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Perceptions of District Technology Coordinators Regarding Factors that Influence Technology Integration in Teacher Practice

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PERCEPTIONS OF DISTRICT TECHNOLOGY COORDINATORS REGARDING FACTORS THAT INFLUENCE TECHNOLOGY INTEGRATION IN TEACHER PRACTICE

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ABSTRACT

Perceptions of District Technology Coordinators Regarding Factors that Influence Technology Integration in Teacher Practice

Severe reductions in funding coupled with the imperative to measure and report teachers' ability to integrate technology into their practice pose a significant problem for school districts in New Jersey. This study was designed to identify factors that influence teacher use of technology. A review of the literature identified four areas of barriers and supports that impact teacher practice: Access (e.g., number of computers available; connectivity; opportunities for professional development, evaluation, and feedback), School Climate (e.g., discipline issues, culture that promotes digital learning and constructivism, modeling by administrators, community support, pressures of standardized testing), Support (e.g., mentoring, onsite tech support, training on new equipment), and Incentives (e.g., extra pay, release time, equipment loans, credit hours, special acknowledgements). A forty-two question survey instrument was constructed to elicit information from district technology coordinators in Essex County regarding these four areas which became the study's dependent variables. Two independent variables underpinned the research: the district's level of technology integration and District Factor Group (i.e., socio-economic status).. Administered to fourteen technology coordinators, the data were analyzed using *t-tests* and ANOVA's; none of the tests resulted in a statistically significant finding. Regarding the influence of level of technology integration, it was unanticipated that none of the participating districts would select "High" which may account for the lack of statistical significance in the data analysis. In regard to the influence of economic status, it may be that all districts are facing difficulties in funding their technology programs

which was mentioned in comments provided at the end of the survey. It is evident from the responses that every district which participated in the study is attempting to do everything that has been identified as potentially beneficial. This effort is not tacitly sanctioned by the State, but it is given support by the breadth of questions on the annual State Technology Survey, the required District Technology Plans, and the publication of district "Report Cards." This research suggests the possibility that it may be appropriate for State and federal policy makers to narrow their focus and allow districts to concentrate on what works best for their teachers.

DEDICATION

This dissertation is dedicated with love and appreciation to my mother, Mary Opalka Paszkowski, for the motivation; to my father, Stanley H. Paszkowski, for the means; and to our dear Pat LiSanti for the fond memories.

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CHAPTER I

INTRODUCTION

> The essence of educational technology is the appropriate use of human and nonhuman resources to change the learner's behavior so that new skills are developed, new knowledge is acquired, and performance meets an agreed upon level of acceptance.
>
> The tools are available, and the challenge is great; the question is how we in education will adapt to the needs of an information-rich society. The United States educational system, with its mix of private and public education, enabled us to dominate the economic and industrial world during the last part of the industrial age. The question facing us is whether we can shift to the needs of the information age or whether we will cling to the bones of yesteryear. I think that we will meet this challenge (Crumb, 1989).

This quote, written five years after the publication of "A Nation at Risk" (National Commission on Excellence in Education, 1983), the study commissioned by President Ronald Reagan to investigate the state of education in the United States, offers a counterpoint to the study's most chilling conclusion: "The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people" (p.1). Billed as "An Open Letter to the American People," the report offered numerous recommendations to address the threat it outlined including increasing teachers' salaries, lengthening the teaching year to allow for more professional development, and the inclusion of the teaching of computer science in high school; however, as stated in "Twenty years after 'A Nation at Risk,' " most of the indices (e.g., SAT scores, teachers' GPA's) are "still below their 1970 levels," and the

most enduring legacy of the report is that "the federal government has an unprecedented and probably irreversible role in education" (Coeyman, 2003, p. 1).

Background Information – National Perspective

The first indication of this more influential role for the federal government in schools was the impact of the "SCANS Report" or *What Work Requires of Schools* written by the Secretary of Labor's Commission on Achieving Necessary Skills (1991). This, too, was billed as a "Letter" - in this case, to "Parents, Employers, and Educators," - and it expressed concern that "changes in the world of work" required schools to make changes in how schools prepared their students for the workplaces of the future. In addition to three "Skills," the report outlined five "Competencies," including one on "Technology," that would provide "an essential preparation for all students, both those going directly to work and those planning further education" (p. xv). The SCANS Report was one of four parts of President George H.W. Bush's *America 2000* initiative which was designed to "transform the United States from a 'Nation at Risk' to a 'Nation of Students' "(p. 24) and thus gave added emphasis to the concepts of "lifelong learning" and "authentic assessments."

When President William Jefferson Clinton took office, the issue of accountability in education was addressed in *The Goals 2000: Educate America Act,* which became law in 1994. "Goals 2000 supports States efforts to develop clear and rigorous standards for what every child should know and be able to do, and supports comprehensive State- and district-wide planning and implementation of school improvement efforts focused on improving student achievement to those standards" (Executive Summary, p.3). By 1998,

over 90% of the $1.7 billion awarded to States was subgranted to local school districts to underwrite professional development among other activities.

A landmark study by the U.S. Congress Office of Technology Assessment ("OTA study") in 1995 led to the development of the first national educational technology plan, *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge*, in 1996. This plan set four broad goals (or "Pillars") for the nation's schools. While most of the Plan focused on infrastructure, its very first goal was: "All teachers in the nation will have the training and support they need to help students learn using computers and the information superhighway" (p. 27). To help pay for this initiative, the President signed the *Telecommunications Act of 1996* (which included the "e-rate") and announced the founding of Technology Literacy Challenge Fund (TLCF) grants.

In 1999, the U.S. Department of Education reviewed the first National Technology Plan and its four pillars and issued a new plan in 2000, *e-Learning: Putting a World-Class Education at the Fingertips of All Children* (USDOE, 2000a). This Plan set five National Educational Technology Goals which reflected the increasing use of the Internet and "began the shift in focus from infrastructure to achievement. It urged policy makers and schools to evaluate their use of technology to determine what works, and it emphasized ongoing professional development for practicing teachers and an overhaul of pre-service teacher education to integrate technology effectively into instruction" (Branigan, 2004, pp.1-2).

With the change in Administrations in 2001, perhaps the most intrusive of federal legislation, the current Elementary and Secondary Education Act (commonly known as "No Child Left Behind" or NCLB) was passed. NCLB not only holds schools to higher

accountability but also requires that each school's performance be publicly reported. According to Susan Patrick, former director of the USDOE's Office of Educational Technology and the force behind the nation's third National Technology Plan, *Toward a New Golden Age in American Education* (USDOE, 2004), "the Bush Administration has changed the way technology is funded by the federal government... by pairing ed-tech funding with specific educational goals, such as improving assessment, increasing literacy, and providing professional development to under-trained teachers" (Branigan, 2004, p.2).

Title IID of NCLB, "Enhancing Education Through Technology," provides funds to support the integration of technology into curriculum and instruction. States must have technology plans that include "...the strategies the state will use to prepare teachers to use technology" (US Department of Education, 2002, p. 86).

By 2005, dramatic changes in the use of federal dollars for technology became clear. In fact, the 2005 issue of *Education Week's* "Technology Counts 2005" was titled "Electronic Transfer: Moving Technology Dollars in New Directions" and concluded that:

> Like it or not, the financial landscape of educational technology is changing.... States and school districts are spending millions of dollars to build online student-data systems that will offer teachers what policymakers hope will be the information needed to craft clear-cut strategies for raising achievement.... Underlying the trend is a major philosophical shift in the White House concerning the role of technology in education. During the Clinton administration, federal leaders largely viewed technology as a way to open new educational horizons. Now, under the current administration and the demands of the law championed by President Bush, the emphasis is on technology as a tool for analyzing achievement data (p.8).

