3. Studies that focused on technology integration in schools, technology education and leadership in a K-12 school setting.

4. Research that involved K-12 teachers, K-12 school districts, higher-education teachers or preservice teachers.
5. Research that involved K-12 students, plus pre-K students, if they were enrolled in the elementary school.
6. Government documents, including national, state, county technology plans and technology surveys
7. Literature reviews, theoretical articles, methodological articles, meta-analyses, and case studies that focused on educational technology and were peer-reviewed.
8. National and/or state educational technology surveys
9. Literature written within the past decade

I carefully reviewed the content and methodology of each study against the criteria list. The studies that fit the criteria and were methodologically sound were utilized for this research study.

Seventy-five studies met the inclusion criteria for this review. Eight were meta-analysis studies which focused on many empirical studies and sixty-seven were from the Journal of Research on Educational Technology. Thirty-three of the articles used a quasi-experimental design, 10 had a pre-experimental design, and two were true experimental studies.

The meta-analysis works were extremely helpful, because they synthesized many studies. Some of the key sources I found most helpful include those listed below broken down by sustainability factors.

Leadership: November (2010), Dickard (2003), Senge (2000), Frazier and Bailey (2004), U. S. Department of Education's National Educational Technology Plan, titled Learning Powered by Technology (2010), Collins and Halverson (2009), Collins (2009), Dawson and Rakes (2003); Tubin and Chen (2001).

Funding: National PBS Survey (2012), Frazier and Bailey (2004), US Department of Education (2010), Ash (2010), U. S. Department of Education's National Educational Technology Plan, titled Learning Powered by Technology (2010), American Recovery and Reinvestment Act (2009), Trotter (2007), No Child Left Behind Act (2002), NJ DOE (2008), NJ DOE (2011), Dickard (2003), Collins (2009)

Professional Development: Frazier and Bailey (2004); Duncan (2010); Dickard (2003); U. S. Department of Education's National Educational Technology Plan, titled Learning Powered by Technology (2010); U.S. Department of Education (2010); Bebell, Russell, and O'Dwyer (2004); Martin and Strother (2010); Mouzza (2008); Garthwait and Weller (2005); U.S. Department of Education (2010); Lawless and Pellegrino (2007); Guskey and Yoon (2009); Brinkerhoff (2006).

Technical Support: NJ Department of Education (2007), Dickard (2003), U.S. Department of Education (2010), Fuller (2000), NJ Department of Education Facility Guide (2009), Frazier and Bailey (2004), Collins (2009).

Assessment: Dickard (2003), Basham et al. (2010), NJ Department of Education (2010), Pierson and Borthwick (2010, The No Child Left Behind Act (2002), U.S. Department of Education (2010), Hohlfeld et al. (2010), Apple Computer, Inc. (1995), Russell & Higgins (2003), Wenglinsky (2005).

Technology Integration: PBS (2012), Kozma (2003), U.S. Department of Education (2000). Wiggins and McTighe (2005), U.S. Department of Education (2010), Thompson and Schmidt (2010), Kozma (2003), Senge (2000), Harris et al. (2009).

Digital Content: Bull et al. (2010); Viadero (2009) National Academy of Engineering (2005), Fadel and Trilling (2009) Lenhart et al. (2008), Evans (2011), Dede et.al, (2004), Manzo (2009) Dickard (2003).

Equitable Access to Technology: US DOE (2010), NJ DOE (2007), The National Center for Education Statistics (2003), Hightower (2009), PBS (2012), Editorial Projects in Education Technology Counts (2008), Edwards, et.al (2007), Collins and Halverson, (2009), Manzo (2010), PBS (2012), Dickard (2003), Cuban (2001).

Connectivity: Barron et al. (2003), New Jersey Department of Education (1996), Trotter (2007), Ansell and Park (2003), US DOE (2010), NJ DOE (2007), Dickard (2003).

Communication/Shared Practices: US DOE (2010), Dickard (2003), PBS (2012), Collins and Halverson (2009), Fadel and Trilling (2009), Boyd and Ellison (2007), American Recovery and Reinvestment Act of 2009 (ARRA).

I then examined the recent literature and research studies, categorizing common themes and trends, and then worked back and forth between the literature and the meaningful and significant categories until a comprehensive set of sustainability factors were established. This was accomplished by first gathering research studies, literature and data; critically evaluating the information looking for themes, patterns, trends; and finally coding the works to a significant factor. I reviewed the research comparing and synthesizing them until the significant factors were identified.

To answer Guiding Question 2, I aligned the sustainability factors to the 2008 New Jersey Educational Technology Survey items, in an effort to describe the survey data using the framework of the sustainability factors.

Along with the State's Educational Technology Plan, the 2008 NJ Technology Survey is the State's instrument that guides effective technology utilization at the local district/school level. It is administered to all school districts each school year. It is designed to lead and assess areas of technology integration.

The alignment of the survey instrument to the factors was an attempt to compare the instrument that the State designed to measure the level of technology integration in its public schools to the sustainability factors that emerged from the literature base. Primarily, I wanted to see if the State's survey instrument was asking relevant technology integration questions based upon current educational technology research.

I aligned the 36 objective questions on the New Jersey School Technology Survey to the 10 sustainability factors using the factor descriptions, and the category the State clustered their questions under. I listed the actual survey items as they appear on the 2008 New Jersey School Technology Survey, identified the group that New Jersey clustered the questions under, and identified the sustainability factor(s) that I assigned to each question.

To answer Guiding Question #3, I used Chi-square statistical analysis because it is suited for analyzing qualitative (nominal/categorical) data. For nominal/categorical data, frequencies and percentages are reported instead of means and standard deviations. To test differences among frequencies, Chi-square statistical analysis is used. The Chi-square statistic is also useful for testing whether there is a statistical relationship between two qualitative or distinct variables. I was interested in testing whether there was a statistically significant relationship between whether the presence or absence of the technology leadership position influences effective technology integration.

Sustainability Factors

1. Leadership
   a. A leadership that inspires a common vision, plan and policies to ensure a comprehensive and broad technology integration that enhances productivity and professional practices.
   b. A leadership that fosters a culture that is supporting and empowering to educators as they integrate technology into the curricular design, instructional strategies and learning environments that maximize teaching and learning.
2. Funding
   a. The process for acquiring funds that ensures the integration of effective resources, including instructional and administrative applications, software, maintenance, support, professional development, connectivity and infrastructure.
   b. The percent or allotment of the school budget spent to ensure the integration of current and sustained technology-based resources and the elimination of a digital divide.
3. Professional Development
   a. The level of differentiated professional development opportunities provided for staff to build capacity and contribute to the infusion of 21st

Century skills into curricula and instructional practices, including technology, content, and pedagogical knowledge (TPack).

b. The strategies, incentives and time required for staff to receive technology integration training through a variety of delivery modes.

4. Technical Support

   a. The established resources and processes available to maintain an effective educational technology program at the district/school level.

   b. The personnel, both inhouse and outsourced, available to provide efficient technical support and maintain an effective educational program.

5. Assessments

   a. The assessments implemented at the district/school level that measure technology expertise and competencies of specific goals and standards.

   b. The techniques used by the school/district to analyze assessment data as a guide for continuous improvement of its educational technology program.

   a. The assessments implemented as the district/school level that measure technology expertise and competencies of specific goals and standards.

6. Technology Integration

   a. The infusion of 21st Century skills in curricula through a process of combining technology resources/skills, pedagogy, and content to enhance learning and instructional practices.

   b. The degree to which the most effective technology tools are chosen by staff and students and used to problem solve, analyze, synthesize, obtain and present information.

c. The goals and strategies in place to ensure that students acquire essential technology skills and expertise required by national and international technology curriculum standards.

7. Digital Content

a. The digital content, including software, videos/podcasts, online podcasts, and online resources that the district/school acquires to support the teaching and learning standards across the curriculum.

b. The degree to which digital content is utilized to support higher-order thinking skills, creativity, expression, collaboration, and to acquire information.

8. Equitable Access to Technology

a. The goals and strategies in place that ensure that all students and staff have equitable access to digital classrooms, including Internet, multimedia computers, mobile devices, digital content, online resources, and expertise that provide effective learning experiences for learners.

b. The policies in place that eliminate the digital divide within the school community.

9. Connectivity

a. The degree to which the network equipment and infrastructure, both wired and wireless, supports the school's communication and technology needs.

b. The degree to which connectivity ensures the implementation of the Children's Internet Protection Act (CIPA).

10. Communication/Shared Practices

a. The technology tools available to the school for the purpose of collaborating and communicating important information with the educational community, including: videoconferencing, emergency notification systems, parent portal for student grade book/homework/attendance information, web pages and electronic social networking.

b. The resources and processes in place to network and establish connections with other educational institutions for the purpose of sharing information and practices.

Instrumentation

"Survey research is a non-experimental research method in which questionnaires or interviews are used to gather information and the goal is to understand the characteristics of a population" (Johnson & Christensen (2008), p. 222). Drawing conclusions from one transitory collection of data provide information about the state of affairs over a longer period of time (Leedy & Omrod, 2005).

The 2008 New Jersey School Technology Survey is a self-reporting data collection instrument that is completed by technology directors or technology coordinators at each school. The questionnaire is created to obtain information about a school's educational technology holdings and program. This survey consists of 39 questions and a demographic section which asks basic information about the school and district, grade levels and contact information for the school principal, media specialist and technology coordinator. Many of the 39 questions have yes/no answers; however, there are a few open-ended questions, some fill-in-the-blank questions, some questions that provide statements that participants consider and respond to from a given list of responses. For example, one question asks "If your school has a website, what kind of information does it provide? (Check all that apply.);" and a set of 16 statements are provided. The 2008 survey has 15 yes/no questions, three open-ended questions, 10 fill-in-the-blank questions, and 11 questions with a list of responses provided to choose from. The 2008 School Technology Survey is written in language that is familiar to technology coordinators and technology leaders, so that they will have the ability to answer all questions. The questionnaire items are written in a clear, precise, and a relatively short manner; and does not use "leading" questions. According to Johnson and Christensen (2008), leading questions contain words that may create a reaction, either positive or negative, and is phrased in a way that suggests a certain answer. The survey does not contain double-barreled questions – questions that combine two or more issues.

I used preexisting data which were collected through the official 2008 New Jersey Educational Technology Survey instrument designed by the New Jersey State Department of Education. Johnson and Christensen (2008) offered the following strengths of archived research data and their utilization in exploratory studies:

- The data have high measurement validity.
- The data are useful for studying trends.
- The data are based on high quality or large probability samples.

The survey instrument is designed for a specific population consisting of technology leaders in New Jersey public schools. Since the New Jersey State Technology Survey is designed to elicit participants' perception of their school and district's educational technology program, training or preparation for survey participants is not necessary.

I consulted with a representative from the New Jersey Department of Education's Office of Educational Technology regarding the 2008 New Jersey Educational Technology Survey. Formal documentation regarding the survey's origin and design is not available. The 2008 Technology Survey is the result of several redesigns from its originally survey which was originally designed by Quality Education Data (QED). The redesigns were necessary in order to effectively assess New Jersey public schools' technology programs alignment with State and Federal goals and consistency with the rapidly changing technology. The 2008 School Technology Survey aligns with the State's most current Technology Plan which is "New Jersey 2007 Education Technology Plan".

The survey instrument is evaluated annually by inhouse New Jersey Department of Education experts. The instrument is redesigned as needed to support the use of technology in New Jersey public schools, to meet State and Federal needs, and to align potential grants to those needs. According to a representative from the New Jersey Department of Education, the normal rate of return is 90-92%.

The 2008 New Jersey State Technology Survey is appropriate to the New Jersey Department of Education's Technology Study, since it aligns with the State's objective to guide the effective and equitable use of technology. The 2008 New Jersey Technology

Survey assessed the following areas: district/school website, leadership, professional development, technology staff, curriculum, integration, infrastructure, equipment, software, technology tools (software, hardware, subscriptions), community partnerships, and the State technology support. The survey and its raw data are available by request from the NJ State Department of Education.

Data Source

I completed a comprehensive content analysis of the peer-reviewed, empirical research studies published over the past decade that related to the integration process for successful educational technology programs. *Content analysis* refers to any "qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings, often called patterns and themes" (Patton , 2002, p. 453). I then synthesized the identified content into 10 sustainability factors that support and maintain successful technology integration programs.

I obtained the raw data used in this study from the New Jersey State Department of Education. The raw data from the 2008 New Jersey State Technology Survey is available by request from the NJ State Department of Education. A New Jersey State representative sent the raw data to me as an attachment in an official e-mail. The data were in the form of a 4.9 megabyte Microsoft Excel spreadsheet. The spreadsheet contained a comprehensive database of survey responses from the 2008 New Jersey School Technology Survey, and included survey data from all New Jersey public schools

Data Collection

Data were collected from 157 elementary schools with grade configurations of pre-kindergarten or kindergarten through grade five. Data were not collected from schools with configurations of pre-kindergarten or kindergarten through grade eight, or from high schools because the survey is not designed to collect data by grade level. Therefore, it would not be possible to collect only elementary level data from schools with configurations that include grades six through twelve. The elementary schools chosen were located in Bergen, Essex, Hudson and Passaic Counties. These specific counties were selected for several reasons. These counties were utilized in the Romano (2005) study, which this study replicates. In addition, these counties include schools from every New Jersey district factor grouping (DFG), and are in close proximity to each other. The New Jersey Department of Education developed the DFG system using demographic variables from census data. According to the New Jersey Department of Education, "The DFG is an indicator of the socioeconomic status of citizens in each district and has been useful for the comparative reporting of test results from New Jersey's statewide testing programs." The following eight DFGs were created based on United States Census data and range from A being the lowest socioeconomic district to J, which is the highest socioeconomic district: A, B, CD, DE, FG, GH, I, J. According to information obtained from the NJ Department of Education relating to DFGs, Bergen, Essex, Hudson and Passaic counties include schools within each DFG.

Data Analysis

I utilized an inductive analysis and creative synthesis method for the data analysis. Patton, (2002, p. 41) described the process as the "immersion in the details and specifics of the data to discover important patterns, themes and interrelationships; begins by exploring, then confirming, guided by analytic principles rather than rules, ends with a creative synthesis".

1. To address the first research question, I thoroughly examined the collection of educational technology literature and research studies that were relevant within the last decade with a focus on exploration and the generation and construction of trends, themes and patterns that were frequently referred to in the literature and research. Patton (2002) described *heuristic research* as a form of phenomenological inquiry "that brings to the fore the personal experience and insights of the researcher" (p. 107). I have been passionately absorbed in technology integration in schools for two decades, and have an intense interest and a depth of experience in the integration process.
2. In an effort to organize and analyze the massive amount of literature and research, I categorized the primary themes and trends that emerged from the relevant works and identified the primary attributes of excellence referred to as the sustainability factors.
3. Once the patterns, themes and theories were established, I went back and forth through the literature base analyzing and confirming the identified categories against the research.
4. I then identified the relevant factors that sustain an effective educational technology program at the elementary level.

In order to analyze Research Question #2, I aligned the items on the New Jersey School Technology Survey to the salient factors necessary to sustain educational technology programs in elementary schools. Several of the items on the survey aligned to more than one sustainability factor. Appendix B provides all Sustainability Factors grouped by NJ School Technology Survey Items.

Chi-square crosstabs analysis was utilized to address Research Question #3, because it supports the descriptive reporting of two categorical variables by computing the sum of the difference between actual and expected values. The Chi-square test is used to analyze qualitative data when one is interested in determining whether there is a relationship between the variables or whether the two variables are independent of each other.

Chi-square crosstabs analyzes categorical data which fits with the New Jersey Technology Survey, since 36 of the 39 questions on the survey consist of Yes/No values. Chi-square crosstabs analysis is used for testing the statistical significance of an association between a categorical outcome. For example, to find an association between the dependent variable, "The school has Internet access" or "the school does not have Internet access" and the independent variable, "the school has a technology coordinator" or "the school does not have a technology coordinator". For this study, the chi-square analysis was completed using the data for the 157 elementary schools.

The chi-square analysis was used to indicate whether an association exists between the presence or absence of technology leadership positions and the effectiveness of an educational technology program when analyzed against dependent variables. I wanted to ascertain the relationship between the sustainability factors which emerged from the literature and their measurement of technology integration and sustainability from the data obtained from the New Jersey School Technology Survey. I entered values for categorical field headings into the Excel spreadsheet. In an effort to eliminate data input errors, the data were imported from the Microsoft Excel database into SPSS. SPSS is a statistical analysis program commonly used by education researchers for statistical analysis, data management and data documentation (Creswell & Clark, 2011). SPSS, which was acquired by IBM in October 2009, is a very powerful software program with many capabilities.

Validity and Reliability

"Objectivity is the essential basis of all research" (Patton, 2002, p. 93). According to Patton (2002), "objectivity is a simultaneous realization of as much reliability and validity as possible; reliability is the degree to which the finding is independent of accidental circumstances of the research and validity is the degree to which the finding is interpreted in a correct way" (p. 94).