Background Information – New Jersey Perspective

The first formal documentation of New Jersey's vision for educational technology was published in *Educational Technology in New Jersey: A Plan for Action* (Stapleton, 1993). Often referred to as "the State's first Technology Plan," it provided a comprehensive outline of the New Jersey Department of Education's goals and objectives regarding technology in schools. In the "Preparing Educators for New Roles" section of the Plan, Objective 2 states, "Provide statewide support for ongoing, accessible staff development opportunities to integrate educational technology into instruction" (p.31).

According to Jeffery Osowski, former Assistant Commissioner, New Jersey Department of Education, "The watershed year for the deployment of technology for learning in New Jersey's schools was 1997-98" (Osowski, p.6). At that time and for five years after, the State of New Jersey made an enormous financial commitment to support educational technology. Through the *Comprehensive Educational Improvement and Financing Act of 1996 (CEIFA),* the State established a five-year program of Distance Learning Network Aid. Starting in the 1997-98 school year at $40.00 per student, up to and including an extension to a sixth year in 2002-03 at $44.00 per student, the State committed over $275 million to the public schools to support educational technology. (Starting in 1998-99, the nonpublic schools began to receive an annual per student allocation as well.)

In addition to mandating that 30% of these funds be spent on equipment, the guidelines suggested that one-third of that percentage, or approximately 10%, be targeted for professional development. To support that effort, the State used $2.7 million in Goals 2000 funding to create an Educational Technology Training Center (ETTC) in each of

New Jersey's 21 counties. An additional $18 million from the federal Technology Literacy Challenge Fund was awarded to school districts from 1997 to 2000 with the requirement that 30% be used for staff training (U.S. Department of Education, 2000a).

Statement of the Problem

It might be fair to say that the "Golden Age" of educational technology funding in New Jersey's schools came to an end in 2003, and, in fact, this may be true for many States; the Consortium for School Networking (CoSN) in its 2004 report, *Digital Leadership Divide* (p. 4), stated that 62% of the 455 school leaders surveyed reported that their districts' technology budgets decreased or stayed the same over the past three years.

Due to the dire fiscal constraints facing the State at that time, Distance Learning Network Aid was discontinued as a discrete program in the 2003-2004 school year; instead, the funds were included as part of "Consolidated Aid" to school districts. Thus, the funds were no longer earmarked for educational technology funding, and individual districts would decide whether to use them for that purpose or not according to E. Gavin, (personal communication, February 6, 2003).

NCLB provides funds for educational technology to the states through its Title IID appropriation, but this funding is precarious as the Bush Administration routinely proposes its elimination (Rivero, 2006). Approximately $17 million was available in FY 2005 (Cocco, 2005), but at approximately 27% of the former Distance Learning Network Aid, the federal contributions do not offset the lost State investment in educational technology. In addition, most of the federal aid is earmarked for "high need" districts and, therefore, is not distributed on an equal per-student basis to all districts as Distance Learning Network Aid had been. Given the budget shortfalls that school districts

themselves face, hard choices on how to allocate these sparse technology funds had to be made in 2003 and continue to this day.

Title IID of NCLB, which is evenly split between formula grants to local districts and competitive grants designed by the State, requires that 25% of funding in either case be spent on professional development. Reflecting the national concern regarding teachers' ability to integrate technology into the curriculum, State competitive grantees since 2003 have been required to include a pretest/posttest analysis using a standardized Levels of Technology Implementation (LoTi) questionnaire in the evaluation of their programs (Gavin, 2003). This instrument "categorizes six levels of computer efficiency [defined as 'the degree to which computers are being used to support concept-based or process-based instruction, consequential learning, and higher order thinking skills'] ranging from Non-use (Level 0) to Refinement (Level 6)" (Moersch, 1996-97, p.52). Key to this assessment of teacher skills is a distinction between teachers' personal use of technology and their ability to integrate it into their teaching and learning. In addition, reflecting the goal of NCLB that all students be technology literate by Grade 8, the State instituted Core Curriculum Content Standards 8.1 and 8.2 in 2005. These Standards delineate benchmarks for students by the end of Grades 4, 8, and 12. (See http://www.state.nj.us/njded/cccs/s8_tech.htm).

So, as funding becomes tighter, demands on teacher competency grow. The State requires each district to complete a State Technology Survey annually which asks districts to report on the levels at which their teachers are able to integrate technology into the curriculum. While there has been some growth over time, the *2003 New Jersey Public School Technology Survey* (the most recent data available) indicates that only 34%

of the State's teachers were at the "Advanced" or "Instructor" levels whereby they are able to integrate technology into their curriculum. This reflects favorably on the State's teachers given other studies: in a survey by the U. S. Department of Education's National Center for Educational Statistics in 2000, "...23 percent of public school teachers reported feeling well-prepared and an additional 10 percent reported feeling very well-prepared to use computers and the Internet in their teaching" (p.2), and in the 2004 CoSN study previously mentioned, an astounding "7 percent of school leaders nationwide rated teachers in their districts as 'very good' or better at integrating technology into the learning experience," (p.10).

There is clearly a need for substantial improvement in New Jersey teachers' skill levels in using technology. As U.S. Secretary of Education Richard Riley said, "Until all teachers have...the adequate training that their counterparts in business and other professions have, our nation's students will be short-changed" (Branigan, 2000, p.70).

Significance of the Study

These two developments – a severe reduction in funding and the State's concomitant imperative to measure and promote teachers' ability to integrate technology into their practice – pose a significant problem for local school districts in New Jersey. Now, more than ever, local districts must have evidence of what works best to advance the integration of technology into the curriculum. Such evidence will allow local school districts to be fiscally prudent while implementing an effective educational technology program that fosters the integration of technology into the curriculum.

Also significant is that there is a dearth of research on the perceptions of school technology coordinators. While numerous studies on educational technology and

professional development have surveyed superintendents, principals, and teachers, only a few have focused directly on technology coordinators, and in those cases (Evans-Andris, 1995; Hearrington, 2006; Langran, 2006; Strudler, 1996; Strudler, Falba, & Hearrington, 2003; Woods, 2000), the coordinators were school-based and not in New Jersey schools. Because New Jersey school districts must develop a district technology plan every three years as well as complete the aforementioned annual technology survey, each district has a "technology coordinator" or equivalent. Functioning as intermediaries between the administrative leaders, the teaching staff, and the technology support personnel, these district technology coordinators have a valuable and unique perspective on what works in their districts. Also worthy of consideration in this regard is the networking that takes place among technology coordinators; while this is often reflective of "misery loves company," it also provides the aggregated wisdom of a group of dedicated professionals. This research will attempt to add their perceptions to the body of knowledge on educational technology with the goal of informing the practice of district staff in their roles as professional developers by providing a continuum of factors that are associated with increased integration of technology in teacher practice.

Purpose of the Study

The purpose of this study is to investigate the perceptions of the technology coordinators in the 21 school districts in Essex County, New Jersey, regarding the integration of technology into teaching practice. According to Bolman & Deal (1997), the proliferation of computers in the 1980's had a radical impact on the typical vertical or hierarchical structure of business organizations. "[C]oordinating roles or units [arose], using persuasion and negotiation to help others integrate their work" (p. 44) in a lateral

fashion. This phenomenon is reflected in New Jersey school districts where 92% reported having a District Technology Coordinator on staff according to the *2003 New Jersey Public School Technology Survey*. In positions nonexistent thirty years ago, these staff members now interact with all levels of the organization and have an important and unique perspective on every aspect of technology use in their districts.

Essex County, in addition to echoing the 93% rate of District Technology Coordinators on staff, is a microcosm of the State by virtue of its range of District Factor Groups (i.e., socioeconomic status) and sizes of school districts. In those districts whose small size precludes a full-time District Technology Coordinator position, there is a person designated as the technology representative of the district to attend the County's Distance Learning Committee meetings, complete the State survey, and write the State-mandated District Technology Plans. (They will be included as "District Technology Coordinators" for the purpose of this study.) Also of note in the choice of Essex County as an appropriate focus of this research on integration of technology into teacher practice is that Essex County reported the second highest level of the "Percent of Schools with Someone Whose Responsibilities Include Providing Leadership and Support for Technology Integration" at 94.9% on the *2003 New Jersey Public School Technology Survey*.

The purpose of this study, then, is to survey District Technology Coordinators in Essex County, New Jersey, to determine their perceptions as to which factors identified in previous research as barriers to, or supports of, technology use by teachers have the most impact on teacher integration of technology into their practice and to share the results with both the school districts in Essex County and those around the State.

The Research Questions

Research Question 1: What is the impact of district educational technology programs for Essex County teachers on the level of technology integration into their practice as perceived by district technology coordinators?

Subsidiary Questions:

1. Does access to technology as perceived by district technology coordinators impact the level of technology integration in teacher practice?
2. Does school climate as perceived by district technology coordinators impact the level of technology integration in teacher practice?
3. Do teacher support factors as perceived by district technology coordinators impact the level of technology integration in teacher practice?
4. Do incentives provided for professional development as perceived by district technology coordinators impact the level of technology integration in teacher practice?

Null Hypotheses:

H_1 - There is no significant difference between *access to technology* and the level of technology integration by teachers in Essex County school districts.

H_2 - There is no significant difference between *school climate factors related to technology* and the level of technology integration by teachers in Essex County school districts.

H_3 - There is no significant difference between *teacher support factors related to technology* and the level of technology integration by teachers in Essex County school districts.

H_4 - There is no significant difference between *incentives provided for professional development* and the level of technology integration by teachers in Essex County school districts.

Research Question 2: What is the impact of District Factor Group (i.e., socioeconomic status) on the level of technology integration in the practice of Essex County teachers?

Subsidiary Questions:

1. Does District Factor Group impact access to technology in Essex County school districts?
2. Does District Factor Group impact school climate as it relates to technology and teacher practice in Essex County school districts?
3. Does District Factor Group impact teacher support factors as they relate to technology and teacher practice in Essex County school districts?
4. Does District Factor Group impact teacher incentives as they relate to technology and teacher practice in Essex County school districts?

Null Hypotheses:

H_5 - There is no significant difference between *access to technology* and the District Factor Group of Essex County school districts.

H_6 - There is no significant difference between *school climate factors related to technology* and the District Factor Group of Essex County school districts.

H_7 - There is no significant difference between *teacher support factors* and the District Factor Group of Essex County school districts.

H_8 - There is no significant difference between *incentives provided to teachers* and the District Factor Group of Essex County school districts.

Definition of Terms

District Factor Group: A ranking of public school districts by the New Jersey Department of Education to indicate socioeconomic status, from a low of "A" to a high of "J." (http://www.state.nj.us/njded/finance/sf/dfgdesc.shtml)

District Technology Coordinators: Staff persons hired by school districts to coordinate the deployment, use, and upkeep of equipment and software and related staff training and those in smaller districts who assume those responsibilities on a more limited basis.

Educational technology: The use of technological devices such as computers, audiovisual equipment, mass media, and telecommunications as tools to enhance the process of teaching and learning. Note: "Educational technology" is not synonymous with "Technology education" wherein technology itself is the subject matter.

Teacher practice: The actual day-to-day activities of individual teachers as they work with their students.

Technology integration: "Technology used as an integral component or tool for learning and communication within the context of academic subjects" (Graf, 1998).

Technology training or professional development: Any class, course, or workshop that provides training on technology skills or integration of technology into the instructional process.

Limitations of the Study

The following limitations were placed on this study:

1. The study was limited to K-12 public school districts in Essex County, New Jersey, that have a District Factor Group designation.
2. The study was limited to one respondent per school district.
3. The study was limited to a definition of "teachers" as those responsible for teaching language arts, math, science, and/or social studies.
4. The study was based on the perceptions of district technology coordinators and, therefore, the results will be limited to the extent of the respondents' honesty and what they report at the time the survey was taken.

Organization of the Study

This study is organized as follows: Chapter I includes the introduction, the background information from both the federal and State of New Jersey perspectives, the statement of the problem, the significance of the study, the purpose of the study, the research questions, the definitions of terms, and the limitations. Chapter II includes a review of the literature including historical benchmarks in use of technology in education, the need for professional development, the barriers and supports that impact technology integration, and the role of technology coordinators. Chapter III describes the design of the study. Chapter IV presents the findings of the study. Chapter V provides a summary, conclusions, and recommendations.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of the review of the literature is to describe the use of technology in education, to define the role of the teacher in regard to the application of the technology, to describe how professional development supports this process, to describe the obstacles that have prevented teachers from fully developing as technology-using educators and the supports that have assisted them, and the role of the technology coordinator.

Historical Benchmarks in the Use of Educational Technology

Microcomputers began to arrive in schools almost thirty years ago, and initial concerns involved the machines themselves – how to use them and how to program them. The focus of the computer curriculum echoed these concerns; courses were developed primarily in computer literacy and programming skills. "Ordinary classroom teachers did not perceive themselves as part of the computer scene" (Caissey, 1987, p.7).

A decade later, with more and more desktop computers in the schools, the emphasis shifted to software selection and to beginning computer instruction in the primary grades. With this shift in focus, two key areas emerged: how to provide computer training to all teachers and how to integrate the use of technology into all curriculum areas. Caissey is one of the first to voice the need for universal staff development in technology: "...until all teachers become familiar with and comfortable with microcomputers, the potential of this marvelous technology for teaching and learning will never be realized" (p.7).

In an article describing the increasing trend of focusing staff development on integration as the key to effective technology use, Presskill (1998), makes reference to a number of studies which reported that teachers have not received the training necessary to effectively implement CAI [computer-aided instruction]" (p. 24) and cites a seminal work by Sheingold, Martin, & Endreweit (1985) which states:

> teachers need the chance to learn and experiment over a long period of time with support from other teachers, administrators, and experts. Such a long-term approach, with continuing support for training, is most likely to ensure that the training will be assimilated and that the technology will be put to its best use (p. 13).

This sentiment is echoed by Sturdivant (1989) who believes that training for teachers must foster "enthusiasm..., experimentation, and widespread implementation.... Because almost a decade since the introduction of computers into the school, teacher training continues to be one of the most critical components of the success of any educational technology program" (p. 31).

In an expression of urgency, Gursky (1991) states that "School districts typically fail to provide adequate inservice training, as though they assume teachers will absorb the necessary operating skills by osmosis or by simply booting up" (p. 36). He offers instead some concrete suggestions to promote teacher computer use such as providing two weeks of summer training to new teachers and letting them keep their computers (see also Caulfield, 1989), and he recommends using state funds to create teacher training centers which many states, including New Jersey, have now done.

By 1994, the U.S. Congress, stating that "Projections suggest that by spring, 1995, schools in the United States will have 5.8 million computers for use in instruction – about one for every nine students" (OTA Report, p. 1), commissioned a landmark study,

Teachers & Technology: Making the Connection (1995). Among the many findings in this 280-page report are the following:

> • Helping teachers use technology effectively may be the most important step to assuring that current and future investments in technology are realized.
> • Most teachers have not had adequate training to prepare them to use technology effectively in teaching....
> • A majority of teachers report feeling inadequately trained to use technology, particularly computer-based technologies (p. 2).
> **Making the connection between technology and teachers – helping the 2.8 million teachers in public and private kindergarten-through-twelfth grade (K-12) schools effectively incorporate technology into the teaching and learning process – is one of the most important steps the nation can take to make the most of past and continuing investments in educational technology** [bold in original] (p .8).