Consistent with the research process, and as a way to enhance the validity, I used triangulation to strengthen the study. Denzin (1978b), as cited in Patton (2002), identified methodological triangulation, the use of multiple methods, to study a problem or program. For this study, I used theoretical, interpretive and descriptive validity to strengthen the study. According to Patton (2002), "a rich variety of methodological combinations can be employed to illuminate an inquiry question" (p.). I used methodological triangulation as a way to test for consistency, and relied on a comprehensive theoretical base of literature and research studies and interpretations of the experts in the field who synthesized the literature base analytical perspectives, as well as the descriptive data that resulted from the chi-square analysis of the existing data from the NJ School Technology Survey.

Although documentation relating to the reliability of the State's Technology Survey was not obtainable, I relied on the fact that New Jersey has been conducting the NJ School Technology Survey consistently each year for the past 19 years, and has been reporting growth and areas of needs consistently over the years through official documentation.

Summary

This chapter provided a discussion of the methodology used to answer the three research questions that framed this research study.

This study inductively investigated the significant factors that influence and lead effective technology integration and sustainability in public schools, aligned those factors with the 2008 New Jersey School Technology Survey and used chi-square to ascertain the relationship between the sustainability factors and their measure of technology integration and sustainability obtained from the raw data received from the New Jersey Department of Education relating to the 2008 NJ School Technology Survey.

The raw data from the 2008 NJ School Technology Survey was sent to me by a representative from the New Jersey Department of Education through an official email correspondence. The survey participants were the school/district technology coordinators or directors. The return rate of surveys was between 90 and 92%.

I consider myself a technology expert. I have held the position of technology director in two New Jersey K-12 public school districts in Bergen County for the past 14 years, and have earned an undergraduate degree in the field of Information Systems and a graduate degree in the field of Management Information Systems from the New Jersey Institute of Technology. I am currently a director of curriculum and instruction in a Pre-K–12 school district.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

The purpose of this study was to explore the essential sustainability factors that guide effective technology integration in schools at the elementary level, and to analyze the degree to which the sustainability factors align with the New Jersey Technology Survey. I was interested in the essential factors that influence educational technology integration at the elementary level in New Jersey Schools, kindergarten through grade five.

Specifically, this research addressed the following questions:

1. What are the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five?
2. How do the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level - specifically kindergarten through grade five - align with the 2008 New Jersey Public Schools Technology Survey?
3. Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence suggest about how the presence or absence of technology leadership influences effective technology integration?

This chapter presents findings of the study based upon the analysis of the collected data concerning three areas.

Initially, a content analysis was completed. Content analysis refers to any "qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings, often called patterns and themes" (Patton, 2002, p. 453). I synthesized the identified content into 10 sustainability factors that support and maintain successful technology integration programs.

An analysis of alignment of sustainability factors to the items included in the 2008 New Jersey School Technology Survey was completed. I aligned the items on the 2008 New Jersey School Technology Survey to the sustainability factors necessary to maintain educational technology programs in elementary schools.

I completed a Chi-square crosstab analysis of two leadership items: Item 2 and Item 4.

Item #2, Does your district have a technology coordinator/director?, was analyzed using SPSS against all other items on the 2008 New Jersey School Technology Survey. They were clustered under the 10 sustainability factors and based on data drawn from the 157 elementary schools.

Item #4, Is there someone at your school whose responsibilities include providing leadership and support for teachers in integrating technology into the curriculum?, was analyzed using SPSS against all other items on the 2008 New Jersey School Technology Survey. They were clustered under the 10 sustainability factors and based on data drawn from the 157 elementary schools. The two analyses were then compared.

Findings for Guiding Question Number One

Findings for Guiding Question Number One include the identification of the following 10 sustainability factors that were commonly identified in the contemporary, peer-reviewed empirical studies that I assessed as methodologically sound. The empirical, peer-reviewed studies chosen were those which influence and lead effective educational technology integration and sustainability in public schools in kindergarten through grade five.

1. Leadership
   a. A leadership that inspires a common vision, plan and policies to ensure a comprehensive and broad technology integration that enhances productivity and professional practices.
   b. A leadership that fosters a culture supporting and empowering to educators as they integrate technology into the curricular design, instructional strategies and learning environments that maximize teaching and learning.
2. Funding
   a. The process for acquiring funds that ensures the integration of effective resources, including instructional and administrative applications, software, maintenance, support, professional development, connectivity and infrastructure.
   b. The percent or allotment of the school budget spent to ensure the integration of current and sustained technology-based resources and the elimination of a digital divide.

3. Professional Development

   a. The level of differentiated professional development opportunities provided for staff to build capacity and contribute to the infusion of 21st Century skills into curricula and instructional practices, including technology, content, and pedagogical knowledge.

   b. The strategies, incentives and time required for staff to receive technology integration training through a variety of delivery modes.

4. Technical Support

   a. The established resources and processes available to maintain an effective educational technology program at the district/school level.

   b. The personnel, both inhouse and outsourced, available to provide efficient technical support and maintain an effective educational program.

5. Assessments

   a. The assessments implemented at the district/school level that measure technology expertise and competencies of specific goals and standards.

   b. The techniques used by the school/district to analyze assessment data as a guide for continuous improvement of its educational technology program.

6. Technology Integration

   a. The infusion of 21st Century skills in curricula through a process of combining technology resources/skills, pedagogy, and content to enhance learning and instructional practices.

b. The degree to which the most effective technology tools are chosen by staff and students and used to problem solve, analyze, synthesize, obtain and present information.

c. The goals and strategies in place to ensure that students acquire essential technology skills and expertise required by national and international technology standards

7. Digital Content

a. The digital content, including software, videos/podcasts, and resources that the district/school acquires to support the teaching and learning standards across the curriculum.

b. The degree to which digital content is utilized to support higher-order thinking skills, creativity, expression, collaboration, and to acquire information.

8. Equitable Access to Technology

a. The goals and strategies in place that ensure that all students and staff have equitable access to digital classrooms, including Internet, multimedia computers, mobile devices, digital content, online resources, and expertise that provide effective learning experiences for learners.

b. The policies in place that eliminate the digital divide within the school community.

9. Connectivity

a. The degree to which the network equipment and infrastructure, both wired and wireless, supports the school's communication and technology needs.

b. The degree to which connectivity ensures the implementation of the Children's Internet Protection Act (CIPA).

10. Communication/Shared Practices

a. The technology tools available to the school for the purpose of collaborating and communicating important information with the educational community, including videoconferencing, emergency notification systems, parent portal for student grade book/homework/attendance information, web pages and electronic social networking.

b. The resources and processes in place to network and establish connections with other educational institutions for the purpose of sharing information.

Findings for Guiding Question Number Two

I analyzed the instrument used by the State of New Jersey Department of Education, which was designed to measure how successfully New Jersey Public Schools sustain and integrate technology in its classrooms. I aligned the 36 objective questions on the 2008 New Jersey Technology Survey to the 10 sustainability factors that were synthesized after an extensive content analysis.

The following section lists the actual survey items as they appear on the 2008 New Jersey School Technology Survey, identifies the group that New Jersey clustered the questions under, and identifies the sustainability factor(s) that I assigned to each question.

Item SW-NJ Technology Survey

"If your school has a website, what kind of information does it provide?" That item was grouped under the section, "District Information on the NJ 2008 Technology Survey." I aligned this item with Sustainability Factors 1 - "Leadership, and 6 – "Technology Integration".

Item 1-NJ Technology Survey

"Identify the number of teachers in your school at each skill level in the use of technology in instruction." That item was grouped under the section, "Staff, Supervision, Leadership and Professional Development," on the NJ 2008 Technology Survey. This item was aligned with Sustainability Factors 3 - "Professional Development", and 6 – "Technology Integration".

Item 2:-NJ Technology Survey

"Does your District have a technology coordinator/director?" That item was grouped under the section, "Staff, Supervision, Leadership and Professional Development," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 1 - "Leadership".

Item 3-NJ Technology Survey

Survey item #3 states the following: "Does your school have a technology coordinator?" That item was grouped under the section, "Staff, Supervision, Leadership and Professional Development," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 1 - "Leadership".

Item 4-NJ Technology Survey

"Is there someone at your school whose responsibilities include providing leadership and support for teachers in integrating technology into the curriculum?" That item was grouped under the section, "Staff, Supervision, Leadership and Professional Development," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 1 - "Leadership".

Item 5-NJ Technology Survey

"Who is responsible for the supervision and evaluation of the integration of technology by teachers in your school?" That item was grouped under the section, "Staff, Supervision, Leadership and Professional Development," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factosr 1 - "Leadership" and 5 – "Assessments".

Item 6-NJ Technology Survey

"How does your school address and evaluate if technology has been effectively integrated into the curriculum?" That item was grouped under the section, "Staff, Supervision, Leadership and Professional Development, on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 5 – "Assessments".

Item 7-NJ Technology Survey

"When technology problems (hardware/software) arise, teachers are supported by the following means?: (Check all that apply.)" That item was grouped under the section, “Staff, Supervision, Leadership and Professional Development,” on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 4 - “Technical Support”.

Item 8-NJ Technology Survey

“Do teachers participate in online professional development?” That item was grouped under the section, “Staff, Supervision, Leadership and Professional Development,” on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 3 - “Professional Development”.

Item 9-NJ Technology Survey

“Does your school have an Acceptable Use Policy (AUP) that addresses Internet usage as well as other information technology use by teachers and administrators?” That item was grouped under the section, “Staff, Supervision, Leadership and Professional Development,” on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 1 - “Leadership”.

Item 10-NJ Technology Survey

“Your school has a specific curriculum for computer and information literacy.” “Computer and information literacy is infused through other curricular areas”. That item was grouped under the section, “Staff, Supervision, Leadership and Professional Development,” on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 6 - “Technology Integration”.

Item 11-NJ Technology Survey

“Check the statements that best describe the way most teachers (greater than 50%) use technology in the classroom.” That item was grouped under the section, “Use of Technology By Teachers and Administrators," on the NJ 2008 Technology Survey. That statement yielded results from the New Jersey public schools with grades pre-kindergarten through grade five and kindergarten through grade five that responded to the survey and was identified on the table summary as "How Teachers Are Using Technology in the Classroom". I aligned this item with Sustainability Factor 6 – "Technology Integration".

Item 12-NJ Technology Survey

"Schoolwide use of technology". That item was grouped under the section, "Use of Technology By Teachers and Administrators," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 1- "Leadership", 6 – "Technology Integration", 7 – "Digital Content", 8 - "Equitable Access to Technology", and 9 – "Connectivity",

Item 13-NJ Technology Survey

"Do any students participate in online courses?" That item was grouped under the section, "Use of Technology By Students," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 6 - "Technology Integration" and 7 – "Digital Content".

Item 14-NJ Technology Survey

"Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?" That item was grouped under the section, "Use of Technology By Students," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 1 - "Leadership".

Item 15-NJ Technology Survey

"Do you have the capability and bandwidth to have videoconferencing reach the individual desktops of students?" That item was grouped under the section, "Use of Technology By Students," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 6 – "Technology Integration", 9 – "Connectivity" and 10 - "Communication/Social Networking/Sharing Best Practices".

Item 16-NJ Technology Survey

"How does your school support students who do not have access to technology in their homes?" That item was grouped under the section, "Use of Technology By Students," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 8 - "Equitable Access to Technology".

Item 17-NJ Technology Survey

"Do you need to use a bridging service or portal to connect outside of your district to do a video conference?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 9 - "Connectivity".

Item 18-NJ Technology Survey

"What type of connectivity do you use for your video conferencing?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 9 - "Connectivity".

Item 19-NJ Technology Survey

"Indicate the type of network connectivity available in your school." That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 9 - "Connectivity".

Item 20-NJ Technology Survey

"Is your school connected to other buildings in your district through a WAN (Wide Area Network)?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 9 - "Connectivity".

Item 21-NJ Technology Survey

"Total number of working computers in your school (number includes all working computers regardless of age or location)". That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 8 – "Equitable Access to Technology" and 9 – "Connectivity".

Item 22-NJ Technology Survey

"Indicate the number of rooms and Internet connections for each location." That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 8 – "Equitable Access to Technology" and 9 – "Connectivity".

Item 23-NJ Technology Survey

"Does your school have Internet filtering/monitoring software currently in use?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 9 - "Connectivity".

Item 24-NJ Technology Survey

"Enter the number of students in your school that use technology tools such as desktop or laptop computers, PDAs, probes, etc. in the curriculum and learning activities on a daily basis." That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 6 - "Technology Integration" and 8 "Equitable Access to Technology".

Item 25-NJ Technology Survey

"Enter the number of students in your school that use the Internet on a daily basis as part of the curriculum in school." That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 6 - "Technology Integration", 8 - "Equitable Access to Technology" and 9 – "Connectivity".

Item 26-NJ Technology Survey

"What number of students collaborate in school on projects on an international level through electronic means?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 6 - "Technology Integration", 9 – "Connectivity", and 10 –"Communication/Shared Practices".

Item 27-NJ Technology Survey

"Most students in our school: "Develop or complete grade appropriate assignments using word processing, database, spreadsheet, presentation software, or graphic organizers that support higher order thinking skills as demonstrated in their work", "Have access to engaging software that supports students' curricular activities", "Use digital materials when acquiring information and knowledge", "Have access to distance learning technology to obtain information and collaborate with peers and experts", "Are self-sufficient in their use of individually appropriate technology tools in their classrooms to support their learning styles". That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 6 - "Technology Integration".

Item 28-NJ Technology Survey

"How many technicians on staff support your school's technology infrastructure? (If a technician is assigned part-time to your school, use a decimal such as .5 to indicate half-time or .25 to indicate quarter-time. This would include only staff or technicians who are employed by the school.)" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 4 - "Technical Support".

Item 29-NJ Technology Survey

"Does your school make use of open-source software?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 0 "Connectivity"

Item 30-NJ Technology Survey

"Does your school use thin client servers, one-to-one computer initiative?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 2 - "Funding".

Item 31-NJ Technology Survey

"How many years is a computer in use in instruction before it is considered obsolete?" "How many years is a computer in use before it is replaced?" "How many computers are currently in use but are considered obsolete?" That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 2 - "Funding".

Item 32-NJ Technology Survey

"Indicate the number of administrators, staff and students provided with school-based connectivity for each group within the school building." That item was grouped under the section, "Hardware, Software and Equipment," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 8 – "Equitable Access to Technology", and 9 - "Connectivity".

Item 33-NJ Technology Survey

"Of the students enrolled in your school, please enter the number of students who have and can use the following in their homes: Multimedia computer with Internet access, basic software (word processing, database, spreadsheet, presentation) and a printer." That item was grouped under the section, "Parent and Community Partnerships," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factor 8 - "Equitable Access to Technology".

Item 34-NJ Technology Survey

"Does your school offer educational technology activities/programs to families and community members?" That item was grouped under the section, "Parent and Community Partnerships," on the NJ 2008 Technology Survey.

I aligned this item with Sustainability Factors 8 - "Equitable Access to Technology" and 10 – "Communication/Shared Practices".

Item 35-NJ Technology Survey

"Is outreach to parents accomplished using electronic means (i.e., website, e-mail, announcements, schedules, lunch menus, permissions slips)?" That item was grouped under the section, "Parent and Community Partnerships," on the NJ 2008 Technology Survey. I aligned this item with Sustainability Factors 1 - "Leadership" and 10 – "Communication/Shared Practices".

Findings for Guiding Question Number Three

Based upon Guiding Question Number Three, "Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence suggest about the sustainability factors and their measurement of technology integration and sustainability?", and the evidence found in this research, I analyzed the data using two Leadership survey items from the 2008 NJ Technology Survey. Those Survey Items #2 – "Does your district have a technology coordinator/director and #4 "Is there someone at your school whose responsibilities include providing leadership and support for the teachers in integrating technology into the curriculum" were each cross-tabulated against all other survey items that fell under a Sustainability Factor. I analyzed the data using chi-square crosstabulation outputs of the data from the 157 schools located in Bergen, Essex, Hudson, and Passaic Counties. I evaluated each chi-square crosstabulation and used only statistically significant results based on chi-square value, level of significance using P< .05 and cells with standard residuals that were close to 2, 2 or greater than 2.

Table 1: All Items analyzed against Item #2: "Does your District have a Technology Coordinator/Director?"

New Jersey 2008 School Technology Survey Items Grouped by Sustainability Factors

	Sustainability Factor Description	Factor Item	New Jersey Survey Item (s)
1.	Leadership	1	SW ,2, 3, 4, 5a, 5b, 5c, 5d, 5e, 5f,9, 11, 12, 14, 16, 34, 35
2.	Funding	2	30, 31
3.	Professional Development	3	1, 8, 11
4.	Technical Support	4	7a, 7b, 7c, 7d, 7f, 7g, 7g, 7h, 7i, 7j, 28
5.	Assessment	5	5a, 5b, 5c, 5d, 5e, 5f, 6a-L,
6.	Technology Integration	6	SW,1, 10, 11a, 11b, 11c, 11d, 11e, 11f, 11g, 11h, 12a-l), 13, 15, 24, 25, 26 27
7.	Digital Content	7	12c, 12j, 12l, 13
8.	Equitable Access to Technology	8	12-a,b,j, 13, 16a, 16b, 16c, 16d, 21, 22, 24, 25, 26, 32, 33, 34
9.	Connectivity	9	12-(a, b, k). 15, 17, 18a-f, 19a-b, 20, 21, 22, 23, 25, 26, 29, 30, 32
10.	Communication/ Shared Practices	10	15, 26, 34, 35

Chi-Square Crosstabulation Analyses Grouped by Sustainability Factors

Chi-Square Analysis Using Survey Item #2 – Does you District have a Technology Coordinator/Director?