A RAND study, *Fostering the Use of Educational Technology: Elements of a National Strategy* (Glennan & Melmed, 2003) was conducted in response to the *Goals 2000: Educate America Act* to develop a national, long-range technology plan. As stated in the "Summary" section of the report, "The authors of this report believe the continuing growth in the presence of technology in schools presents an important opportunity to a nation seeking improved performance from its schools." The issue of teacher training is addressed in Chapter 4 of the report, "Challenges of Creating a Nation of Technology-Enabled Schools," wherein it states

> Successful use of technology in schools depends upon the skills of the teachers and other staff in those schools. Unfortunately, as participants in the RAND/CTI workshop ... put it, "professional development as currently conceived and delivered – one-shot seminars, an afternoon with an expert, or 200 teachers in a gymnasium – will not bring the profession up to speed with emerging school reforms" (p.8).

Instead, the report offers

> three common requirements for successful support of teachers:
> 1. Adequate time (and organization of time) for teachers to acquire skills and to plan the school's programs and activities.
> 2. Assistance that is keyed to the needs of teachers and administrators and provided at the times when they need it.
> 3. A clear vision concerning the purposes and the educational goals that guide the program of the school and classroom (p.10).

These findings are echoed in *The Power of the Internet for Learning: Moving from Promise to Practice, the Report of the Web-based Commission to the President and the Congress of the United States* (USDOE, 2000c) which stated

> Professional development is the critical ingredient for effective use of technology in the classroom.... Professional development is often called "training," but the term implies much more than just building basic technology skills. It means developing a vision built on the understanding that technology is a tool that can offer solutions to longstanding teaching and learning problems.... Teachers need more than a quick course in basic computer operations.... They need time (pp. 35-36).

The September 23, 1999, issue of *Education Week* was a special report called "Technology Counts '99: Building the Digital Curriculum," published in collaboration with the Milken Exchange on Education Technology. It noted that "a critical mass has been reached. More than half the nation's classrooms are connected to the Web, and schools have an average of one instructional computer for every 5.7 students" (p. 5) and concluded that "Professional development is the essential ingredient to making the most of digital content in the classroom" (p. 37). It lays out some noteworthy specifics:

> The *Education Week* survey repeatedly demonstrates the importance of professional development, but it also offers some discouraging statistics about how much teachers are receiving.
>
> Asked how many hours of basic technology skills training they had received within the past 12 months, the largest group of respondents – 31 percent – said one to five hours. Next came the 27 percent of teachers with no training.

> The figures are worse regarding training on integrating technology into the curriculum: 36 percent of teachers received one to five hours, and another 36 percent received none.
>
> Still, the training seems to make a positive difference to those who got it, particularly when it came to their confidence level, use of digital content, and willingness to experiment:
>
> Teachers who received 11 or more hours of curriculum and integration training are five times as likely to say they feel "much better prepared today" to integrate technology into their classroom lessons than teachers who received no such training (p. 40).

It should be noted that it is not only in the area of educational technology training that professional development is lacking; in *A National Plan for Improving Staff Development* (Sparks & Hirsh, 1999), state that "a growing body of research shows that improving teacher knowledge and teaching skills is essential to raising student performance (p. 2)"; yet,

> the American school system fails to provide sufficient staff development. The typical school district currently allocates only about one percent of its budget for improving the abilities of its staff. Fewer than half of teachers reported receiving release time to attend professional development (47 percent) and nearly a quarter (23 percent) said they were given no support, time, or credit for professional development. [NCES: Toward, 1998] Only 19 percent of teachers had a mentor teacher and two-thirds did not participate in a formal induction program during their first year on the job. [NCES: Teacher Quality, 1999], p. 5.

Another study that makes reference to specific hours of training, *Computer-Based Technology and Learning: Evolving Uses and Expectations* ("NCREL" report) by the North Central Regional Educational Laboratory of the U.S. Department of Education (Valdez, et al, 2000) states that:

> The extent to which teachers are given access to pertinent training to use computers to support learning plays a major role in determining whether or not technology has a positive impact on achievement. Students of teachers with more than ten hours of training significantly outperformed students whose teachers had five or fewer hours of training (p. iv).

Similarly, the Benton Foundation Report, *The Sustainability Challenge: Taking Edtech to the Next Level* (Dickard, 2003) reiterated that

> Edtech literature emphasizes the importance of providing ongoing support when helping teachers use technology to enhance student learning.... Students of teachers with more than 10 hours of training in edtech have been found to significantly outperform students of teachers with five or fewer hours (West Ed, 2002; Sivin-Kachala & Bialo, 2000)" (p. 36).

A number of factors have been identified to explain why teachers have not become highly competent users. The OTA study cites the following:

- insufficient availability of training (p. 135)
- lack of financial support for training by school districts (p. 136)
- competing priorities for limited staff development time (p. 137)
- "piecemeal training" – that is, a lack of a comprehensive scope and sequence of training opportunities (p. 140)
- lack of pedagogical support (e.g., help in selecting software) (p. 140)
- lack of onsite computer support (p. 141)
- lack of a clear educational rationale for technology use (p.143)
- the use of traditional standardized tests, not computers, to assess student achievement (p.143) and
- lack of support from principals and other administrators (p.153).

Issues Beyond Professional Development

The previously cited studies emphasized the need for professional development, but also alluded to other critical factors influencing the degree to which teachers integrate technology in their practice. Similarly, in "Technology Counts '99: Building the Digital

Curriculum," for example, the results of an *Education Week* survey were cited (pp.37-43), and several reasons in addition to lack of training were noted as barriers to teachers' use of educational technology:

- not enough computers in the classroom,
- not enough time to try out software,
- difficulty finding appropriate websites and/or software, and
- poor matches between teacher's instructional styles and software designs.

Another possible impediment, first described in Seymour Papert's book, *The Children's Machine: Rethinking School in the Age of the Computer* (1993), is that teachers "may also resist [the infusion of technology] because, at a fundamental level, they fear that technology will change what they do, that it will displace teachers and dehumanize teaching" (p. 6). To counteract this, curriculum activities should be designed so that the technology is embedded in such a way as to become transparent.

Even more alarming is the position taken in the NCREL report (2000) that K-12 education needs to now respond to a third phase of technology use, "Data-Driven Virtual Learning" whereby teachers will have moved from Phase I, use of software in segments by content or skill, through Phase II, computers as whole-group, learner-centered teaching tools, to Phase III which "now encompasses making systemic changes in curriculum, instruction, and assessment to the extent that it requires changes in student roles, teacher roles, and teaching and learning tasks and expectations" (p. 18).

William D. Pflaum, whose year-long sabbatical visiting classrooms across America culminated in his 2004 book, *The Technology Fix: The Promise and Reality of Computers in Our Schools*, concluded that training "...is quite necessary, but it is simply

not sufficient. The larger issues of purpose, alignment, and focus have to be settled for teacher training to pay off" (p.209). Two of his eleven key findings that support this conclusion (p. 197) are relevant here:

• 8. Teachers and administrators are driven by proficiency testing, which determines what is taught, how time is used, and how money is spent.

• 9. Technology is used best when the principal is committed and the school has a full-time technology coordinator.

This last statement is supported by further research. Langran (2006) concluded that "The principal's role in technology decisions is essential in creating schools that effectively integrate technology. By evaluating teachers' use of technology in the classroom and modeling, these principals created an expectation for technology integration in the classroom" (pp. iii-iv).