Leadership

Under Leadership, I found the following five chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

Table 2: SWd*2 School website includes: Homework assignments * Does your district have a technology coordinator/director?

Crosstab

			Does your district have a technology coordinator/director? N	Y	Total
School website includes: Homework assignments	N	Count	1	91	92
		Expected Count	5.9	86.1	92.0
		Std. Residual	-2.0	.5	
	Y	Count	9	56	65
		Expected Count	4.1	60.9	65.0
		Std. Residual	2.4	-.6	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.398[b]	1	.001		
Continuity Correction[a]	8.368	1	.004		
Likelihood Ratio	11.109	1	.001		
Fisher's Exact Test				.002	.002
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.14.

Analysis of the standardized residuals in the four cells in Table 2: SWd*2 revealed that two cells contained a residual that was two or more. The first cell (No/No) contained a negative standardized residual of -2.0. The second cell (Yes/No) contained a positive standardized residual of 2.4. "School website includes hmework assignments" and "Does your district have a technology coordinator/director?" indicated that, proportionately, more schools in districts that did not have a cistrict technology coordinator/director had a school website that included homework assignments than one would expect by chance. In the first cell (No/No), the expected count of 5.9 and the observed count of 1 represented a net difference of -4.9. In the second cell (Yes/No) the expected count of 4.1 and the observed count of 9 represented a net difference of -4.9.

There was a statistically significant difference between the observed and the expected counts for "When technology problems (hardware/software) arise, teachers are supported by technology coordinator" and "Does your district have a technology coordinator/director?" with $\chi 2(1,N=157)=10.398$, $p=.001$.

Table 3 5c * 2 Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school * Does your district have a technology coordinator?

Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school	N	Count	10	88	98
		Expected Count	6.2	91.8	98.0
		Std. Residual	1.5	-.4	
	Y	Count	0	59	59
		Expected Count	3.8	55.2	59.0
		Std. Residual	-1.9	.5	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.430[b]	1	.011		
Continuity Correction[a]	4.833	1	.028		
Likelihood Ratio	9.832	1	.002		
Fisher's Exact Test				.014	.007
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.76.

Analysis of the standardized residuals in the four cells in Table 3: 5c * 2 revealed two cells that contained a residual that was close to 2. The first cell (No/No) contained a positive standardized residual of 1.5. The second cell (Yes/No) contained a negative standardized residual of -1.9. “Academic content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school”, and “Does your district have a technology coordinator/director”, indicated that proportionately more schools in districts that did not have a district technology coordinator had an academic content supervisor responsible for the supervision and evaluation of the integration of technology by teachers in their school than one would expect by chance.

In the first cell (No/No), the expected count of 6.2 and the observed count of 10 represented a net difference of -3.8. In the second cell (Yes/No,) the expected count of 3.8 and the observed count of 0 represented a net difference of 3.8.

There was a statistically significant difference between the observed and the expected counts for "Academic content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Does your district have a technology coordinator/director with $\chi^2(1,N=157)=6.430$, $p=.011$.

Table 4: 5g * 2 Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school * Does your district have a technology coordinator/director? Abbreviated Table

			Does your district have a technology coordinator/director?		
			N	Y	Total
Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school.	Director of Instructional Services	Count	4	0	4
		Expected Count	.3	3.7	4.0
		Std. Residual	7.4	-1.9	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	61.221[a]	19	.000
Likelihood Ratio	26.276	19	.123
N of Valid Cases	157		

a. 38 cells (95.0%) have expected count less than 5. The minimum expected count is .06.

Analysis of the standardized residuals in the four cells in Table 4: 5g*2 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a positive standardized residual of 7.4. "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school: Director of Instructional Services" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director had a Director of Instructional Services that was responsible for the supervision and evaluation of the integration of technology by teachers in their school. The expected count of .3 and the observed count of 4 represented a net difference of -3.70.

There was a statistically significant difference between the observed and the expected counts for "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school?": "Director of instructional services" and "Does district have a technology coordinator/director?"with $\chi 2(1,N=157)=61.221$, $p=.000$.

Table 5: 14 * 2 Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?*Does your district have a technology coordinator/director?

Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students? * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director? N	Y	Total
Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?	N	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.7	-1.0	
	Y	Count	9	147	156
		Expected Count	9.9	146.1	156.0
		Std. Residual	-.3	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.794[b]	1	.000		
Continuity Correction[a]	3.212	1	.073		
Likelihood Ratio	5.604	1	.018		
Fisher's Exact Test				.064	.064
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .06.

Analysis of the standardized residuals in the 4 cells in Table 5: 14*2 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a positive standardized residual of 3.7. "Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have an

Acceptable Use Policy (AUP) than one would expect by chance. The expected count of .1 and the observed count of 1 represented a net difference of -.9.

There was a statistically significant difference between the observed and the expected counts for "Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have an Acceptable Use Policy (AUP) with $\chi2(1,N=157)=14.794$, $p=.000$.

Table 6: 16c * 2 Students who do not have access to technology in their homes can use library with hours open for use outside of normal school hours*Does your district have a technology coordinator/director?

Students who do not have access to technology in their homes can use Library with hours open for use outside of normal school hours * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Students who do not have access to technology in their homes can use Library with hours open for use outside of normal school hours	N	Count	1	62	63
		Expected Count	4.0	59.0	63.0
		Std. Residual	-1.5	.4	
	Y	Count	9	85	94
		Expected Count	6.0	88.0	94.0
		Std. Residual	1.2	-.3	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.035[b]	1	.045		
Continuity Correction[a]	2.807	1	.094		
Likelihood Ratio	4.813	1	.028		
Fisher's Exact Test				.051	.041
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.01.

Analysis of the standardized residuals in the four cells in Table 6: 16c*2 revealed 1 cell that contained a residual that was close to 2. That cell (No/No) contained a negative standardized residual of -1.5. "Students who do not have access to technology in their homes can use library with hours open for use outside of normal school hours" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have an available library for students who do not have access to technology in their homes to use outside of normal school hours" than one would expect by chance. The expected count of 4 and the observed count of 1 represented a net difference of 3.

There was a statistically significant difference between the observed and the expected counts for "Students who do not have access to technology in their homes can use library with hours open for use outside of normal school hours" and "Does district have a technology coordinator/director with $\chi2(1,N=157)=4.035$, $p=.045$.

Funding

I did not find any statistically significant difference between the observed and the expected counts in the crosstabs analyses of New Jersey School Technology Survey items that fell under Sustainability Factor 2: Funding.

Professional Development

I did not find any statistically significant difference between the observed and the expected counts in the crosstabs analyses of New Jersey School Technology Survey items that fell under Sustainability Factor 3: Professional Development.

Technical Support

Under Technical Support, I found the following three Chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

Table 7: 7e *2 When technology problems (hardware/software arise, teachers are supported by Troubleshooters*Does your district have a technology coordinator/director?

When technology problems (hardware/software) arise, teachers are supported by - Troubleshooters * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
When technology problems (hardware/software) arise, teachers are supported by - Troubleshooters	N	Count	10	72	82
		Expected Count	5.2	76.8	82.0
		Std. Residual	2.1	-.5	
	Y	Count	0	75	75
		Expected Count	4.8	70.2	75.0
		Std. Residual	-2.2	.6	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.769[b]	1	.002		
Continuity Correction[a]	7.831	1	.005		
Likelihood Ratio	13.612	1	.000		
Fisher's Exact Test				.002	.001
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.78.

Analysis of the standardized residuals in the four cells in Table 7: 7e*2 revealed that two cells contained a residual that was greater than 2. The first cell (No/No) contained a positive standardized residual of 2.1. The second cell (Yes/No) contained a negative standardized residual of -2.2. "When technology problems (hardware/software) arise, teachers are supported by Help Desk" and "Does district have a technology coordinator/director?" indicated that, proportionately, more schools in districts that did not have a coordinator/director did have a help desk to support technology problems (hardware/software than one would expect by chance. In the first cell (No/No,) the expected count of 5.2 and the observed count of 10 represented a net difference of -4.80. In the second cell (Yes/No), the expected count of 4.8 and the observed count of 0 represented a net difference of 4.8.

There was a statistically significant difference between the observed and the expected counts for "When technology problems (hardware/software) arise, teachers are supported by troubleshooters" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 9.769$, $p=.002$.

Table 8: 7g *2 – When technology problems (hardware/software) arise, teachers are supported by Technology Coordinator*Does your district have a technology coordinator/director?

When technology problems (hardware/software) arise, teachers are supported by - Technology Coordinator * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director? N	Y	Total
When technology problems (hardware/software) arise, teachers are supported by - Technology Coordinator	N	Count	10	29	39
		Expected Count	2.5	36.5	39.0
		Std. Residual	4.8	-1.2	
	Y	Count	0	118	118
		Expected Count	7.5	110.5	118.0
		Std. Residual	-2.7	.7	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	32.315[b]	1	.000		
Continuity Correction[a]	28.158	1	.000		
Likelihood Ratio	30.019	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.48.

Analysis of the standardized residuals in the four cells in Table 8: 7g*2 revealed that two cells contained a residual that was greater than 2. The first cell (No/No) contained a positive standardized residual of 4.8. The second cell (Yes/No) contained a negative standardized residual of -2.7. “When technology problems (hardware/software) arise, teachers are supported by technology coordinator” and “Does district have a technology coordinator/director?” indicated that proportionately more schools in districts that did not have a coordinator/director did not have a technology coordinator to support teachers when technology problems (hardware/software) than one would expect by chance. In the first cell (No/No), the expected count of 2.5 and the observed count of 10 represented a net difference of -7.50. In the second cell (Yes/No), the expected count of 7.5 and the observed count of 0 represented a net difference of -7.5.

There was a statistically significant difference between the observed and the expected counts for "When technology problems (hardware/software) arise, teachers are supported by Technology Coordinator" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 32.315$, $p=.000$.

Table 9: 7j*2 When technology problems (hardware/ software) arise, teachers are supported by - Other * Does your district have a technology coordinator/director?

When technology problems (hardware/software) arise, teachers are supported by - Other * Does your district have a technology coordinator/director? Abbreviated Table

			Does your district have a technology coordinator/director?		T otal
			N	Y	
When technology problems hardware /software) arise, teachers are supported by - Other * Does your district have a technology coordinator/ director?	Director of Instructional Services	Count	4	0	4
		Expected Count	.3	3.7	4.0
		Std. Residual	7.4	-1.9	
	PRINCIPAL	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.7	-1.0	
	Team for Technology Integration	Count	0	3	3
		Expected Count	.2	2.8	3.0
		Std. Residual	-.4	.1	
	Technology Teacher	Count	0	1	1
		Expected Count	.1	.9	1.0
		Std. Residual	-.3	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	76.312[a]	11	.000
Likelihood Ratio	31.804	11	.001
N of Valid Cases	157		

a. 22 cells (91.7%) have expected count less than 5. The minimum expected count is .06.

Analysis of the standardized residuals in the cells in Table 9: 7j*2 revealed that two cells contained a residual that was greater than 2. The first cell (Director of Instructional Services/No) contained a positive standardized residual of 7.4. The second cell (Principal/No) contained a positive standardized residual of 3.7. “When technology problems (hardware/software) arise, teachers are supported by other” and “Does district have a technology coordinator/director?” indicated that proportionately more schools in districts that did not have a coordinator/director did not have another person to support technology problems (hardware/software than one would expect by chance. In the first cell (director of instructional services/No), the expected count of .3 and the observed count of 4 represented a net difference of -3.7. In the second cell (principal/No), the expected count of .1 and the observed count of 1 represented a net difference of -.9.

There was a statistically significant difference between the observed and the expected counts for “When technology problems (hardware/software) arise, teachers are supported by technology coordinator” and “Does district have a technology coordinator/director?” with $\chi 2(1,N=157)= 76.312$, $p=.000$.

Assessment

Under Authentic EdTech Assessment, I found the following three Chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

5c * 2: "Academic content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Does your district have a technology coordinator/director" is noted here as it fell equally under two Sustainability Factors: Leadership and Assessment (see Table 3).

5g*2: "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school?": "Director of Instructional Services" and "Does district have a technology coordinator/director?" is noted here as it fell equally under two Sustainability Factors: Leadership and Assessment (see Table 4).

Table 10: 6j *2 School review relevant research as technology integration evaluation tool* Does district have a technology coordinator/director?

School reviews relevant research as technology integration evaluation tool * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
School reviews relevant research as technology integration evaluation tool	N	Count	10	105	115
		Expected Count	7.3	107.7	115.0
		Std. Residual	1.0	-.3	
	Y	Count	0	42	42
		Expected Count	2.7	39.3	42.0
		Std. Residual	-1.6	.4	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.901[b]	1	.048		
Continuity Correction[a]	2.579	1	.108		
Likelihood Ratio	6.471	1	.011		
Fisher's Exact Test				.063	.040
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.68.

Analysis of the standardized residuals in the four cells in Table 10: 6j*2 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a negative standardized residual of -1.6. "School reviews relevant research as technology integration evaluation" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a technology coordinator/director did review relevant research as technology integration evaluation than one would expect by chance. The expected count of 2.7 and the observed count of 0 represented a net difference of 2.7.

There was a statistically significant difference between the observed and the expected counts for "School reviews relevant research as technology integration evaluation" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)=3.901$, $p=.048$.

Technology Integration

Under Technology Integration through Literacy, I found nine Chi-square analyses that demonstrated sufficient statistically significant evidence. SWd*2 was previously reported as listed below:

Table 11: 10 *2 Your school has a specific curriculum for computer and information literacy* Does district have a technology coordinator/director?

Your school has a specific curriculum for computer and information literacy * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director? N	Y	Total
Your school has a specific curriculum for computer and information literacy	N	Count	1	61	62
		Expected Count	3.9	58.1	62.0
		Std. Residual	-1.5	.4	
	Y	Count	9	86	95
		Expected Count	6.1	88.9	95.0
		Std. Residual	1.2	-.3	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.887[b]	1	.049		
Continuity Correction[a]	2.681	1	.102		
Likelihood Ratio	4.645	1	.031		
Fisher's Exact Test				.090	.044
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.95.

Analysis of the standardized residuals in the 4 cells in Table 11: 10*2 revealed one cell that contained a residual that was close to 2. That cell (No/No) contained a standardized residual of -1.5. “Your school has a specific curriculum for computer and information literacy” and “Does district have a technology coordinator/director?” indicated that proportionately more schools in districts that did not have a coordinator/director did not have specific curriculum for computer and information literacy than one would expect by chance. The expected count of 3.9 and the observed count of 1 represented a net difference of 2.9.

There was a statistically significant difference between the observed and the expected counts for "Your school has a specific curriculum for computer and information literacy" and "Does district have a technology coordinator/director?" with $\chi2(1,N=157)=3.887$, $p=.049$.

Table 12: 11a*2 More than 50% of teachers use tools to enhance productivity (i.e., e-mail, grade books) * Does your district have a technology coordinator/director?

More than 50% of teachers use tools to enhance productivity (i.e., e-mail, grade books) * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		T otal
			N	Y	
More than 50% of teachers use tools to enhance productivity (i.e. e-mail, gradebooks)	N	Count	2	6	8
		Expected Count	.5	7.5	8.0
		Std. Residual	2.1	-.5	
	Y	Count	8	141	149
		Expected Count	9.5	139.5	149.0
		Std. Residual	-.5	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	V alue	df	Asy mp. Sig. (2-sided)	Ex act Sig. (2-sided)	Ex act Sig. (1-sided)
Pearson Chi-Square	4.906(b)	1	.027		
Continuity Correction(a)	2.167	1	.141		
Likelihood Ratio	3.070	1	.080		
Fisher's Exact Test				.083	.083
N of Valid Cases	157				

a Computed only for a 2x2 table

b 1 cells (25.0%) have expected count less than 5. The minimum expected count is .51.

Analysis of the standardized residuals in the four cells in Table 12 11a*2 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a standardized residual of 2.1. "More than 50% of teachers use tools to enhance productivity (i.e. e-mail, grade books)?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have more than 50% of teachers use tools to enhance productivity than one would expect by chance. The expected count of .5 and the observed count of 2 represented a net difference of -1.5.

There was a statistically significant difference between the observed and the expected counts for "More than50% of teachers use tools to enhance productivity (i.e., e-mail, grade books)?" and "Does district have a technology coordinator/director?" with $\chi 2(1, N=157)= 4.906$, $p=.027$.

Table 13: 11b*2 More than 50% of teachers use the Internet to provide student activities that support the curriculum * Does your district have a technology coordinator/director?

More than 50% of teachers use the Internet to provide student activities that support the curriculum * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
More than 50% of teachers use the Internet to provide student activities that support the curriculum	N	Count	2	3	5
		Expected Count	.3	4.7	5.0
		Std. Residual	3.0	-.8	
	Y	Count	8	144	152
		Expected Count	9.7	142.3	152.0
		Std. Residual	-.5	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.794[b]	1	.002		
Continuity Correction[a]	4.836	1	.028		
Likelihood Ratio	5.010	1	.025		
Fisher's Exact Test				.033	.033
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .32.

Analysis of the standardized residuals in the four cells in Table 13: 11b*2 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a standardized residual of 3.0. "More than 50% of teachers use the Internet to provide student activities that support the curriculum" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have more than 50% of teachers use the Internet to provide student activities that support the curriculum than one would expect by chance. The expected count of .3 and the observed count of 2 represented a net difference of -1.7.

There was a statistically significant difference between the observed and the expected counts for "More than 50% of teachers use the Internet to provide student activities that support the curriculum" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 9.794$, $p=.002$.

Table 14: 11c *2 More than 50% of teachers use assessments to evaluate student use of technology in their learning process (i.e., e-portfolios, multimedia projects, NJTAP-IN)*Does your district had a technology coordinator/director?

More than 50% of teachers use assessments to evaluate student use of technology in their learning process (i.e. e-portfolios, multi-media projects, NJTAP-IN) * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
More than 50% of teachers use assessments to evaluate student use of technology in their learning process (i.e. e-portfolios, multi-media projects, NJTAP-IN)	N	Count	10	59	69
		Expected Count	4.4	64.6	69.0
		Std. Residual	2.7	-.7	
	Y	Count	0	88	88
		Expected Count	5.6	82.4	88.0
		Std. Residual	-2.4	.6	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.621[b]	1	.000		
Continuity Correction[a]	11.299	1	.001		
Likelihood Ratio	17.317	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.39.

Analysis of the standardized residuals in the four cells in Table 14: 11c*2 revealed that two cells contained a residual that was greater than 2. The first cell (No/No) contained a positive standardized residual of 2.7. The second cell (Yes/No) contained a negative standardized residual of -2.4. "More than 50% of teachers use assessments to evaluate student use of technology in their learning process (i.e. e-portfolios, multimedia projects, NJTAP-IN)?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have more than 50% of teachers use assessments to evaluate student use of technology in their learning process. In the first cell (No/No), the expected count of 4.4 and the observed count of 10 represented a net difference of -5.60. In the second cell (Yes/No), the expected count of 5.6 and the observed count of 0 represented a net difference of 5.6.

There was a statistically significant difference between the observed and the expected counts for "More than 50% of teachers use assessments to evaluate student use of technology in their learning process (i.e,. e-portfolios, multimedia projects, NJTAP-IN)?" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)=$ 13.621, p=.000.

Table 15: 11d *2 More than 50% of teachers offer opportunities for authentic student centered, project-based learning*Does your district have a technology coordinator/director?

More than 50% of teachers offer opportunities for authentic student centered, project-based learning * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
More than 50% of teachers offer opportunities for authentic student centered, project-based learning	N	Count	9	63	72
		Expected Count	4.6	67.4	72.0
		Std. Residual	2.1	-.5	
	Y	Count	1	84	85
		Expected Count	5.4	79.6	85.0
		Std. Residual	-1.9	.5	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.381[b]	1	.004		
Continuity Correction[a]	6.590	1	.010		
Likelihood Ratio	9.294	1	.002		
Fisher's Exact Test				.006	.004
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.59.

Analysis of the standardized residuals in the four cells in Table 15: 11d*2 revealed 1 cell that contained a residual that was greater than 2. That cell (No/No) contained a standardized residual of 2.1. "More than 50% of teachers offer opportunities for authentic student centered project-based learning?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have more than 50% of teachers offer opportunities for authentic student centered project-based learning than one would expect by chance. The expected count of 4.6 and the observed count of 9 represented a net difference of -4.4.

There was a statistically significant difference between the observed and the expected counts for "More than 50% of teachers offer opportunities for authentic student centered project-based learning?" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 8.381$, $p=.004$.

Table 16: 12f *2 Food service office has access to and uses online information on student lunch eligibility *Does your district have a technology coordinator/director?

Food service office has access to and uses online information on student lunch eligibility * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Food service office has access to and uses online information on student lunch eligibility	N	Count	10	80	90
		Expected Count	5.7	84.3	90.0
		Std. Residual	1.8	-.5	
	Y	Count	0	67	67
		Expected Count	4.3	62.7	67.0
		Std. Residual	-2.1	.5	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.951[b]	1	.005		
Continuity Correction[a]	6.197	1	.013		
Likelihood Ratio	11.633	1	.001		
Fisher's Exact Test				.005	.003
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.27.

Analysis of the standardized residuals in the four cells in Table 16: 12f*2 revealed one cell that contained a residual that was greater than 2. That cell (Yes/No) contained a standardized residual of -2.1. "Food Service office has access to and uses online information on student lunch eligibility" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did have a food service office that has access to and uses online information on student lunch eligibility than one would expect by chance. The expected count of 4.3 and the observed count of 0 represented a net difference of 4.3.

There was a statistically significant difference between the observed and the expected counts for "Food service office has access to and uses online information on student lunch eligibility" and "Does district have a technology coordinator/director?" with $\chi2(1,N=157) = 7.951$, $p=.005$.

Table 17: 12i *2 Library has automated systems for card catalogs*Does your district have a technology coordinator/director?

Library has automated systems for card catalogs * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Library has automated systems for card catalogs	N	Count	6	36	42
		Expected Count	2.7	39.3	42.0
		Std. Residual	2.0	-.5	
	Y	Count	4	111	115
		Expected Count	7.3	107.7	115.0
		Std. Residual	-1.2	.3	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.025[b]	1	.014		
Continuity Correction[a]	4.349	1	.037		
Likelihood Ratio	5.244	1	.022		
Fisher's Exact Test				.023	.023
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.68.

Analysis of the standardized residuals in the four cells in Table 17: 12i*2 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a standardized residual of 2.0. "Library has automated systems for card catalogs" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have a library with an automated systems for card catalogs than one would expect by chance. The expected count of 2.7 and the observed count of 6 represented a net difference of -3.3.

There was a statistically significant difference between the observed and the expected counts for "Library has automated systems for card catalogs" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 6.025$, $p=.014$.

Table 18: 25c*2 56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school*Does your district have a technology coordinator/director?

56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school * Does your district have a technology coordinator/director? Abbreviated Table

			Does your district have a technology coordinator/director?		
			N	Y	Total
56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school * Does your district have a technology coordinator/ director?	48	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.7	-1.0	
	100	Count	4	0	4
		Expected Count	.3	3.7	4.0
		Std. Residual	7.4	-1.9	
	116	Count	0	2	2
		Expected Count	.1	1.9	2.0
		Std. Residual	-.4	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	77.667[a]	45	.002
Likelihood Ratio	35.464	45	.845
N of Valid Cases	157		

a. 90 cells (97.8%) have expected count less than 5. The minimum expected count is .06.

Analysis of the standardized residuals in the cells in Table 18: 25c*2 revealed that two cells contained a residual that was greater than 2. The first cell (48/No) contained a positive standardized residual of 3.7. The second cell (100/No) contained a positive standardized residual of 7.4. "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director had a count of 48 and 100 when responding to the survey question "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school" than one would expect by chance. In the first cell (48/No), the expected count of .1 and the observed count of 1 represented a net difference of -.9. In the second cell (100/No) the expected count of .3 and the observed count of 4 represented a net difference of -3.7.

There was a statistically significant difference between the observed and the expected counts for "56-80% of students in your school use of the Internet on a daily basis as part of the curriculum in school and "Does district have a technology coordinator/director?" with $\chi2(1,N=157)= 77.667$, $p=.002$.

Digital Content

Under Digital Content, I found one Chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

12i*2 "Library has automated system for card catalogs" and "Someone at your school whose responsibilities include leadership and support for teachers integrating tech into curriculum?" had to be mentioned here, as it fell equally under two Sustainability Factors: Technology Integration and Digital Content (see Table 17).

Equitable Access to Technology

Under Equitable Access to Technology, I found five Chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

16c*2 "Libraries with hours open for use outside of normal school hours" and "Someone at your school whose responsibilities include leadership and support for teachers integrating tech into curriculum?" had to be mentioned here, as it fell equally under two Sustainability Factors: Technology Integration and Digital Content (see Table 6).

25c*2 "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school" and "Someone at your school whose responsibilities include leadership and support for teachers integrating tech into curriculum?" had to be mentioned here, as it fell equally under two Sustainability Factors: Technology Integration and access and connectivity (see Table 18).

Table 19: 32a*2 Number of administrators provided with Internet*Does your district have a technology coordinator/director?

# of administrators provided with Internet * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
# of administrators provided with Internet	0	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.7	-1.0	
	1	Count	9	107	116
		Expected Count	7.4	108.6	116.0
		Std. Residual	.6	-.2	
	2	Count	0	32	32
		Expected Count	2.0	30.0	32.0
		Std. Residual	-1.4	.4	
	3	Count	0	6	6
		Expected Count	.4	5.6	6.0
		Std. Residual	-.6	.2	
	4	Count	0	2	2
		Expected Count	.1	1.9	2.0
		Std. Residual	-.4	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.796[a]	4	.001
Likelihood Ratio	11.125	4	.025
N of Valid Cases	157		

a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is .06.

Analysis of the standardized residuals in the four cells in Table 19: 32a*2 revealed one cell that contained a residual that was greater than 2. That cell (0/No) contained a standardized residual of 3.7. "Number of administrators provided with

Internet?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director fell in the 0 range for number of administrators provided with Internet than one would expect by chance. The expected count of .1 and the observed count of 1 represented a net difference of -.9.

There was a statistically significant difference between the observed and the expected counts for "Number of administrators provided with Internet?" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 17.796$, $p=.001$.

Table 20: 32d *2 Number of Instructional Staff provided with email*Does your district have a technology coordinator/director?

# of Instructional staff provided with email * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
# of Instructional staff provided with email	0	Count	1	1	2
		Expected Count	.1	1.9	2.0
		Std. Residual	2.4	-.6	
	1	Count	9	106	115
		Expected Count	7.3	107.7	115.0
		Std. Residual	.6	-.2	
	2	Count	0	32	32
		Expected Count	2.0	30.0	32.0
		Std. Residual	-1.4	.4	
	3	Count	0	6	6
		Expected Count	.4	5.6	6.0
		Std. Residual	-.6	.2	
	4	Count	0	2	2
		Expected Count	.1	1.9	2.0
		Std. Residual	-.4	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.514[a]	4	.049
Likelihood Ratio	8.514	4	.074
N of Valid Cases	157		

a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is .13.

Analysis of the standardized residuals in the cells in Table 20: 32d*2 revealed one cell that contained a residual that was greater than 2. That cell (0/No), contained a standardized residual of 2.4. "Number of instructional staff provided with e-mail?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director fell in the 0 range for number of instructional staff provided with email than one would expect by chance. The expected count of .1 and the observed count of 1 represented a net difference of -.9.

There was a statistically significant difference between the observed and the expected counts for "Number of Instructional staff provided with e-mail?" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 9.514$, $p=.049$.

Table 21: 34b*2 Does your school offer access to e-mail accounts to families and communities*Does your district have a technology coordinator/director?

Does your school offer access to Email accounts to families and communities * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director? N	Does your district have a technology coordinator/director? Y	Total
Does your school offer access to Email accounts to families and communities	N	Count	8	145	153
		Expected Count	9.7	143.3	153.0
		Std. Residual	-.6	.1	
	Y	Count	2	2	4
		Expected Count	.3	3.7	4.0
		Std. Residual	3.5	-.9	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.102[b]	1	.000		
Continuity Correction[a]	6.670	1	.010		
Likelihood Ratio	6.087	1	.014		
Fisher's Exact Test				.021	.021
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .25.

Analysis of the standardized residuals in the four cells in Table 21: 34b*2 revealed one cell that contained a residual that was greater than 2. That cell (Yes/No) contained a standardized residual of 3.5. "Does your school offer access to Email accounts to families and communities?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did offer access to e-mail accounts to families and communities than one would expect by chance. The expected count of .3 and the observed count of 2 represented a net difference of -1.7.

There was a statistically significant difference between the observed and the expected counts for "Does your school offer access to e-mail accounts to families and communities?" and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 13.102, p=.000$.

Connectivity

Under Connectivity, I found six Chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

25C*2 "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school and "Does district have a technology coordinator/director?" must be mentioned here, as it fell equally under three Sustainability Factors: Technology Integration, Equitable Access to Technology, and Connectivity (see Table 18).

32a*2 "Number of administrators provided with Internet?" and "Does district have a technology coordinator/director?" must be mentioned here, as it fell equally under two Sustainability Factors: Equitable Access to Technology, and Connectivity. (see Table 19).

32d*2, "Number of instructional staff provided with e-mail?" and "Does district have a technology coordinator/director?" had to be mentioned here, as it fell equally under two Sustainability Factors: Equitable Access to Technology, and Connectivity (see Table 20).

Table 22: 17*2 Do you need to use a bridging service or portal to connect outside of your district to do a video conference*Does your district have a technology coordinator/director?

Do you need to use a bridging service or portal to connect outside of your district to do a video conference * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Do you need to use a bridging service or portal to connect outside of your district to do a video conference	N	Count	0	92	92
		Expected Count	5.9	86.1	92.0
		Std. Residual	-2.4	.6	
	Y	Count	10	55	65
		Expected Count	4.1	60.9	65.0
		Std. Residual	2.9	-.8	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.117[b]	1	.000		
Continuity Correction[a]	12.647	1	.000		
Likelihood Ratio	18.610	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.14.

Analysis of the standardized residuals in the four cells in Table 22: 17*2 revealed that two cells contained a residual that was greater than 2. The first cell (No/No) contained a negative standardized residual of -2.4. The second cell (Yes/No) contained a positive standardized residual of 2.9. "Do you need to use a bridging service or portal to connect outside of your district to do a video conference and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director need to use a bridging service or portal to connect outside of your district to do a video conference than one would expect by chance. In the first cell (No/No), the expected count of 5.9 and the observed count of 0 represented a net difference of 5.9. In the second cell (Yes/No,) the expected count of 4.1 and the observed count of 10 represented a net difference of -5.90.

There was a statistically significant difference between the observed and the expected counts for "Do you need to use a bridging service or portal to connect outside of your district to do a video conference and "Does district have a technology coordinator/director?" with $\chi2(1,N=157)= 15.117, p=.000$.

Table 23: 18b *2 Type of connectivity used for videoconferencing is IP*Does your district have a technology coordinator/director?

Type of connectivity used for video conferencing is IP * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Type of connectivity used for video conferencing is IP	N	Count	2	85	87
		Expected Count	5.5	81.5	87.0
		Std. Residual	-1.5	.4	
	Y	Count	8	62	70
		Expected Count	4.5	65.5	70.0
		Std. Residual	1.7	-.4	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.421[b]	1	.020		
Continuity Correction[a]	3.999	1	.046		
Likelihood Ratio	5.624	1	.018		
Fisher's Exact Test				.024	.022
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.46.

Analysis of the standardized residuals in the four cells in Table 23: 18b*2 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a standardized residual of 1.7. "Type of Connectivity used for video conferencing is IP?" and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did use IP Connectivity for video conferencing than one would expect by chance. The expected count of 4.5 and the observed count of 8 represented a net difference of -3.5.

There was a statistically significant difference between the observed and the expected counts for "Type of Connectivity used for video conferencing is IP?" and "Does district have a technology coordinator/director?" with $\chi2(1,N=157)= 5.421$, $p=.020$.

Table 24: 19a *2 Your school has a LAN (Local Area Network) *Does your district have a technology coordinator/director?

Your school has a LAN (Local Area Network) * Does your district have a technology coordinator/director? Crosstabulation

			Does your district have a technology coordinator/director?		
			N	Y	Total
Your school has a LAN (Local Area Network)	N	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.7	-1.0	
	Y	Count	9	147	156
		Expected Count	9.9	146.1	156.0
		Std. Residual	-.3	.1	
Total		Count	10	147	157
		Expected Count	10.0	147.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.794[b]	1	.000		
Continuity Correction[a]	3.212	1	.073		
Likelihood Ratio	5.604	1	.018		
Fisher's Exact Test				.064	.064
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .06.

Analysis of the standardized residuals in the four cells in Table 24: 19a*2 revealed 1 cell that contained a residual that was greater than 2. That cell (No/No) contained a standardized residual of 3.7. "Your school has a LAN (local area network)? and "Does district have a technology coordinator/director?" indicated that proportionately more schools in districts that did not have a coordinator/director did not have a LAN in their school than one would expect by chance. The expected count of .1 and the observed count of 1 represented a net difference of -9.

There was a statistically significant difference between the observed and the expected counts for "Your school has a LAN (local area network)? and "Does district have a technology coordinator/director?" with $\chi 2(1,N=157)= 14.794$, $p=.000$.

Communication/Shared Practices

Under Communication/Shared Practices, I found one sufficient statistically significant evidence that showed some difference between observed and expected counts.

34b *2 "Does your school offer access to e-mail accounts to families and communities?" and "Does district have a technology coordinator/director?" had to be mentioned here, as it fell equally under two Sustainability Factors: Equitable Access to Technology and Communication (see Table 23).