Education Week's "Technology Counts 2003" edition found that "Many states are trying to address educators' technology skills through the creation of teacher or administrator standards that include technology.... Seven require technology training or coursework for teacher or administrator recertification; and two states... require teachers or administrators to pass a technology test" (pp. 44, 48). By the 2006 edition of "Technology Counts," twenty-one states (including New Jersey) were listed as having "Requirements for an initial license include technology coursework or a test" but only nine (not including New Jersey) were listed as a "State [that] requires technology training or a test for recertification, or requires participation in technology-related professional development" (p. 55).

"Technology Counts 2003" further stated that "Rather than forcing school personnel to improve their technology skills using the proverbial stick, some states have chosen to dangle a carrot. Ten states currently offer professional or financial incentives for teachers to use educational technology and 31 states provide such incentives for administrators" (p.48). In New Jersey, the State, through a Bill Gates Foundation grant, sponsors the NJ ELITE program which provides laptops, training, golf outings and other incentives for administrators; there is no equivalent State-sponsored program for teachers.

In 2002, SRI International published a major report, *Technology-related Professional Development in the Context of Educational Reform: A Literature Review* commissioned by the U.S. Department of Education. After reviewing the literature, the report delineated "Essential Elements of Effective Technology-related Professional Development" and stated:

> The necessary system-level conditions can either support or hinder technology integration. If many barriers are encountered, even the most highly motivated teacher will have a difficult time using technology in teaching. The elements described in the following section (time, access to equipment and technical assistance, curriculum, leadership and community support, and scalability) are consistently mentioned as important to the success of a technology plan. By far, however, the factors most often cited in the literature are time, access, and training (see, for example, Trotter, 1999; AIR, 1998; CEO Forum, 1999; Grant. 1996; Fulton, 1998). (p.49).

The report goes on to cite specific concerns:

- curriculum issues, such as an overwhelming amount of materials to choose from that are not reviewed for relevance or curriculum that does not include technology;
- leadership and community issues, such as the pressure to achieve on standardized tests;

• scalability issues, such as a lack of funds impacting equity and access and relying only on volunteers to participate in training when requirements for recertification and other mandatory requirements would better serve "both the enthusiastic and the reluctant teacher" (p.51); and

• individual teacher characteristics, such as "computer illiteracy, computer phobia, disinterest, distrust that the system will support them as they make changes, fear of appearing incompetent in front of students, and fear of changing roles in the classroom" (p. 52).

Constructivism

A theme that runs through all of the literature on integrating technology into teacher practice is the potential for technology to support constructivist learning (Becker & Reil, 2000; Carney, 1998; Honey, Culp & Carrigg, 1999; Jacobsen, 2001; Jonassen, Peck & Wilson, 1999; Matzen & Edmunds, 2007; Sheingold & Tucker, 1990; Thompson, Simonsen, & Hargrove, 1996; Thornburg, 1991). As defined in *Connecting Student Learning & Technology* (Adams & Burns,1999), "Constructivism, a learning theory informed by cognitive psychology, educational research, and neurological science, views learning as the product of experience and social discourse. Constructivists consider learning to be an individual and personal event" (p. 6). After discussing the power of technology to foster constructivism and cautioning that "Not every lesson needs technology" (p. 30), the authors conclude that:

> Constructivism provides valuable insight for classroom teachers who want to use technology to support student learning. Computers offer opportunities for enhancing intellectual growth and learner-centered classrooms can help students connect the curriculum with their personal experience and innate abilities to learn. These classrooms have the most promise for successful technology integration (p.49).

In a review of the literature on *Constructing Knowledge with Technology* (Boethel & Dimock, (1999) come to the following conclusion:

> Professional development is needed that allows teachers to construct preofessional knowledge about pedagogy, content, and technology, as well as strategies for managing the changing classroom environments brought about with the creation of constructivist learning environments supported by technology. Just as constructivist learning theory informs the transformation of classroom environments for students, it also informs the development of learning experiences for teachers.... By providing the very experiences promoted for constructivist learning environments in the classroom, it is possible that teachers will confront their "theories in use" to enable them to create learning experiences appropriate for the children of the Information Age (pp.29-30).

Technology Coordinators

In a position that first appeared in the 1980's, the duties of a technology coordinator were outlined in *Planning for Computers in Education: A Resource Handbook, Revised* (Northwest Regional Educational Lab, 1988): Administration, Teaching, Software management, Technical support, and Communications and outreach (p. 51). In *Technology Counts 2003*, a national report, only 16 percent of schools were found to have a full-time coordinator on staff (p.47); according to the *2003 New Jersey Public School Technology Survey*, New Jersey stands in sharp contrast to the national statistics with 91.9% of school districts reporting having a district technology coordinator and 57.8% of schools reporting having a technology coordinator.

The landmark OTA study (1995) states "Research on implementation of innovations in schools has consistently shown that onsite assistance contributes to effective implementation of new ideas" (pp. 146-147). The report then describes research at three Oregon schools and quotes Strudler (1994) who wrote "the support provided by an effective coordinator serves to 'tip the scales' for teachers weighing the costs and

benefits of technology use" (p.147). Strudler, a professor at the University of Nevada, Las Vegas, has done additional research on the role of technology coordinators (2005, 1995-96) and mentored Hearrington (2006) whose doctoral dissertation states in part, "The findings of this study indicate that coordinators perceive the levels of staff development and instructional support as less than optimal, that school-level leadership related to ICT [information and communication technology] could be improved, and that technical support is increasingly difficult to provide" (p.134).

SRI International's Literature Review (2002) cited above in regard to professional development comments that "Leaders at the school level, including principals, teachers, technology coordinators, and parents, all influence a school's culture and, in turn, a school's delivery of professional development and technology-related professional development" (p.18). This finding was supported by Langran's research (2006) which concluded that "With their access to teachers, principals, and school division administrators, technology coordinators have the potential to act as global change agents and leaders in the schools and help interpret a school's vision to fit with the local culture of their school" (p. iii; see also Dawson & Rakes, 2003; Hernandez-Ramos, 2005; Kadela, 2002; Wiske, 2006).

Romano (2005) conducted research using data from the *2003 New Jersey Public School Technology Survey* and his findings "supported a deficit in some aspect of integrating and sustaining technology in light of the absence of a district coordinator/director of technology" (p. 158; see also Shuldman, 2004; *Education Week*, 2003).

Synthesis of Barriers and Supports

The review of the literature identified a wide range of barriers to, and supports of, educational technology use in teacher practice. For purposes of this study, they have been synthesized into four areas of concern:

1. Access to technology, including number of computers available, access to the Internet, and availability of professional development. (See also Chang, 2002; Cradler & Cradler, 2002; Guenther, 2002; Hasselbring, 1991; Jayroe, Ball, & Novinski, 2001; McCarthy, 1998; NCES, 2000a; Norris, Sullivan, Poirot, & Soloway, 2003.)
2. School climate, including discipline issues; a culture that promotes digital learning and constructivism; modeling by superintendents, principals, and curriculum leaders; and pressures of standardized testing. (See also Ashburn & Floden, 2006; Burns, 2002; Cuban, 1998; Fredericks, 2004; Hudanich, 2002; Kerr, 1989; Mouza, 2002-2003; Rakes, Fields, & Cox, 2006; Russell & Haney, 2000; Sivin-Kachela & Bialo, 2000; Zhoa, et al, 2001).
3. Support, including access to mentoring, onsite technology support, and training on new equipment. (See also Christensen, 2002; Chuang, Thompson, & Schmidt, 2003; Clausen, 2007; Cradler, Freeman, & Cradler, 2002; Cuban, 2001; Fuller, 2000; MacArthur et al, 1995; Maddin, 2002; Parr, 1999; Sandholtz, 2001.)
4. Incentives, including extra pay, release time, and out-of-district conferences. (See also Ely, 1990; NCES, 2000b; Shuldman, 2004; USDOE, 2000b; Weber, 1996; Wetzel, 2001-2002.)