Table 25: **All Items analyzed against Item #4: Is there someone in your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?**

New Jersey 2008 School Technology Survey Items Grouped by Sustainability Factors

	Sustainability Factor Description	Factor Item	New Jersey Survey Items)
1.	Leadership	1	SW,2,3,4,5a,5b,5c, 5d, 5e, 5f,9,11,12,14,16,34,35
2.	Funding	2	30,31
3.	Professional Development	3	1,8, 11
4.	Technical Support	4	7a, 7b, 7c, 7d, 7f, 7g, 7g, 7h, 7i, 7j, 28
5.	Assessment	5	5a, 5b,5c,5d,5e,5f, 6a-L,
6.	Technology Integration	6	SW,1, 10,11a,11b,11c, 11d,11e,11f,11g,11h,12a-l), 13,15,24,25,26,27
7.	Digital Content	7	12c. 12j, 12l, 13
8.	Student Access to Technology	8	12-a,b,j, 13, 16a, 16b,16c, 16d,21, 22,24,25,26,32,33,34
9.	Connectivity	9	12-(a, b, k),15,17,18a-f, 19a-b, 20,21,22,23,25,26,30,32
10.	Communication/Social Networking/Sharing Best Practices	10	15, 26, 34, 35

Chi-Square Analysis Using Survey Item #4

Leadership

Under Leadership, I found the following five Chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts:

Table 26: 2 * 4 Does your district have a technology coordinator/director? *Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into the curriculum?

Does your district have a technology coordinator/director? * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Does your district have a technology coordinator/director?	N	Count	7	3	10
		Expected Count	.9	9.1	10.0
		Std. Residual	6.5	-2.0	
	Y	Count	7	140	147
		Expected Count	13.1	133.9	147.0
		Std. Residual	-1.7	.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	49.063[b]	1	.000		
Continuity Correction[a]	41.360	1	.000		
Likelihood Ratio	25.892	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is .89.

Analysis of the standardized residuals in the four cells in Table 26: 2*4 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a positive standardized residual of 6.5. "Does your district have a technology coordinator/director?" and "Is there Someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, did not have a technology coordinator/director than one would expect by chance. The expected count of .9 and the observed count of 7 represented a net difference of -6.1.

There was a statistically significant difference between the observed and the expected counts for "Does your district have a technology coordinator/director?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"with $\chi^2(1,N=157)=49.063$, $p=.000$.

Table 27: 5c * 4 Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school?*Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into the curriculum?

Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school	N	Count	13	85	98
		Expected Count	8.7	89.3	98.0
		Std. Residual	1.4	-.5	
	Y	Count	1	58	59
		Expected Count	5.3	53.7	59.0
		Std. Residual	-1.9	.6	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.070[b]	1	.014		
Continuity Correction[a]	4.729	1	.030		
Likelihood Ratio	7.542	1	.006		
Fisher's Exact Test				.018	.010
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.26.

Analysis of the standardized residuals in the four cells in Table 27: 5c*4 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a standardized residual of -1.9. "Academic content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, did have an cademic content supervisor responsible for the supervision and evaluation of the integration of technology by teachers in your school than one would expect by chance. The expected count of 5.3 and the observed count of 1 represented a net difference of 4.3.

There was a statistically significant difference between the observed and the expected counts for "Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1,N=157)=6.070$, $p=.014$.

Table 28: 5f * 4 Specify who is responsible for supervision and evaluation of the integration of technology by teachers in your school?*Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into the curriculum?

Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

This Pearson Chi-square value was statistically significant and there were two cells that held statistically significant residuals in the "No" column (abbreviated table):

Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		T otal
			N	Y	
Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school	Director of Instructional Services	Count	4	0	4
		Expected Count	.4	3.6	4.0
		Std. Residual	6.1	-1.9	
	Dist. Coordinator of Educational Tech - Eval only	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	54.169[a]	19	.000
Likelihood Ratio	29.699	19	.056
N of Valid Cases	157		

a. 38 cells (95.0%) have expected count less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the cells in Table 28: 5f*4 revealed that two cells contained a residual that was greater than 2. The first cell (Director of Instructional Services/No) contained a positive standardized residual of 6.1. The second cell (District Coordinator of Educational Tech – Eval only/No), contained a positive standardized residual of 6.1. “Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school ” and “Is there Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?” indicated that proportionately more schools in districts that did not have a someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum had a cirector of instructional services who is responsible for the supervision and evaluation of the integration of technology by teachers in their school than one would expect by chance. In the first cell (Director of Instructional Services/No) the expected count of .4 and the observed count of 4 represented a net difference of -3.6. In the second cell (District Coordinator of Educational Tech – Eval only/No) the expected count of .1 and the observed count of 1 represented a net difference of -.9.

There was a statistically significant difference between the observed and the expected counts for “Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Is there Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi2(1,N=157)= 54.169$, p=.000.

Table 29: 12c*4 All instructional and administrative rooms have access to an online attendance system?*Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into the curriculum?

All instructional and administrative rooms have access to an online attendance system * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
All instructional and administrative rooms have access to an online attendance system	N	Count	5	91	96
		Expected Count	8.6	87.4	96.0
		Std. Residual	-1.2	.4	
	Y	Count	9	52	61
		Expected Count	5.4	55.6	61.0
		Std. Residual	1.5	-.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.185[b]	1	.041		
Continuity Correction[a]	3.092	1	.079		
Likelihood Ratio	4.063	1	.044		
Fisher's Exact Test				.049	.041
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.44.

Analysis of the standardized residuals in the four cells in Table 29: 12c*4 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a positive standardized residual of 1.5. “All instructional and administrative rooms have access to an online attendance system” and “Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?” indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum had all instructional and administrative rooms that have access to an online attendance system than one would expect by chance. The expected count of 5.4 and the observed count of 9 represented a net difference of -3.60.

There was a statistically significant difference between the observed and the expected counts for “All instructional and administrative rooms have access to an online attendance system” and “Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?” $\chi^2(1,N=157)=4.185$, $p=.041$.

Table 30: Survey Questions: 34c*4 Does your school offer training to families and community members?*Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into the curriculum?

Does your school offer training to families and community members * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		Total
			N	Y	
Does your school offer training to families and community members	N	Count	13	95	108
		Expected Count	9.6	98.4	108.0
		Std. Residual	1.1	-.3	
	Y	Count	1	48	49
		Expected Count	4.4	44.6	49.0
		Std. Residual	-1.6	.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.147[b]	1	.042		
Continuity Correction[a]	3.007	1	.083		
Likelihood Ratio	5.216	1	.022		
Fisher's Exact Test				.066	.033
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.37.

Analysis of the standardized residuals in the four cells in Table 30: 34c*4 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a negative standardized residual of -1.6. "Does your school offer training to family and community members" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that had offered training to family and community members did not have "someone whose responsibilities included leadership and support for teachers integrating technology into curriculum" than one would expect by chance. The expected count of 4.4 and the observed count of 1 represented a net difference of 3.40.

There was a statistically significant difference between the observed and the expected counts for "Does your school offer training to family and community members" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"with $\chi^2(1,N=157)=4.147$, $p=.042$.

Funding

I did not find any statistically significant difference between the observed and the expected counts in the crosstabs analyses of New Jersey School Technology Survey items that fell under Sustainability Factor 2: Funding.

Professional Development

Under Professional Development, I found the following two chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts:

Table 31: Survey Questions: 1a*4 Number of teachers in your school at beginner skill level * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

This Pearson Chi-square value was statistically significant and there were four cells that held statistically significant residuals in the "No" column (abbreviated table):

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Number of teachers in your school at beginner skill level	5	Count	5	13	18
		Expected Count	1.6	16.4	18.0
		Std. Residual	2.7	-.8	
	6	Count	3	2	5
		Expected Count	.4	4.6	5.0
		Std. Residual	3.8	-1.2	
	13	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
	60	Count	1	1	2
		Expected Count	.2	1.8	2.0
		Std. Residual	1.9	-.6	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48.802(a)	25	.003
Likelihood Ratio	37.612	25	.050
N of Valid Cases	157		

a 43 cells (82.7%) have expected count less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the cells in Table 31: 1a*4 revealed that four cells contained a residual that was greater than or close to 2. The first cell (5/No) contained a positive standardized residual of 2.7. The second cell (6/No) contained a positive standardized residual of 3.8. The third cell (13/No) contained a positive standardized residual of 3.1. The fourth cell (60/No) contained a positive standardized residual of 1.9. "Percentage of teachers in your school at each skill level in the use of technology in instruction: Beginner" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone at their school whose responsibilities included leadership and support for teachers integrating technology into curriculum fell under the 5, 6, 13, and 60 count than one would expect by chance. In the first cell (5/No), the expected count of 1.6 and the observed count of 5 represented a net difference of -3.4. In the second cell (6/No), The expected count of .4 and the observed count of 3 represented a net difference of -2.6. In the third cell (13/No), the expected count of 1.1 and the observed count of 1 represented a net difference of -.9. In the fourth cell (60/No), the expected count of .2 and the observed count of 1 represented a net difference of -.8.

There was a statistically significant difference between the observed and the expected counts for "Percentage of teachers in your school at each skill level in the use of technology in instruction: Beginner" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1, N=157)=48.802, p=.003$.

Table 32: 1b*4 Number of teachers in your school at intermediate skill level * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

This Pearson Chi-square value was statistically significant and there were two cells that held statistically significant residuals in the "No" column (abbreviated table):

Number of teachers in your school at intermediate skill level * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		T otal
			N	Y	
Number of teachers in your school at intermediate skill level * Is there someone at your school whose responsibil-ities include leadership and support for teachers integrating technology into curriculum?	5	Count	5	3	8
		Expected Count	.7	7.3	8.0
		Std. Residual	5.1	-1.6	
	47	Count	1	I	2
		Expected Count	.2	1.8	2.0
		Std. Residual	1.9	-.6	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	V alue	df	Asy mp. Sig. (2-sided)
Pearson Chi-Square	57.227(a)	40	.038
Likelihood Ratio	43.840	40	.312
N of Valid Cases	157		

a 73 cells (89.0%) have expected count less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the four cells in Table 32: 1b*4 revealed that two cells contained a residuals that was greater than or close to 2. The first cell

(5/No) contained a positive standardized residual of 5.1. The second cell (47/No) contained a positive standardized residual of 1.9. "Percentage of teachers in your school at each skill level in the use of technology in instruction: Intermediate" and "Is there Is there Someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone at their school whose responsibilities included leadership and support for teachers integrating technology into curriculum had counts of 5 and 47 than one would expect by chance. In the first cell (5/No), the expected count of .7 and the observed count of 5 represented a net difference of -4.3. In the second cell (47/No,) the expected count of .2 and the observed count of 1 represented a net difference of -.8.

There was a statistically significant difference between the observed and the expected counts for "Percentage of teachers in your school at each skill level in the use of technology in instruction: Intermediate" and "Is there Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi 2(1,N=157)=57.227$, $p=.038$.

Technical Support

Under Technical Support, I found the following three chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

Table 33: 7g*4 When technology problems (hardware/software arise, teachers are supported by technology coordinator Number * Is there someone at your school

whose responsibilities include leadership and support for teachers integrating technology into curriculum?

When technology problems (hardware/software) arise, teachers are supported by - echnology Coordinator * Is there someone at your school whose responsibilities includ leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
When technology problems (hardware/software) arise, teachers are supported by - Technology Coordinator	N	Count	8	31	39
		Expected Count	3.5	35.5	39.0
		Std. Residual	2.4	-.8	
	Y	Count	6	112	118
		Expected Count	10.5	107.5	118.0
		Std. Residual	-1.4	.4	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.590[b]	1	.003		
Continuity Correction[a]	6.796	1	.009		
Likelihood Ratio	7.378	1	.007		
Fisher's Exact Test				.007	.007
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.48.

Analysis of the standardized residuals in the four cells in Table 33: 7g*4 revealed one cell that contained a residual that was greater than 2. That cell (No/No) contained a positive standardized residual of 2.4. "When technology problems (hardware/software arise, teachers are supported by technology coordinator?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, were not supported by a technology coordinator when technology problems (hardware/software) arise, than one would expect by chance. The expected count of 3.5 and the observed count of 8 represented a net difference of -4.5.

There was a statistically significant difference between the observed and the expected counts for "When technology problems (hardware/software arise, teachers are supported by technology coordinator?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1,N=157)=8.590$, p=.003.

Table 34: 7j*4 When technology problems (hardware/software) arise, teachers are supported by - Other * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
When technology problems (hardware/software) arise, teachers are supported by – Other	Director of Instructional Services	Count	4	0	4
		Expected Count	.4	3.6	4.0
		Std. Residual	6.1	-1.9	
	no support	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	53.689[a]	11	.000
Likelihood Ratio	28.541	11	.003
N of Valid Cases	157		

a. 22 cells (91.7%) have expected count less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the cells in Table 34: 7j*4 revealed two cells that contained residuals that were greater than 2. Those cells which represented schools that answered no to survey item 7j, and fell under the director of instructional services" and "no support" categories and contained positive standardized residuals of 6.1 and 3.1. "When technology problems (hardware/software) arise, teachers are supported by others?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone at their school whose responsibilities included leadership and support for teachers integrating technology into curriculum fell under the director of instructional services" and "no support" categories than one would expect by chance. In the director of instructional services category, the expected count of .4 and the observed count of 4 represented a net difference of -3.60. In the "no support category", the expected count of .1 and the observed count of 1 represented a net difference of -.90.

There was a statistically significant difference between the observed and the expected counts for "When technology problems (hardware/software arise, teachers are supported by others?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1,N=157)=53.689$, p=.000.

Table 35: 28*4 How many technicians on staff support your school's technology infrastructure? * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

This Pearson chi-square value was statistically significant and there were two cells that held statistically significant residuals in the "No" column (abbreviated table):

How many technicians on staff support your school's technology infrastructure? * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
How many technicians on staff support your school's technology infrastructure	.00	Count	6	8	14
		Expected Count	1.2	12.8	14.0
		Std. Residual	4.3	-1.3	
	.01	Count	1	1	2
		Expected Count	.2	1.8	2.0
		Std. Residual	1.9	-.6	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.810(a)	20	.012
Likelihood Ratio	31.448	20	.050
N of Valid Cases	157		

a. 34 cells (81.0%) have an expected count of less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the cells in Table 35: 28*4 revealed two cells that contained residuals that were greater than or close to 2. The first cell (.00/No) contained a positive standardized residual of 4.3. The second cell (.01/No) contained a positive standardized residual of 1.9. "How many technicians on staff support your school's technology infrastructure" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone at their school whose responsibilities included leadership and support for teachers integrating technology into curriculum had counts of .00 and .01 technicians on staff to support their school's infrastructure than one would expect by chance. In the first cell (.00/No), the expected count of 1.2 and the observed count of 6 represented a net difference of -4.8. In the second cell (.01/No), the expected count of .2 and the observed count of 1 represented a net difference of -.8.

There was a statistically significant difference between the observed and the expected counts for "How many technicians on staff support your school's technology infrastructure" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1,N=157)=36.810$, $p=.012$.

Assessment

Under Assessment, I found the following chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

Table 36: 5g*4 Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

This Pearson Chi-square value was statistically significant and there were two cells that held statistically significant residuals in the "No" column (abbreviated table):

Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school	Director of Instructional Services	Count	4	0	4
		Expected Count	.4	3.6	4.0
		Std. Residual	6.1	-1.9	
	Dist. Coordinator of Educational Tech - Eval only	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	54.169[a]	19	.000
Likelihood Ratio	29.699	19	.056
N of Valid Cases	157		

a. 38 cells (95.0%) have expected count less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the two cells in Table 36: 5g*4 revealed two cells that contained a residual that was over two. The first cell (Director of

Instructional Services/No) contained a positive standardized residual of 6.1. The second cell (District Coordinator of Educational Tech – Eval only/No) contained a positive standardized residual of 3.1. "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, had a Director of Instructional Services and a Dist. Coordinator of Educational Tech-Eval only than one would expect by chance. In the first cell (Director of Instructional Services/No), the expected count of .4 and the observed count of 4 represented a net difference of -3.6. In the second cell (District Coordinator of Educational Tech – Eval only/No), the expected count of .1 and the observed count of 1 represented a net difference of -9.

There was a statistically significant difference between the observed and the expected counts for "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1,N=157)=54.169$, $p=.000$.

Technology Integration

Under Technology Integration through Literacy, I found five chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

1a*4 "Number of teachers in your school at beginner skill level * Is there Is there Someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" is noted here as it fell equally under two Sustainability Factors: Professional Development and Technology Integration (see Table 31).

1b*4 "Number of teachers in your school at intermediate skill level * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" is noted here, as it fell equally under two Sustainability Factors: Professional Development and Technology Integration (see Table 32).

Table 37: 12c*4 All instructional and administrative rooms have access to an online attendance system * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

All instructional and administrative rooms have access to an online attendance system * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
All instructional and administrative rooms have access to an online attendance system	N	Count	5	91	96
		Expected Count	8.6	87.4	96.0
		Std. Residual	-1.2	.4	
	Y	Count	9	52	61
		Expected Count	5.4	55.6	61.0
		Std. Residual	1.5	-.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.185[b]	1	.041		
Continuity Correction[a]	3.092	1	.079		
Likelihood Ratio	4.063	1	.044		
Fisher's Exact Test				.049	.041
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.44.

Analysis of the standardized residuals in the four cells in Table 37: 12c*4 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a positive standardized residual of 1.5. “All Instructional and Administrative Rooms have access to an online attendance system” and “Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, had access to an online attendance system in all instructional and administrative rooms than one would expect by chance. The expected count of 5.4 and the observed count of 9 represented a net difference of -3.6.