These four areas led to the development of the questionnaire that was the foundation of this study. (See Appendix A). Note also that a distinction was made in the

survey between "personal professional" use of technology and "technology integration" in the classroom (Bebell, Russell, & O'Dwyer, 2004; Mills & Tincher, 2003).

Educational Technology and Student Achievement

While not a focus of this study, a final area of importance to any review of the literature on educational technology is the issue of its impact on student achievement. In the section, "Meta-Analyses Involving Technology and Achievement," the NCREL study reported on its review of:

> Ten meta-analyses that synthesized research from 946 studies, ranging from the preschool level to college.... These meta-analyses were conducted independently by different researchers, focused on the different uses of computers and multimedia technologies with different populations, and differed in terms of the methodology used to identify studies and analyze results. Nonetheless, each meta-analysis concluded that instructional programs that included technology show a positive impact on student achievement, resulting on higher test scores (p.6).

A review of the research conducted in 1996 (Thompson, Simonson, and Hargrave) concluded that "In general, teachers and schools are not yet integrating newer technology applications into the curriculum" (p.64) but

> The evidence shows that a media-based teaching and learning process is not inherently better than traditional teaching and learning process. However, the evidence supports the position that technology based teaching and learning is effective. That is, people can learn from media and because of the improved instructional strategies, and the enhanced materials, facilitated by media, they may learn more efficiently and in some cases, more effectively (p. 63).

An analysis of seven major studies on *The Impact of Education Technology on Student Achievement: What the Most Current Research Has to Say* (Schacter, 1999) reported that, in each case, the positive findings outweighed the negative findings and stated that "students with access to technology show positive gains in achievement on research-constructed testing, standardized testing, and national tests" (p. 9). Citing these

two studies along with two others, Collins (2004-2005) concluded that "The bottom line is that educational technology has yet to prove its effectiveness in improving student achievement. We can learn lessons from all of these works, however." (p. 59). It is in that spirit that this study was conducted.

CHAPTER III

METHODOLOGY

Introduction

As outlined in Chapter II, numerous studies on educational technology and its influence on teacher practice have been conducted; however, for the most part, their subjects have been superintendents, principals, teachers, and site-based technology coordinators. Only one (Strudler, 1996) focused directly on district technology coordinators and, in that case, only those in elementary schools. This research attempted to add a broader perspective to the body of knowledge on technology integration in teacher practice by investigating the perceptions of the technology coordinators in the twenty-one school districts in Essex County, New Jersey, which, by virtue of its range of District Factor Groups (i.e., socio-economic status) and number of students in each district, is a microcosm of the State as a whole.

The State of New Jersey requires each school district to complete an annual School Technology Survey and to submit a District Technology Plan every three years. As a result, each district has designated a "District Technology Coordinator" to fulfill these obligations.

The purpose of this study was to investigate the perceptions of the technology coordinators in the twenty-one school districts in Essex County, New Jersey, regarding the integration of technology into teaching practice with the permission of their Superintendents. The methods the researcher employed in obtaining the data are reviewed in this chapter, and the procedures that were followed in administering the questionnaire

are explained. Finally, the statistical procedures that were used to analyze the data are described.

Instrumentation

A questionnaire to determine what factors influence teachers' use of technology in their practice was constructed following the guidelines outlined in Rea & Parker (1997). This instrument has been designed to elicit information from District Technology Coordinators about conditions and attitudes in their districts. Responses to questions were generated from a Likert type scale. The administration of the questionnaire was confidential, anonymous, and voluntary. The survey sought to answer the following:

Research Question 1: What is the impact of district educational technology programs for Essex County teachers on the level of technology integration into their practice as perceived by district technology coordinators?

The independent variable for Research Question 1 is the first question (Q1) on the survey which attempts to elicit the respondents' perceptions of the level of technology integration in teacher practice by using the choices of "Low," "Medium," and "High." The criteria for each choice is given using references from the aforementioned "Levels of Technology Implementation" (LoTi) as well as "Apple Classrooms of Tomorrow" (ACOT) formats. (See Baker, Gearhart, & Herman, n.d.)

Research Question 2: What is the impact of District Factor Group (i.e., socioeconomic status) on the level of technology integration in the practice of Essex County teachers?

The independent variable for Research Question 2 is the last multiple-choice question (Q42) which asks respondents to give their District Factor Group classification. To ensure confidentiality, this question was posed using a four-part range of choices.

The dependent variables (access, school climate, support, and incentives) are addressed as follows:

Questions 2 – 14 address the subsidiary question, "Do technology coordinators in Essex County school districts perceive access to technology as having a positive effect on technology integration in teacher practice?"

Questions 15 - 29 address the subsidiary question, " Do technology coordinators in Essex County school districts perceive school climate as having a positive effect on technology integration in teacher practice?"

Questions 30 – 35 address the subsidiary question, "Do technology coordinators in Essex County school districts perceive teacher support factors as having a positive effect on technology integration in teacher practice?"

Questions 36 – 41 address the subsidiary question "Do technology coordinators in Essex County school districts perceive teacher incentives for professional development as having a positive effect on technology integration in teacher practice?"

The final question is open-ended to allow respondents to add any other perceptions which they deem to be of merit. Responses were analyzed by the researcher and are presented in Chapter IV.

This questionnaire was reviewed by a panel of experts in educational technology:

• Margaret Honey, PhD, Director, Center for Children and Technology;

• Julia Stapleton, former Director, Office of Educational Technology, New Jersey Department of Education; and

• David Thornburg, PhD, Director of the Thornburg Center and Senior Fellow of the Congressional Institute for the Future.

This survey was field tested by a group of Technology Coordinators from Middlesex County for readability and clarity. Using their responses, the survey instrument was pretested for scale reliability using SPSS version 11.5. The resulting reliability coefficient was calculated at .8108 (alpha). Detailed reliability on respondents will be analyzed in Chapter IV.

Participants

Technology coordinators in Essex County, New Jersey, were the participants in this study. As a result of the State requirements for funding and reporting, each district has identified a staff person as their "Technology Coordinator." Although their official titles may include Director of Instructional Technology, Library Media Specialist, Supervisor of Technology, or Computer Resource Teacher (depending on the size of the district), these are the people who act as their district's liaison to the State and who complete the annual School Technology Survey. Because of their knowledge of the equipment and software in their districts as well as their close contact with classroom teachers, these technology coordinators have a unique perspective on the use of technology in their districts that makes them ideal for this study.

Procedures

The procedures to be used include: (a) collection of data, and (b) the treatment of the data.

Collection of the data

A letter was sent to each of the twenty-one Superintendents in Essex County requesting permission to send the survey to their designated "technology coordinator." The letter included the purpose of the survey and requested that they send a letter on their district letterhead granting permission to the researcher to send the survey to their district's Technology Coordinator or equivalent.

Fourteen approval letters were received that comprised a representative sample of the DFG's in the County. Having secured permission from Seton Hall University's Institutional Review Board (IRB), the survey was sent to the fourteen technology coordinators as identified by their superintendents with an introductory letter giving the purpose of the study, information on IRB approval, assurances that all responses would be held in strictest confidence, and a request for their voluntary participation. In addition to the survey instrument, a stamped envelope was enclosed, coded to allow the researcher to determine who had not returned the survey while maintaining confidentiality. A follow-up reminder was sent to those who had not returned the survey in three weeks; an e-mail request was sent to the four who had not replied in six weeks. Ultimately, all fourteen technology coordinators returned the survey.