There was a statistically significant difference between the observed and the expected counts for "All instructional and administrative rooms have access to an online attendance system" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"with $\chi^2(1,N=157)=4.185$, $p=.041$.

Table 38: 12d*4 Faculty news/announcements are shared throughout the building by e-mail*Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Faculty news/announcements are shared throughout the building by e-mail * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Faculty news/announcements are shared throughout the building by e-mail	N	Count	0	39	39
		Expected Count	3.5	35.5	39.0
		Std. Residual	-1.9	.6	
	Y	Count	14	104	118
		Expected Count	10.5	107.5	118.0
		Std. Residual	1.1	-.3	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.080[b]	1	.024		
Continuity Correction[a]	3.724	1	.054		
Likelihood Ratio	8.439	1	.004		
Fisher's Exact Test				.022	.015
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.48.

Analysis of the standardized residuals in the four cells in Table 38: 12d*4 revealed one cell that contained a residual that was close to 2. That cell (No/No) contained a standardized residual of -1.9. "Faculty news announcements are shared throughout the building by e-mail" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, also did not have faculty news announcements that are shared throughout the building by e-mail than one would expect by chance. The expected count of 3.5 and the observed count of 0 represented a net difference of 3.5.

There was a statistically significant difference between the observed and the expected counts for "Faculty news announcements are shared throughout the building by e-mail" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"with $\chi^2(1,N=157)=5.080$, p=.024.

Table 39: 12f*4 Food service office has access to and uses online information on student lunch eligibility * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Food service office has access to and uses online information on student lunch eligibility * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Food service office has access to and uses online information on student lunch eligibility	N	Count	12	78	90
		Expected Count	8.0	82.0	90.0
		Std. Residual	1.4	-.4	
	Y	Count	2	65	67
		Expected Count	6.0	61.0	67.0
		Std. Residual	-1.6	.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.064[b]	1	.024		
Continuity Correction[a]	3.870	1	.049		
Likelihood Ratio	5.727	1	.017		
Fisher's Exact Test				.026	.021
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.97.

Analysis of the standardized residuals in the four cells in Table 39: 12f*4 revealed one cell that contained a residual that was close to 2. That cell (Yes/No) contained a standardized residual of -1.6. “Food service office has access to and uses online information on student lunch eligibility” and “Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?” indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, did have a food service office that had access to and uses online information on student lunch eligibility than one would expect by chance. The expected count of 6.0 and the observed count of 2 represented a net difference of 4.0.

There was a statistically significant difference between the observed and the expected counts for “Food service office has access to and uses online information on student lunch eligibility” and “Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?” with $\chi^2(1,N=157)=5.064$, $p=.024$.

Digital Content

Under Digital Content, I found no Chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

Equitable Access to Technology

Under Equitable Access to Technology, I found three Chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

Table 40: 22*4 Number of rooms and Internet Connections that are Computer Labs * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		T otal
			N	Y	
Number of rooms and Internet Connections that are Computer Labs * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?	24	Count	0	1	1
		Expected Count	.1	.9	1.0
		Std. Residual	-.3	.1	
	29	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.230(a)	6	.040
Likelihood Ratio	8.900	6	.179
N of Valid Cases	157		

a 10 cells (71.4%) have expected count less than 5. The minimum expected count is .09.

Analysis of the standardized residuals in the four cells in Table 40: 22*4 revealed one cell that contained a residual that was over 2. That cell (29/No) contained a standardized residual of 3.1. "Number of rooms and Internet connections that are in computer labs and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, also had a count of 29 number of rooms and Internet connections than one would expect by chance. The expected count of .1 and the observed count of 1 represented a net difference of -.90.

There was a statistically significant difference between the observed and the expected counts for "Number of rooms and Internet connections that are computer labs and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"with $\chi^2(1,N=157)=13.230$, $p=.040$.

Table 41: 32f*4 Number of students provided with email * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
# of students provided with email	233	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
	248	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
	368	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
	380	Count	1	0	1
		Expected Count	.1	.9	1.0
		Std. Residual	3.1	-1.0	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.206(a)	25	.013
Likelihood Ratio	23.567	25	.544
N of Valid Cases	157		

a 50 cells (96.2%) have expected count less than 5.
The minimum expected count is .09.

Analysis of the standardized residuals in the cells in Table 41: 32f*4 revealed that four cells contained a residual that was greater than to 2. The first cell (233/No) contained a positive standardized residual of 3.1. The second cell (248/No) contained a positive standardized residual of 3.1. The third cell (368/No) contained a positive standardized residual of 3.1. The fourth cell (380/No) contained a positive standardized residual of 3.1

"The number of students provided with e-mail" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone at their school whose responsibilities included leadership and support for teachers integrating technology into curriculum fell under the 233, 248, 368, and 380 count than one would expect by chance. In the first cell (233/No), the expected count of .1 and the observed count of 1 represented a net difference of -.9. In the second cell (248/No), the expected count of .1 and the observed count of 1 represented a net difference of -.9. In the third cell (368/No), the expected count of .1 and the observed count of 1 represented a net difference of -.9. In the fourth cell (380/No), the expected count of .1 and the observed count of 1 represented a net difference of -.9.

There was a statistically significant difference between the observed and the expected counts for ""The number of students provided with e-mail" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1,N=157)=43.206$, $p=.013$.

Table 42: 34c * 4 Does your school offer training to families and community members * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

)oes your school offer training to families and community members * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		Total
			N	Y	
Does your school offer training to families and community members	N	Count	13	95	108
		Expected Count	9.6	98.4	108.0
		Std. Residual	1.1	-.3	
	Y	Count	1	48	49
		Expected Count	4.4	44.6	49.0
		Std. Residual	-1.6	.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.147[b]	1	.042		
Continuity Correction[a]	3.007	1	.083		
Likelihood Ratio	5.216	1	.022		
Fisher's Exact Test				.066	.033
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.37.

Analysis of the standardized residuals in the four cells in Table 42: 34c*4 revealed one cell that contained a residual that was close to 2. That cell Yes/No) contained a standardized residual of 1.6. "Does your school offer training to families and community members" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, offered training to families and community members than one would expect by chance. The expected count of 4.4 and the observed count of 1 represented a net difference of 3.4.

There was a statistically significant difference between the observed and the expected counts for "Does your school offer training to families and community members" and "Is there Someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi^2(1, N=157)=4.147$, $p=.042$.

Connectivity Analysis

Under Connectivity, I found two chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

Table 43: 17*4 Do you need to use a bridging service or portal to connect to outside of your district to do a video conference * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Do you need to use a bridging service or portal to connect outside of your district to do a video conference * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Do you need to use a bridging service or portal to connect outside of your district to do a video conference	N	Count	4	88	92
		Expected Count	8.2	83.8	92.0
		Std. Residual	-1.5	.5	
	Y	Count	10	55	65
		Expected Count	5.8	59.2	65.0
		Std. Residual	1.7	-.5	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.712[b]	1	.017		
Continuity Correction[a]	4.434	1	.035		
Likelihood Ratio	5.675	1	.017		
Fisher's Exact Test				.023	.018
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.80.

Analysis of the standardized residuals in the four cells in Table 43: 17*4 revealed that two cells contained a residual that was close to 2. The first cell (No/No) contained a positive standardized residual of -1.5. The second cell (Yes/No) contained a positive standardized residual of 1.7. "Do you need to use a bridging service or portal to connect outside of your district to do a video conference?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, also did not need to use a bridging service or portal to connect outside of your district to do a video conference?" than one would expect by chance. In the first cell (No/No), the expected count of 8.2 and the observed count of 4 represented a net difference of -4.2. In the second cell (Yes/No), the expected count of 5.8 and the observed count of 10 represented a net difference of -4.20.

There was a statistically significant difference between the observed and the expected counts for "Do you need to use a bridging service or portal to connect outside of your district to do a video conference?" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" with $\chi2(1,N=157)=5.712$, $p=.017$.

Table 44: 18c*4 Type of connectivity used for videoconferencing is Fiber * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?

Type of connectivity used for video conferencing is Fiber * Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum? Crosstabulation

			Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?		
			N	Y	Total
Type of connectivity used for video conferencing is Fiber	N	Count	5	104	109
		Expected Count	9.7	99.3	109.0
		Std. Residual	-1.5	.5	
	Y	Count	9	39	48
		Expected Count	4.3	43.7	48.0
		Std. Residual	2.3	-.7	
Total		Count	14	143	157
		Expected Count	14.0	143.0	157.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.230[b]	1	.004		
Continuity Correction[a]	6.579	1	.010		
Likelihood Ratio	7.480	1	.006		
Fisher's Exact Test				.011	.007
N of Valid Cases	157				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.28.

Analysis of the standardized residuals in the four cells in Table 44: 18c*4 revealed one cell that contained a residual that was over 2. That cell (Yes/No) contained a standardized residual of 2.3. "Type of connectivity used for video conferencing is Fiber" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?" indicated that proportionately more schools in districts that did not have someone whose responsibilities included leadership and support for teachers integrating technology into curriculum, used Fiber as their type of connectivity used for video conferencing than one would expect by chance. The expected count of 4.3 and the observed count of 9 represented a net difference of -4.70.

There was a statistically significant difference between the observed and the expected counts for "Type of connectivity used for video conferencing is Fiber" and "Is there someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"with $\chi 2(1,N=157)=8.230$, $p=.004$.

Communication/Shared Practices

Under Communication/Shared Practices, I found no sufficient statistically significant evidence that showed some difference between observed and expected counts.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Introduction

The 2010 National Educational Technology Plan (NETP) suggests that successful technology integration provides engaging and powerful learning content and experiences, and can be utilized to assess student achievement in authentic ways (U.S. Department of Education, 2010). Research indicates that school districts attempt to cultivate technology in rich, learner-centered environments for all learners, and continue to spend a great deal of funds on technology integration even though no real evidence of increased student achievement is available. November (2009) stressed that there is little test data that demonstrates increased student achievement for all students exists.

According to the 2010 NETP, educators have put forth great effort to provide technology infused learning environments that meet the challenging and quickly shifting demands of our global economy (US DOE, 2010). Research on educational technology integration completed in the last decade revealed that, because the integration process is multifaceted and incredibly complex, with many barriers compounding the difficulty, educators struggle with how to best apply school resources to develop and sustain an effective educational technology program that meets the needs of the 21st Century learner and improves teaching and learning effectiveness.

This research study attempted to expand the knowledge base and understanding of current educational technology integration and identify the essential factors needed to sustain an effective contemporary educational technology program. This study, which replicates Romano's 2005 study, focused on technology integration at the elementary level.

Three major research questions guided this study:

1. What are the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five?
2. How do the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five, align with the 2008 New Jersey Public Schools Technology Survey?
3. Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence suggest about how the presence or absence of technology leadership influences effective technology integration?

Conclusions

Guiding Question One

To answer Guiding Question One, I explored the essential sustainability factors that guide effective, contemporary and innovative technology that assess learning and curriculum and connect with national and state core curriculum standards. The elementary grades are particularly important, since the majority of students who entered first grade in the year 2011 were experienced users of digital age technology tools and gadgets. I was interested in current technology, which enhances learner-centered environments, including engaging educational software capable of assessing, tracking and reporting student achievement and progress, as well as providing individualized content related activities based on student progress. I reviewed literature that focused on essential factors needed for successful technology integration, as well as teacher perceptions, integration barriers and support needs. I synthesized and categorized the relevant research base into essential factor categories called "sustainability factors". The sustainability factors listed below are aligned with the meta-analyses works of Li and Ma (2010), Cuban (2001), Dickard (2003), Pearson et al., (2005), Pflaum (2004), Schacter (1999), and Sivin-Kachala and Bialo (2000); and the synthesis work of Romano (2005) and Guskey and Yoon (2009), as well as the 2007 New Jersey Department of Education Technology Plan, The 2003 National Center for Educational Statistics, Brush and Hew (2007), U. S. Department of Education 2010 Technology Plan, and 67 other scholarly literature of the past decade relating to educational technology programs.

Sustainability Factors:

1. Leadership
    a. A leadership that inspires a common vision, plan and policies to ensure a comprehensive and broad technology integration that enhances productivity and professional practices.
    b. A leadership that fosters a culture supporting and empowering to educators as they integrate technology into the curricular design, instructional strategies and learning environments that maximize teaching and learning.

2. Funding

    a. The process for acquiring funds that ensures the integration of effective resources, including instructional and administrative applications, software, maintenance, support, professional development, connectivity and infrastructure.

    b. The percent or allotment of the school budget spent to ensure the integration of current and sustained technology-based resources and the elimination of a digital divide.

3. Professional Development

    a. The level of differentiated professional development opportunities provided for staff to build capacity and contribute to the infusion of 21st Century skills into curricula and instructional practices, including technology, content, and pedagogical knowledge.

    b. The strategies, incentives and time required for staff to receive technology integration training through a variety of delivery modes.

4. Technical Support

    a. The established resources and processes available to maintain an effective educational technology program at the district/school level.

    b. The personnel, both inhouse and outsourced, available to provide efficient technical support and maintain an effective educational program.

5. Assessments

a. The assessments implemented at the district/school level that measure technology expertise and competencies of specific goals and standards.

b. The techniques used by the school/district to analyze assessment data as a guide for continuous improvement of its educational technology program.

6. Technology Integration

   a. The infusion of 21st Century skills in curricula through a process of combining technology resources/skills, pedagogy, and content to enhance learning and instructional practices.

   b. The degree to which the most effective technology tools are chosen by staff and students and used to problem solve, analyze, synthesize, obtain and present information.

   c. The goals and strategies in place to ensure that students acquire essential technology skills and expertise required by national and international technology standards.

7. Digital Content

   a. The digital content, including software, videos/podcasts, and online resources, the district/school acquires to support the teaching and learning standards across the curriculum.

   b. The degree to which digital content is utilized to support higher-order thinking skills, creativity, expression, collaboration, and to acquire information.

8. Equitable Access to Technology

a. The goals and strategies in place that ensure that all students and staff have equitable access to digital classrooms including Internet, multimedia computers, mobile devices, digital content, online resources, and expertise that provide effective learning experiences for learners.

b. The policies in place that eliminate the digital divide within the school community.

9. Connectivity

a. The degree to which the network equipment and infrastructure, both wired and wireless, supports the school's communication and technology needs.

b. The degree to which connectivity ensures the implementation of the Children's Internet Protection Act (CIPA).

10. Communication/Shared Practices

a. The technology tools available to the school for the purpose of collaborating and communicating important information with the educational community including: video conferencing, emergency notification systems, parent portal for student grade book/homework/attendance information, web pages and electronic social networking.

b. The resources and processes in place to network and establish connections with other educational institutions for the purpose of sharing information.

Guiding Question Two

"How do the significant and relevant factors that are found in current educational technology literature and research that influence and lead effective technology integration and sustainability in public schools at the elementary level, specifically kindergarten through grade five, align with the 2008 New Jersey Technology Survey? Table 1 and Appendix B give clear depictions of the survey items and their associated Sustainability Factor.

I aligned the 10 "sustainability factors" to the 36 objective questions on the 2008 New Jersey Technology Survey. I provided the exact survey item as it was written on the NJ Technology Survey, and indicated the section title with which the New Jersey Department of Education clustered the survey item. I then corresponded each survey item on the NJ Technology Survey to a sustainability factor.

All of the survey items on the State's Technology Survey aligned with at least one sustainability factor. The New Jersey Department of Education developed an instrument that had been carefully crafted to include survey questions that aligned to the current literature base and assessed the essential areas associated with successful educational technology integration. Many of the 36 objective survey items had subquestions with yes/no answers, as well as given statements and responses.

The findings revealed that the survey adequately assessed areas relating to leadership, technology integration, equitable access to technology and connectivity with main questions and subquestions. These four factors had between 11 and 13 main questions associated with them.

I found that, although the survey questions addressed the sustainability factors, not all factors were thoroughly concentrated on. Communication/shared practices had moderate coverage, with four main questions and one open-ended question. The areas, including funding, professional development, technical support, assessment and digital content were slightly covered with each category having two main questions associated with them.

Guiding Question Three

To answer Guiding Question Three ("Using the information collected from the sample population of selected elementary public schools, what does the statistical evidence suggest about the sustainability factors and their measurement of technology integration and sustainability?"), I organized and analyzed the data using the leadership items from the 2008 NJ Technology Survey. Following the format of Romano's 2005 study, I advanced leadership as the highest rank of the sustainability factors in sustaining educational technology, and ran all the questions on the survey against two leadership questions. According to the 2010 NETP, many districts have evolved their technology departments into two departments, one concerned with the technology use in teaching and learning and the other a traditional information technology department concerned with infrastructure, network and equipment. I used two leadership questions, because the responsibilities of district technology coordinator varies from district to district and it is not possible to know whether the person in that position is an educator and involved in educational technology integration at the school level.

The two leadership questions used for this analysis were Item #2 – "Does your district have a technology coordinator/director" and item number 4, "Is there someone at your school whose responsibilities include providing leadership and support for the teachers in integrating technology into the curriculum". Both survey items were cross-tabulated separately against all other survey items that fell under a sustainability factor. I analyzed the data using Chi-square crosstabulation outputs of the data from the 157 schools located in Bergen, Essex, Hudson, and Passaic Counties. I evaluated each Chi-Square crosstabulation, and used only statistically significant results based on Chi-Square value, level of significance using $P < .05$ and cells with standard residuals that were close to 2, 2 or greater than 2.

Both survey item numbers 2 and 4 were crosstabulated individually against the other 35 items on the 2008 New Jersey Technology Survey, in an effort to find statistically significant evidence that showed some difference between observed and expected counts. I identified 27 crosstabulation analyses that provided sufficient statistical evidence relating to differences between the observed and expected counts when Survey Item #2 – "Does your district have a technology coordinator/director" - was crosstabulated against all other survey items. In contrast, the research identified 17 crosstabulation analyses that provided sufficient statistical evidence relating to differences between the observed and expected counts when Survey Item #4: "Is there someone at your school whose responsibilities include providing leadership and support for the teachers in integrating technology into the curriculum?"

Sustainability Factors

Sustainability Factor 1: Leadership

Survey Item 2: "Does your district have a technology coordinator/director" was analyzed against 35 survey items. Of those 35 items, 5 chi-square crosstabulation analyses yielded statistically significant results:

SWd*2:"School website includes homework assignments"

5c*2: "Academic content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school"

5g*2: "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school": "Director of Instructional Services"

14*2: "Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?"

16c*2 "Students who do not have access to technology in their homes can use library with hours open for use outside of normal school hours"

These five statistically significant analyses support the literature. Schools that did not have someone in the position of technology coordinator/director may not include homework assignments on their school website; may not have someone with leadership responsibilities for the supervision and evaluation of technology integration at the school level, other than an academic content supervisor or a director of instructional services; may not have an Acceptable Use Policy that addresses Internet and other information technology used by students; and may not provide students who do not have access to technology in their homes with a library that is open for students use outside of normal hours.

I ran Survey Item #4 against 35 other survey items and discovered the following five chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

2*4: "Does your district have a technology coordinator/director?"

5c*4: "Academic Content Supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school"

5f*4: "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school"

12c*4: "All instructional and administrative rooms have access to an online attendance system"

34c*4: "Does your school offer training to family and community members"

These five statistically significant analyses support the literature, as follows:

Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may not have a district technology coordinator/director; may not have someone with leadership responsibilities for the supervision and evaluation of technology integration at the school level, other than an academic content supervisor or a director of instructional services; may not have an online attendance system accessible in all instructional and administrative rooms; and may not offer technology training to family and community members.

According to November (2010), improving learning requires a powerful vision and creative teachers to teach beyond traditional achievement expectation levels. Stronge, et.al. (2010) suggested that transformational leadership that engages and empowers others is essential in accomplishing goals. Collins (2009) indicated that "Leaders, managers and policy-makers make decisions on the best approach to align the individuals with the organization" (p.38).

Sustainability Factor 2: Funding

I ran Survey Items #2 and #4 against 35 other Survey Items, and did not find any statistically significant difference between the observed and the expected counts in the crosstabs analyses.

Sustainability Factor 3: Professional Development

I ran Survey Item #2 against 35 other survey items. I did not find any statistically significant evidence that showed some difference between observed and expected counts.

In contrast, I ran Survey Item #4 against 35 other Survey Items, and discovered the following two chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts:

1a*4: "Percentage of teachers in your school at each skill level in the use of technology in instruction: Beginner"

1b*4: "Percentage of teachers in your school at each skill level in the use of technology in instruction: Intermediate"

The differences identified in the previous two analyses supported the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may not have technicians on staff to support their school's technology, and may have found higher percentages of teachers who fell in the beginner and intermediate skill range than the advanced range. For educational technology to reach its potential, technology experts must be available (US DOE, 2003). Brinkerhoff (2006) found that, although teachers had shown gains in their self-assessed technology skills, they did not change their technology integration beliefs and practices. The NETP (2010) suggests that educators are more likely to integrate technology into their instruction when they have access to coaching and mentoring.

Sustainability Factor 4: Technical Support

I ran Survey Item #2 against 35 other Survey Items, and discovered the following three chi-square analyses that demonstrated statistically significant evidence showing some difference between observed and expected counts:

7e*2: "When technology problems (hardware/software) arise, teachers are supported by troubleshooters"

7g*2: "When technology problems (hardware/software) arise, teachers are supported by technology coordinator"

7j*2: "When technology problems (hardware/software) arise, teachers are supported by Other: Director of instructional services, principal".

The differences identified in the previous three analyses supported the literature. Schools that did not a district technology coordinator/director may not have troubleshooters or a technology coordinator to support teachers when technology problems arise, or may have found higher percentages of principals whose responsibilities include supporting teachers when technology problems arise.

I ran Survey Item #4 against 35 other survey items, and identified the following three chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

7g*4: "When technology problems (hardware/software) arise, teachers are supported by Technology Coordinator?"

7j*4: "When technology problems (hardware/software arise, teachers are supported by others: Director of Instructional Services and no support"

28*4: "How many technicians on staff support your school's technology infrastructure: .00, .01.

The differences identified in the previous three analyses supported the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers integrating technology into the curriculum may not have a technology coordinator on staff to support their school's technology, may have found higher percentages in the director of instructional services, or no support range, and may have found higher percentages in the .00 and .01 range of the number of technicians that support their school's technology infrastructure.

Teachers are hesitant to use technology in their lessons if they do not have adequate technical support. In order to have sustained educational technology integration, it is essential that teachers have adequate technical support (Ringstaff & Kelley (2002), NCES, 1999). If teachers worry that computers will break during critical times in the classroom and that they would know how to fix them, they will become resistant to using technology (Fuller, 2000). According to the 2010 NETP, the ratio of computers to computer technicians is roughly 612 computers to each technician.

Teachers are expected to handle routine maintenance and computer troubleshooting themselves (NETP, 2010).

Sustainability Factor 5: Assessments

I ran Survey Item #2 against 35 other survey items and discovered the following three chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

5c * 2: "Academic Content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school"

5g*2 : "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school?": "Director of Instructional Services"

6j*2: "School reviews relevant research as technology integration evaluation"

The differences identified in the previous three analyses supported the literature. Schools that did not have a district technology coordinator/director may have found higher percentages of academic content supervisors and directors of instructional services whose responsibility include the supervision and evaluation of the integration of technology by teachers than expected, and may not address and evaluate how technology is effectively integrated into the curriculum through review of relevant research.

I ran Survey Item #4 against 35 other survey items, and discovered the following chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

5g*4: "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school" Director of

Instructional Services, District Coordinator of Educational Technology-Evaluation only.

The differences identified in the previous analyses is supported by the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may have found higher percentages in the director of instructional services or district coordinator of educational technology-evaluation range only for the person responsible for the supervision and evaluation of the integration of technology by teachers in your school. Assessments should be aligned with multiple teaching strategies (Pierson & Borthwick, 2010). Effective and meaningful assessment should be consistent with what we know about teaching and learning (Pierson & Borthwick, 2010).

Sustainability Factor 6: Technology Integration

I ran Survey Item #2 against 35 other survey items. Of those 35 items, the following nine chi-square analyses yielded statistically significant results:

SWd*2: "School website includes homework assignments"

10*2: "Your school has a specific curriculum for computer and information literacy"

11a*2: "More than 50% of teachers use tools to enhance productivity (i.e., e-mail, grade books)?"

11b*2: "More than 50% of teachers use the Internet to provide student activities that support the curriculum"

11c*2: "More than 50% of teachers use assessments to evaluate student use of technology in their learning process (i.e., e-portfolios, multimedia projects, NJTAP-IN)?"

11d*2: "More than 50% of teachers offer opportunities for authentic student centered project-based learning?"

12f*2: "Food service office has access to, and uses, online information on student lunch eligibility"

12i*2: "Library has automated systems for card catalogs"

25c*2: "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school"

SWd*2 can be referenced under Leadership, as that survey item related equally in the mentioned categories. Schools that did not have a district technology coordinator/director may not have specific curriculum for computer and information literacy; and may not have more than 50% of their teachers that use technology tools to enhance productivity, use the Internet to provide student activities that support the curriculum, use assessments to evaluate student use of technology in their learning process, or offer opportunities for authentic student centered project-based learning. In addition, schools that did not have a district technology coordinator/director may not have a food service office that has access to, and uses, online information on student lunch eligibility; may not have a library that has automated systems for card catalogs; and may not have 56-80% of students that use the Internet on a daily basis as part of the curriculum in school.

I ran Survey Item #4 against 35 other survey items, and discovered the following five chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

1a*4: "Number of teachers in your school at beginner skill level

1b*4: "Number of teachers in your school at intermediate skill level

12c*4: "All instructional and administrative rooms have access to an online attendance system"

12d*4: "Faculty news announcements are shared throughout the building by e-mail"

12f*4: "Food service office has access to and uses online information on student lunch eligibility"

The differences identified in the previous analyses are supported by the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may have found higher numbers of teachers at the beginner and intermediate skill levels, may not have an online attendance system accessible in all instructional and administrative rooms, may not have shared faculty news announcements through e-mail, and may not have a food service office that uses online information for student lunch eligibility.

I found differences in the previous analyses that supported the literature in several ways. Integrating technology can simplify routine tasks. November (2010) discussed the differences between automating and informating. November (2010), suggested that automating streamlines the work using the same process and procedures (digital report cards, and automating library card catalogs), while informating may lead to higher-level process changes and shifts control. According to November, (2010 perspective and leadership drive informating. The NETP (2010) Goal 3.0 Teaching: Prepare and Connect states "educators will be supported individually and in teams by technology that connects them to data, content, resources, expertise and learning experiences that enable and inspire more effecting teaching for all learners".

Sustainability Factor 7: Digital Content

I ran Survey Item #2 against 35 other survey items, and found one chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

12i*2:"Library has automated system for card catalogs"

I found differences in the previous analyses that supported the literature in several ways. Item 12i*2 can be referenced under technology integration, as it relates equally under both digital content and technology integration.

I ran Survey Item #4 against 35 other survey items, and did not find any sufficient statistically significant evidence that showed some difference between observed and expected counts.

The differences identified in the previous analyses are supported by the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may have found a count of 29 for the number of rooms and Internet connections, which is more than one would expect by chance; and may have found higher numbers in the 23, 24, 36, and 38 range for the number of students provided with e-mail than one would expect; and may not offer training to families and community members.

Digital content, including streaming videos, content, interactive lessons, real-time assessments and online professional development, provide multiple ways to deliver content and increase retention and understanding. The NETP 2010 suggests that digital content is a real-world tool that creates learning opportunities that prepare students for the global economy. Supporting and promoting online learning and digital content is a goal of the 2010 NETP).

Sustainability Factor 8: Equitable Access to Technology

I ran Survey Item #2 against 35 other survey items, and found five chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

16c*2: "Libraries with hours open for use outside of normal school hours"

25c*2: "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school."

32a*2: "Number of administrators provided with Internet?"

32d*2: "Number of instructional staff provided with e-mail?"

34b*2: "Does your school offer access to e-mail accounts to families and communities?"

I found differences in the previous analyses that supported the literature in several ways. Schools that did not have a district technology coordinator/director may not have libraries with hours open for use outside of normal school hours, may not have 56-80% of students use the Internet on a daily basis as part of the curriculum in school, may have no administrators that are provided with Internet access, may have no instructional staff provided with e-mail, and may not offer access to e-mail accounts to families and communities.

I ran Survey Item #4 against 35 other survey items, and discovered no chi-square analyses that demonstrated sufficient statistically significant evidence that showed some difference between observed and expected counts.

The 2010 NETP states that "state and local public education institutions must ensure equitable access to learning experiences for all students, and especially students in underserved populations – low income and minority students, students with disabilities" (US DOE, 2010. p xv). According to the PBS Learning Survey (2012), only 22% of teachers said they have the right level of technology.

Sustainability Factor 9: Connectivity

I ran survey item #2 against 35 other survey items found six chi-square analyses that demonstrated sufficient statistical evidence that showed some difference between observed and expected counts:

25C*2: "56-80% of students in your school use the Internet on a daily basis as part of the curriculum in school?"

32a*2: "Number of administrators provided with Internet?"

32d*2: "Number of instructional staff provided with e-mail?"

17*2: "Do you need to use a bridging service or portal to connect outside of your district to do a videoconference?"

18B*2: "Type of connectivity used for video conferencing is IP"

19A*2: "Your school has a LAN (local area network)

I found differences in the previous six analyses that supported the literature. Schools that did not have someone in the leadership position of district technology coordinator/director may not have 56-80% of students that use the Internet on a daily basis as part of the curriculum, may have a higher number of administrators than expected that do not have Internet access, and may have a higher number of instructional staff than expected that are not provided with e-mail. In addition, schools that did not have a district technology coordinator/director may use a bridging service or portal to connect outside of your district to do a videoconference, may use IP connectivity for videoconferencing, and may not have a LAN in place in their school.

I ran Survey Item #4 against 35 other survey items, and found two chi-square analyses that demonstrated statistically significant evidence that showed some difference between observed and expected counts:

17*4: "Do you need to use a bridging service or portal to connect outside of your district to do a videoconference?"

18c*4: "Type of connectivity used for videoconferencing is Fiber"

I found that differences in the previous results were supported by the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may use a bridging service or portal to connect outside of your district to do a videoconference, may use Fiber connectivity for videoconferencing, and may not have a LAN in place in their school.

According to the 2010 NETP, the FCC's National Broadband Plan recognizes that high-speed Internet access for schools improves learning experiences. Adequate bandwidth is necessary for accessing online learning resources such as multimedia, communication and collaborative environments and communities. The NETP (2010) calls for every school to have access to a broadband infrastructure that provides learning resources for all students.

Sustainability Factor 10: Communication/Shared Practices

I ran Survey Item #2 against 35 other survey items, and discovered one statistically significant analysis that showed some difference between observed and expected counts.

34b *2: "Does your school offer access to e-mail accounts to families and communities?"

I found differences in the previous analyses that supported the literature in several ways. Schools that did not a district technology coordinator/director may not offer access to e-mail accounts to families and communities.

I did not find any statistically significant analyses that showed some difference between observed and expected counts when Survey Item #4 was analyzed against 35 other survey items.

I found differences in the above analyses that are supported by the literature. Schools that did not have someone whose responsibilities include leadership and support for teachers' integrating technology into the curriculum may not share faculty news announcements throughout their building by e-mail.

I found that the above analyses are supported by the literature. Schools that employ both a technology coordinator and someone whose responsibilities include leadership and support for teachers integrating technology into the curriculum have fewer instances where a difference in the observed and expected counts occur. Goal 4.2 of the

NETP (2010) states that "every student and educator have access to at least on technology device for communication and collaboration. Goal 3.2 calls for schools to leverage social networking technologies and platforms to create communities of practice that provide learning opportunities. According to the NETP (2010), social networks and online communities may enable learners to take online course, communicate with experts, collaborate about best practices, and offer tools to design, develop and share resources.

Conclusion

The statistical analysis used two leadership questions – Survey Item #4, which was concerned with the use of technology in teaching and learning at the school level; and Survey Item #2, which was concerned with infrastructure, network and equipment at the district level. When comparing the list of statistically significant differences that resulted when two leadership questions (#2 and #4) were each crosstabulated independently against all other items on the survey, the number of statistically significant differences between the observed and expected outcomes was reduced to six common statistically significant differences between the observed and expected outcomes:

5c "Academic content supervisor is responsible for the supervision and evaluation of the integration of technology by teachers in your school"

5g: "Specify who is responsible for the supervision and evaluation of the integration of technology by teachers in your school?": "Director of Instructional Services"

7g: "When technology problems (hardware/software) arise, teachers are supported by technology coordinator"

7j: "When technology problems (hardware/software) arise, teachers are supported by Other: Director of Instructional Services, Principal".

12f: "Food service office has access to, and uses, online information on student lunch eligibility *Does your district have a technology coordinator/director?

17: "Do you need to use a bridging service or portal to connect outside of your district to do a videoconference?"

Table 45: Common Survey items that demonstrated statistically significant differences between observed and expected outcomes for Question # 2 and #4.

Factor	"Does your district have a technology coordinator/director?"		"Is there Someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"	
1-Leadership	**5c*2**		**5c*4**	
4-Technical Support	**7g*2**		**7g*4**	
4-Technical Support	**7j*2**		**7j*4**	
5-Assessment	**5g*2**		**5g*4**	
6-Technology Integration	**12f*2**		**12f*4**	
9-Connectivity	**17*2**		**17*4**	

This research study aligns with the literature which indicates that leadership is considered the most significant factor influencing successful technology integration.

Recommendations for Future Research

1. Future studies might focus on investigating whether having two leadership positions whose responsibilities include educational technology integration and network/infrastructure is more effective than having one position.
2. Future studies might focus on how a "Bring Your Own Technology/Device" program may change technology integration when the district is not bearing the full cost of technology.
3. This study was limited in scope. Although I included representation from each of the District Factor Groups identified by the New Jersey Department of Education, this research included only 159 elementary schools that had pre-kindergarten through five and kindergarten through grade five from four counties in New Jersey. Further research might include all elementary schools in New Jersey.
4. Future studies might focus on designing professional development that focuses on technology-enhanced, student-centered classrooms using the TPACK format.
5. A replication study might be conducted to focus on technology integration at the middle school level.
6. As we live and work in a global society, one might look to expand the study to compare New Jersey data to another country's educational technology program, such as Hong Kong, Japan, or China.