Treatment of the Data

The data is reported in Chapter IV in the form of descriptive statistics using frequencies, percentages, means, standard deviations, t-tests, and one-way ANOVA's.

The SPSS 11.5 was used to analyze the data. Since the survey scale values were equal, interval scales with normal distributions, means, and standard deviations were used to describe the data. Differences in the mean scores were evaluated using independent samples. The two-tailed *t*-tests and ANOVA's were set at a level of significance of .05. A significant result would mean that the variable (e.g., incentives) was related to the teachers' level of technology integration and/or DFG.

The steps taken to analyze the data were as follows:

1. An overall representation of the data using frequencies, means, and standard deviations.
2. The coding of scaled variables to enable statistical treatment.
3. The creation of subscales to enable analysis by the four subgroups: Access, School Climate, Support, and Incentives.
4. Performance of a Cronbach Alpha Cooefficient of Reliability on the full instrument and each of the subscales.
5. Independent *t*-tests for Research Question 1 because the reported level of technology integration resulted in only two of the possible three responses being chosen.
6. ANOVA's to address Research Question 2 because responses were reported in all four categories of District Factor Group.

Finally, qualitative analysis, described in the following quote from Leedy (1997, p.165) as "primarily an inductive process of organizing data into categories and

identifying patterns (relationships) among the categories" was used to analyze the responses to the final open-ended question.

CHAPTER IV

ANALYSIS OF THE DATA

Introduction

The purpose of this chapter is to describe the responses given on the researcher-designed survey instrument and provide an analysis of the data collected. The participants were fourteen Educational Technology Coordinators from Essex County, New Jersey, as identified by their superintendents.

Data Collection

Within approximately a six-month period, all fourteen respondents had completed and returned the survey instrument for a response rate of 100%. When all fourteen surveys had been received, they were removed from their envelopes and randomly coded to preserve anonymity. Two of the respondents were from DFG A; three from DFG's B to H; seven from DFG I; and two from DFG H. This is a representative sample of the total population of districts in the county.

Design of the Survey Instrument

The questions on the survey instrument (see Appendix A) were arranged into eight sections (seven multiple choice sections and one open-ended question) as described below. The descriptive data for the complete scale, consisting of all forty-two multiple-choice questions, is displayed in Table 1. The variables displayed on Table 1 have been labeled: "Level of Teachers' Technology Integration" (which was Question 1 on the survey); Q2 through Q41 to correspond to the survey question numbers as displayed on the research questionnaire from Questions 2 through 41; and "DFG" which corresponds

to Question 42. The four subsets of Access, School Climate, Support, and Incentives are also given.

Table 1: Statistics

Statistics

	N					
	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Level of Teachers' Technology Integration	14	0	1.71	.469	1	2
Q2	14	0	2.43	.646	1	3
Q3	14	0	4.43	.756	3	5
Q4	14	0	3.79	.975	2	5
Q5	14	0	3.14	1.167	2	5
Q6	14	0	3.29	.726	2	5
Q7	14	0	2.86	1.231	1	5
Q8	14	0	2.86	1.292	2	5
Q9	14	0	2.50	1.019	2	5
Q10	14	0	2.71	1.267	1	5
Q11	14	0	2.50	1.225	1	5
Q12	14	0	2.36	.929	1	4
Q13	14	0	2.93	1.439	1	5
Q14	14	0	2.79	1.528	1	5
Q15	14	0	3.93	1.141	1	5
Q16	14	0	4.29	.726	3	5
Q17	14	0	2.57	.938	1	4
Q18	14	0	2.71	1.069	1	5
Q19	14	0	3.86	.363	3	4
Q20	14	0	3.93	.829	2	5
Q21	14	0	4.00	.392	3	5
Q22	14	0	2.64	1.008	1	4
Q23	14	0	3.57	.852	2	5
Q24	14	0	3.29	.994	2	5
Q25	14	0	3.36	1.008	2	5
Q26	14	0	4.00	1.359	1	5
Q27	14	0	3.71	.825	2	5
Q28	14	0	4.29	.825	3	5
Q29	14	0	4.36	.633	3	5
Q30	14	0	3.64	1.082	2	5
Q31	14	0	2.43	1.342	1	4
Q32	14	0	2.71	1.326	1	5
Q33	14	0	2.86	1.099	1	5
Q34	14	0	4.14	.770	2	5
Q35	14	0	3.29	1.069	2	5
Q36	14	0	2.14	1.460	1	5
Q37	14	0	4.79	.802	2	5
Q38	14	0	2.79	1.311	1	5
Q39	14	0	3.14	1.292	1	5
Q40	14	0	2.86	1.231	1	5
Q41	14	0	3.50	1.225	2	5
DFG	14	0	2.64	.929	1	4
Access	14	0	21.5000	7.26160	14.00	38.00
School Climate	14	0	54.5000	5.30239	45.00	62.00
Support	14	0	13.0714	3.09998	8.00	18.00
Incentives	14	0	19.2143	4.90178	10.00	27.00
Total	14	0	108.2857	13.79759	85.00	127.00

Section 1. Question 1 asked participants to "characterize the level of technology integration by teachers" in their district as Low, Medium, or High based on ACOT or LoTi levels (with which technology coordinators in New Jersey are familiar). This question was essential to determining the answer to Research Question 1: What is the impact of district educational technology programs for Essex County teachers on the level of technology integration into their practice as perceived by district technology coordinators?

Four of the respondents rated their teachers as "Low" in their level of technology integration; the remaining ten rated their teachers as "Medium." (Note: None reported their teachers' level as "High.") This question will be addressed more fully below under "Hypothesis 1."

Table 2: Level of Teachers' Technology Integration

Level of Teachers' Technology Integration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	4	28.6	28.6	28.6
	Medium	10	71.4	71.4	100.0
	Total	14	100.0	100.0	

Section 2. Questions 2 through 6 provided demographic information which was not included in the subscales and, therefore, was not analyzed in the *t-tests* or ANOVA's. A closer look at the answers given, particularly to Questions 3 and 4, does provide some potentially relevant information.

Question 2 asked, "Which of the following best describes how many computers your teachers have in their classrooms?" Answers indicated no districts with more than four computers to a classroom overall.

Table 3: Q2

Q2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	1	7.1	7.1	7.1
	1	6	42.9	42.9	50.0
	2-4	7	50.0	50.0	100.0
	Total	14	100.0	100.0	

Question 3 asked, " How would you rate your teachers' access to the Internet for personal professional use?" With two exceptions, respondents reported access as Good or Excellent.

Table 4: Q3

Q3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fair	2	14.3	14.3	14.3
	Good	4	28.6	28.6	42.9
	Excellent	8	57.1	57.1	100.0
	Total	14	100.0	100.0	

Question 4 asked, "How would you rate your teachers' access to the Internet for teaching practice?" Seven of the fourteen respondents reported the same levels as for personal professional use; the other half reported that access for teaching was lower than for personal professional use.

Table 5: Q4

Q4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	2	14.3	14.3	14.3
	Fair	2	14.3	14.3	28.6
	Good	7	50.0	50.0	78.6
	Excellent	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

It may be worthwhile to draw a comparison between the answers given to Questions 3 and 4. Question 3 asked for a rating of teacher access to technology for personal professional use; Question 4 asked for a rating of teacher access to technology for teaching practice. Half of the respondents indicated that access to technology for instruction was equal to that for personal professional use, and half indicated that access was less for classroom instruction than for personal professional use.

Question 5 asked, "On average, how many hours of professional development on technology does your district offer to each teacher per year?" Ten of the fourteen reported that fewer than 16 hours are offered to their teachers each year.