Recommendations for Policy and Practice

Policy Recommendations

1. Develop policies that focus on the 10 sustainability factors that lead and guide effective educational technology integration. For example, the district might want

to develop a policy where the school district allows students/staff to use their own personal technology devices, such as smartphones, iPads, Pod Touch and/or e-books in the classroom. Allowing personal devices will enable schools to have a 1:1 technology initiative at a considerable savings.

2. The district might want to develop a policy for new technology conditions that support and facilitate improving teacher's technology skills and integration capacity.
3. The district might want to incorporate a plan to use the services of a telecommunication company for wireless networks.

Practice Recommendations

Based on the results and conclusion of this research, the following areas are recommended for practice:

1. Technology leaders might consider the sustainability factors and their characteristics when making educational technology integration decisions: Leadership, Funding, Professional Development, Technical Support, Assessment, Technology Integration, Digital Content, Equitable Access to Technology, Connectivity, and Communication/ Shared Practices that relate to sustaining a dynamic, successful technology integration program.
2. As districts continue planning for technology implementation, they might consider professional development that includes a model based upon TPACK (Harris, et.al (2009) which focuses on pedagogical, technological and content knowledge and provides time and opportunities for teachers to learn, practice, and collaborate with colleagues.

3. Districts may want to consider using the sustainability factors as a framework for planning, acquiring, sustaining, and assessing educational technology integration.

4. Districts may want to develop and communicate clear goals for technology integration to students, staff, parents and community that explain technology expectations and limitations.

Concluding Remarks

I discovered the following technologies and implementation strategies during the research process that are worthy of mentioning as "New Horizons":

1. Educational leaders might want to investigate "digital fabrication", an emerging technology which was introduced at the 2010 National Technology Leadership Summit. Personal digital fabrication is the automation of a digital design into a physical object through a personal computing fabrication system (Bull et al., 2010).

2. Districts might want to consider entering into a contract with a telecommunications company, such as Verizon Wireless, for their wireless infrastructure and technology devices for all students and staff members. Wireless infrastructures are extremely costly and require ongoing support and upgrading. An existing utility company may provide a wireless signal and a current technology device for each study which is replaced every two years for a monthly charge. This would allow the district to benefit from considerable savings by not having to incur the costs for installing and maintaining a wireless

infrastructure in every school, paying ongoing maintenance costs for technicians and engineers, and upgrading expenses.

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Appendices

Appendix A: NJ Public School Technology Survey

NJ Technology Survey 2008

Date:

District: School: -

Person completing this form:		
First Name:		Last Name:
Title:		E-Mail:
School Phone: use this format 123-123-1234x12345	School Fax:	
School Address: City: State: Zip:	# of Administrators: # of Teachers: # of Students:	Grade Span: NonePre-KK123456789101112Adult H.S. Through: NonePre-KK123456789101112Adult H.S.
Principal: First Name: Last Name: Principal's E-Mail:	Media Specialist: Media Spec. E-Mail:	
Technology Coordinator: First Name: Last Name: Tech. Coordinator's E-Mail:	Enter web site address only: District Web Site: School Web Site:	

Is your district/school's website up-to-date on the state list? (http://www.state.**nj**.us/njded/directory/websites.shtml) If your web site is not current, please e-mail the school and district name with the correct web site to mailto:TECHSURVEY@doe.state.**nj**.us?subject=**Technology Survey**	Yes/No
If your school has a web site, what kind of information does it provide: (Check all that apply.)	

Calendar of Events
Staff E-Mail
Remote access for staff related materials on network/e-mail
Homework assignments
Student grade book
Student handbook
Technology plan
Links to teacher web pages
Curriculum related electronic resources
Cyber Safety information
Emergency information
School menus
Directions
Help desk
Podcasts
RSS feeds

STAFF, SUPERVISION, LEADERSHIP AND PROFESSIONAL DEVELOPMENT

1. Identify the number of teachers in your school at each skill level in the use of technology in instruction.	
Beginner: uses computer systems to run "software", access, generate and manipulate data, and publish results.	
Intermediate: applies tools for professional growth and productivity and uses it to communicate, conduct research and solve problems.	
Advanced: uses computers and related technologies to support instruction; plans and delivers instructional units that integrate applications and learning tools. Lessons developed reflect effective grouping and assessment strategies for diverse populations.	
Instructor: teaches the items above.	
Are these levels resultant from ObservationAssessmentBoth	
Assessment method used:	
2. Does your district have a technology coordinator/director?	YesNo

3. Does your school have a technology coordinator?	YesNo
4. Is there someone at your school whose responsibilities include providing leadership and support for teachers in integrating technology into the curriculum?	YesNo

5. Who is responsible for the supervision and evaluation of the integration of technology by teachers in your school? (Check all that apply.)

Principal	Curriculum Coordinator
Assistant Principal	Technological Literacy Coordinator
Academic Content Supervisor	Other (please specify):

6. How does your school address and evaluate if technology has been effectively integrated into the curriculum? (Check all that apply.)

- Conduct needs assessments
- Teacher attendance at professional development opportunities where technology is integrated into the curriculum
- Attendance by teachers at professional development opportunities
- Evaluate use of technology in lesson plans
- Observe classrooms
- Include technology use in professional improvement plans
- Conduct site-based research
- Use of rubrics that include the use of technology
- Conduct student and teacher surveys
- Review of relevant research
- Make use of totally digital curricula
- Support curriculum with digital resources
- Use tools that assess the level of technology implementation in the classroom such as:
LoTi: http://www.lqhome.com/cgi-bin/WebObjects/lotilounge.woa
EnGauge: http://www.ncrel.org/engauge
Taglit: http://www.taglit.org/, etc.
- Other

7. When technology problems (hardware/software) arise, teachers are supported by the following means: (Check all that apply.)

- Technician
- Help desk
- Hotlines
- Electronic monitoring
- Troubleshooters

Parent Volunteers	
Technology Coordinator	
Student Assistants	
Other Teachers	
Other:	

8. Do teachers participate in online professional development?		YesNo
If yes, then		
Subject Area:	Number of Teachers:	Provider/Vendor of the course:

9. Does your school have an Acceptable Use Policy (AUP) that addresses Internet usage as well as other information technology use by teachers and administrators?	YesNo
Please note: To receive support for Internet access and internal connections services from the Universal Service Fund (USF), school authorities must enforce a policy of Internet safety that includes measures to block or filter Internet access for both minors and adults to certain visual depictions. CIPA does not apply to schools that only receive discounts for telecommunications services from the Universal Service Fund. http://www.universalservice.org/sl/applicants/step10/cipa.aspx	

10. Your school has: (Check all that apply.)
a specific curriculum for computer and information literacy
computer and information literacy is infused through other curricular areas

USE OF TECHNOLOGY BY TEACHERS AND ADMINISTRATORS

11. Check the statements that best describe the way most teachers (greater than 50%) use technology in the classroom.
Use tools to enhance productivity (i.e., e-mail, grade books)
Use the Internet to provide student activities that support the curriculum
Use assessments to evaluate student use of technology in their learning process (i.e., e-portfolios, multimedia projects, NJTAP-IN)
Offer opportunities for authentic student centered, project-based learning
Make use of videoconferencing, video streaming, podcasting etc. for the delivery of specialized or rigorous academic courses and curriculum
Use technology to modify the delivery of instruction
Use electronically-based data to modify instruction to meet the needs of students
None of the above

12. Schoolwide use of technology: (Check all that apply to your school.)
All instructional and administrative rooms have functioning multi-media computers with NETWORK access
All instructional and administrative rooms have functioning multi-media computers with INTERNET access

All instructional and administrative rooms have access to an online attendance system
Faculty news/announcements are shared throughout the building by e-mail
Classrooms and administrative offices have access to online student's records as appropriate for guidance counselors, faculty, administration and transportation offices
Food service office has access to and uses online information on student lunch eligibility
All staff make use of an online student grade book
Electronic student report cards are issued
Library has automated systems for card catalogs
All students have access to relevant electronically delivered learning materials
Library has high speed access to the Internet for student access/research
There is a school-wide electronic media distribution system

USE OF TECHNOLOGY BY STUDENTS

13. Do any students participate in online courses?			YesNo
If yes, then			
a.) Identify subject, grade, number of students and provider:			
Subject:	Grade:	Number enrolled:	Provider/Vendor of the course:
b.) In what other subject areas (grade levels) are online courses needed?			
Subject:		Grade:	
14. Does your school have an Acceptable Use Policy (AUP) that addresses Internet and other information technology use by students?			YesNo

Video Conferencing:

15. Do you have the capability and bandwidth to have video conferencing reach the individual desktops of students?	YesNo
16. How does your school support students who do not have access to technology in their homes?	
Before school, after school, lunch time or open labs	
Community centers with hours open for use outside of normal school hours	
Libraries with hours open for use outside of normal school hours	
School has equipment that can be checked out	
Other	

HARDWARE, SOFTWARE, AND EQUIPMENT

17. Do you need to use a bridging service or portal to connect outside of your district to do a video conference?	YesNo
18. What type of connectivity do you use for your video conferencing:	

ATM	
IP	
Fiber	
Satellite	
IDLS	
Internet2	

19. Indicate the type of network connectivity available in your school.	
LAN (Local Area Network)?	YesNo
Wireless network?	YesNo
20. Is your school connected to other buildings in your district through a WAN (Wide Area Network)?	YesNo
21. Total number of working computers in your school (number includes ALL working computers regardless of age or location)	

22. Indicate the number of rooms and Internet connections for each location. Consider your answer as a snapshot where any mobile cart with multiple units (i.e. COWS) are fixed in one location.

	Classroom/ Instructional	Library/ Media Center	Computer Labs	Administrative Offices
Number of rooms in each location				
Average number of individual computers per location that can simultaneously access the Internet in each room by location listed at top of column.				

23. Does your school have Internet filtering/monitoring software currently in use?	YesNo

Please note: To receive support for Internet access and internal connections services from the Universal Service Fund (USF), school authorities must enforce a policy of Internet safety that includes measures to block or filter Internet access for both minors and adults to certain visual depictions. CIPA does not apply to schools that only receive discounts for telecommunications services from the Universal Service Fund.
http://www.universalservice.org/sl/applicants/step10/cipa.aspx

24. Enter the number of students in your school that use technology tools such as desktop or laptop computers, PDAs, probes, etc. in the curriculum and learning activities on a daily basis (i.e.

5 students use technlology tools 0-30% of the day).	
0-30%	
31-55%	
56-80%	
over 80%	
25. Enter the number of students in your school that use the Internet on a daily basis as part of the curriculum in school (i.e., 5 students use Internet 0-30% of the day).	
0-30%	
31-55%	
56-80%	
over 80%	
26. What number of students collaborate in school on projects on an international level through electronic means?	
27. Most students in our school: (Check all that apply.)	
Develop or complete grade-appropriate assignments using word processing, database, spreadsheet, presentation software, or graphic organizers that support higher order thinking skills as demonstrated in their work	
Have access to engaging software that supports students' curricular activities	
Use digital materials when acquiring information and knowledge	
Have access to distance learning technology to obtain information and collaborate with peers and experts	
Are self sufficient in their use of individually appropriate technology tools in their classrooms to support their learning styles	
28. How many technicians on staff support your school's technology infrastructure? (If a technician is assigned part-time to your school, use a decimal such as .5 to indicated half-time or .25 to indicate quarter-time. This would include only staff or technicians who are employed by the school.)	
29. Does your school make use of open source software?	YesNo
30. Does your school use thin client servers?	YesNo
Does your school have a one to one computer initiative?	YesNo
31. How many years is a computer in use in instruction before it is considered obsolete?	
How many years is a computer in use before it is replaced?	
How many computers are currently in use but are considered obsolete?	

32. Indicate the number of administrators, staff and students provided with school-based connectivity for each group within the school building.

	Administrators	Instructional Staff	Students
Internet Access			

E-Mail

PARENT AND COMMUNITY PARTNERSHIPS

33. Of the students enrolled in your school, please enter the number of students who have and can use the following in their homes:	
Multi-media computer with Internet access, basic software (word processing, database, spreadsheet, presentation) and a printer	
34. Does your school offer educational technology activities/programs to families and community members?	YesNo
If yes, then check all those below that apply.	
Access to e-mail	
E-mail accounts	
Training	
On campus adult access to school equipment	
Off-campus adult access to school equipment	
Web site hosting for community organizations	
Online parent resource section on the school's web site	
35. Is outreach to parents accomplished using electronic means (i.e. web site, e-mail, announcements, schedules, lunch menus, permissions slips)?	Yes No

ASSESSMENT

36. Provide an example of your school's best educational technology practices and included a web site link if it is posted online.
37. How can the state educational technology unit best support your school?
Grant information and resources
Online technology assistance
Sharing best practices
Other
38. Describe or add any other information that you feel is valuable for us to know.

mailto:TECHSURVEY@doe.state.nj.us?subject=Technology Survey
Designed by the Application Development Unit

Appendix B: Sustainability Factors Grouped by NJ School Technology Survey Items

Sustainability Factors Grouped by NJ School Technology Survey Items		
2008 NJ Technology Survey Description	**Item**	**Factor**
Kind of information school web site provides	SW	1
Teacher Skill Levels	1	3, 6
Schools with a Technology Coordinator	2	1
Schools with a Dist. Technology Coord/Dir.	3	1
Schools with someone whose Responsibilities include providing Leadership and Support for Teachers in Integrating Technology into the Curriculum	4	1
Responsible for the Supervision and Evaluation of the Integration of Technology by Teachers in your School	5	1, 5
Address and Evaluate whether Technology has been Effectively Integrated into the Curriculum	6	5
Technology Support (hardware/software).	7	4
Staff Participation in Online PD	8	3
Acceptable Use Policy (AUP) for Teachers and Administrators	9	1
How Technology is Integrated into the Curricular Areas	10	6
How more than 50% of Teachers are Using Technology In the Classroom	11	3, 6
Schoolwide use of Technology	12	1, 6, 7, 8, 9
Student Participation In Online Courses	13	6, 8, 7
Acceptable Use Policy (AUP) for Students	14	1
Capability and Bandwidth for Video Conferencing to Reach Individual Desktops for Students	15	9, 10
Support for Students Who Do Not Have Access to Technology at Home	16	1, 8

Sustainability Factors Grouped by NJ School Technology Survey Items (Continued)		
2008 NJ Technology Survey Description	**Item**	**Factor**
Use a Bridging Service or Portal for Video Conferences Outside of District	17	9
Type of Connectivity for Video Conferencing	18	9
Schools with a LAN or Wireless Network	19	9
Schools with a WAN	20	9
Student to Computer Ratios	21	8, 9
Number of Internet Connections	22	8, 9
Internet Filtering/Monitoring Software	23	9
Use Technology Tools: computers, PDAs, Probes, etc. in the Curriculum and Learning Activities on a Daily Basis	24	6, 8
Use Internet on a Daily Basis as Part of the Curriculum	25	6, 8, 9
Student Collaboration in School on Projects on an International Level through Electronic Means	26	6, 8,9,10
How Students Use Technology In Our Schools	27	6
Support the Schools Technology Infrastructure	28	4
Open Source Software	29	9
Thin Client Servers	30	2,9
Obsolete Computers	31	2
School Based Connectivity	32	8, 9
Students with computers and Internet Access at Home	33	8
Schools offering Educational Technology Activities/ Programs to Families and Community Members	34	1, 8, 10
Outreach to Parents Using Electronic Means	35	1, 10

Appendix C:

Comparison of Survey Items that Demonstrated Statistically Significant Differences between the Observed and the Expected outcomes

Table 46: Comparison of survey items that demonstrated statistically significant.

Factor	"Does your district have a technology coordinator/director?"		"Is there Someone at your school whose responsibilities include leadership and support for teachers integrating technology into curriculum?"	
1-Leadership	SWd*2		--------	
	5c*2		**5c*4**	
	5g*2		--------	
	14*2		--------	
	16c*2		--------	
	--------		2*4	
	--------		5f*4	
	--------		12c*4	
	--------		34c*4	
2-Funding	--------		--------	
3-Prof. Dev.	--------		--------	
	--------		1a*4	
	--------		1b*4	
4-Technical Support	7e*2		--------	
	--------		28*4	
	7g*2		**7g*4**	
	7j*2		**7j*4**	
5-Assessment	5c*2		--------	
	5g*2		**5g*4**	
	6j*2		--------	
6-Technology Integration	25c*2		--------	
	SWd*2		--------	

	10*2		--------	
	11a*2		--------	
	11b*2		--------	
	11c*2		--------	
	11d*2		--------	
	12f*2		**12f*4**	
	12i*2		--------	
	--------		12c*4	
	--------		1a*4	
	--------		1b*4	
	--------		12d*4	
7-Digital Content	12i*2		--------	
	--------		--------	
	--------		34c*4	
8-Equitable Access to Technology	16c*2		--------	
	25c*2		--------	
	32a*2		--------	
	32d*2		--------	
	34b*2		--------	
	--------		22*4	
	--------		32f*4	
	--------		34c*4	
9-Connectivity	25c*2		--------	
	32a*2		--------	
	32d*2		--------	
	17*2		**17*4**	

	18b*2		18c*4	
	19a*2		--------	
10-Communication/ Shared Practices	34b*2		--------	