Table 6: Q5

Q5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-8	5	35.7	35.7	35.7
	9-16	5	35.7	35.7	71.4
	17-24	1	7.1	7.1	78.6
	25+	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 6 asked, "Is this training mandatory or voluntary?" Ten of the fourteen respondents reported that all or most of the training in their district was voluntary.

Table 7: Q6

Q6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All attendance is voluntary	1	7.1	7.1	7.1
	Most attendance is voluntary; some is mandatory	9	64.3	64.3	71.4
	Most attendance is mandatory; some is voluntary	3	21.4	21.4	92.9
	All attendance is mandatory	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Reliability

Sections 3 through 6 cover the four subscales of the survey. Reliability tests were run on the four subscales. The test used was Cronbach's Alpha Coefficient (α) which is a test of internal consistency between items in the scale. An alpha score (α) >.6 signifies good inter-item consistency among the questions being tested.

Subscale One: Access

Section 3. Questions 7 through 14 represented Subscale One: "Access." These questions covered the areas of teacher surveys and observations as a means to assessing teachers' needs and the offering of training to teachers to meet their needs as indicated by those assessments. Table 8 gives the descriptive data and a reliability measurement. The averaged responses of items within Subscale One: Access resulted in a Cronbach's alpha (α) of .870 indicating that the scale has an acceptable internal consistency.

Table 8: Subscale One: Access

Reliability
Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	14	100.0
	Excluded[a]	0	.0
	Total	14	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.870	.877	8

Inter-Item Correlation Matrix

	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Q7	1.000	.470	.368	.761	.714	.317	.341	.187
Q8	.470	1.000	.175	.443	.778	.494	.532	.334
Q9	.368	.175	1.000	.477	.339	.610	.341	.766
Q10	.761	.443	.477	1.000	.645	.486	.621	.284
Q11	.714	.778	.339	.645	1.000	.237	.327	.103
Q12	.317	.494	.610	.486	.237	1.000	.711	.763
Q13	.341	.532	.341	.621	.327	.711	1.000	.552
Q14	.187	.334	.766	.284	.103	.763	.552	1.000

Question 7 asked, "On a yearly basis, is teachers' personal professional use of technology (i.e., word processing, accessing the Internet, using e-mail, operating district programs for attendance, etc.) assessed and training designed accordingly?

Table 9: Q7

Q7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	14.3	14.3	14.3
	Sometimes	4	28.6	28.6	42.9
	About half the time	3	21.4	21.4	64.3
	Often	4	28.6	28.6	92.9
	Always	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 8 asked, "How often are written surveys used to evaluate teacher's personal professional use of technology?"

Table 10: Q8

Q8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	9	64.3	64.3	64.3
	About half the time	1	7.1	7.1	71.4
	Often	1	7.1	7.1	78.6
	Always	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 9 asked, "How often are observed demonstrations used to evaluate teachers' personal professional use of technology?"

Table 11: Q9

Q9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	11	78.6	78.6	78.6
	Often	2	14.3	14.3	92.9
	Always	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 10 asked, "On a yearly basis, is teachers' ability to integrate technology into their practice (i.e., incorporate a wide range of technologies into their classroom instruction) assessed and training provided accordingly?"

Table 12: Q10

Q10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	7.1	7.1	7.1
	Sometimes	8	57.1	57.1	64.3
	About half the time	1	7.1	7.1	71.4
	Often	2	14.3	14.3	85.7
	Always	2	14.3	14.3	100.0
	Total	14	100.0	100.0	

Question 11 asked, "How often are written surveys used to evaluate teachers' ability to integrate technology into their practice?"

Table 13: Q11

Q11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	7.1	7.1	7.1
	Sometimes	10	71.4	71.4	78.6
	Often	1	7.1	7.1	85.7
	Always	2	14.3	14.3	100.0
	Total	14	100.0	100.0	

Question 12 asked, "How often are observed demonstrations or presentations of final projects used to evaluate teachers' ability to integrate technology into their practice?"

Table 14: Q12

Q12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	7.1	7.1	7.1
	Sometimes	10	71.4	71.4	78.6
	Often	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 13 asked, "How often do formal written evaluations of teachers by their supervisors include a category that addresses personal professional use of technology?"

Table 15: Q13

Q13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	14.3	14.3	14.3
	Sometimes	5	35.7	35.7	50.0
	About half the time	2	14.3	14.3	64.3
	Often	2	14.3	14.3	78.6
	Always	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 14 asked, "How often do formal written evaluations of teachers by their supervisors include a category that addresses technology integration into their practice?"

Table 16: Q14

Q14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	14.3	14.3	14.3
	Sometimes	7	50.0	50.0	64.3
	About half the time	1	7.1	7.1	71.4
	Always	4	28.6	28.6	100.0
	Total	14	100.0	100.0	

As can be noted in the above tables, observations and written evaluations of teachers' use of technology was reported to be "Never," "Sometimes," or "About half the time" at a rate of 64% or better.

Subscale Two: School Climate

Section 4. Questions 15 through 29 comprised Subscale Two: School Climate. These questions related to issues of school culture, security concerns, constructivism, the pressures of standardized testing, teacher participation in technology purchasing, curriculum issues, and participation in the promotion of technology by superintendents,

principals, curriculum leaders, and the community. Table 17 gives the descriptive data and a reliability measurement. The averaged responses of items within Subscale Two resulted in a Cronbach's alpha (α) of .607 indicating that the scale has an acceptable internal consistency.

Table 17: Subscale Two: School Climate

Reliability
Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	14	100.0
	Excluded[a]	0	.0
	Total	14	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.607	.626	15

Inter-Item Correlation Matrix

	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29
Q15	1.000	.119	-.031	.423	.716	.157	.172	-.158	-.113	-.048	.224	.000	-.350	.350	-.175
Q16	.119	1.000	.081	.113	-.125	.037	.270	.045	.711	.517	.690	.312	.403	-.147	-.072
Q17	-.031	.081	1.000	.099	.032	.552	.000	.070	-.151	-.354	-.151	.121	.227	-.128	-.241
Q18	.423	.113	.099	1.000	.283	.062	.000	.328	-.229	-.207	.173	-.318	-.623	.623	-.179
Q19	.716	-.125	.032	.283	1.000	.475	.540	-.150	-.213	-.304	.150	.312	-.403	.147	-.096
Q20	.157	.037	.552	.062	.475	1.000	.710	-.033	-.265	-.533	-.059	.410	.305	-.418	.199
Q21	.172	.270	.000	.000	.540	.710	1.000	.000	.000	-.197	.389	.577	.238	-.475	.310
Q22	-.158	.045	.070	.328	-.150	-.033	.000	1.000	-.013	.186	.438	.225	-.224	.040	.336
Q23	-.113	.711	-.151	-.229	-.213	-.265	.000	-.013	1.000	.791	.371	.399	.360	.078	.163
Q24	-.048	.517	-.354	-.207	-.304	-.533	-.197	.186	.791	1.000	.427	.398	.201	.174	.314
Q25	.224	.690	-.151	.173	.150	-.059	.389	.438	.371	.427	1.000	.449	.040	-.224	-.095
Q26	.000	.312	.121	-.318	.312	.410	.577	.225	.399	.398	.449	1.000	.412	-.343	.447
Q27	-.350	.403	.227	-.623	-.403	.305	.238	-.224	.360	.201	.040	.412	1.000	-.661	.210
Q28	.350	-.147	-.128	.623	.147	-.418	-.475	.040	.078	.174	-.224	-.343	-.661	1.000	-.063
Q29	-.175	-.072	-.241	-.179	-.096	.199	.310	.336	.163	.314	-.095	.447	.210	-.063	1.000

Question 15 asked, "To what extent do you agree that your district promotes a culture that considers digital learning or computer-assisted instruction as fundamental?"

Table 18: Q15

Q15

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1	7.1	7.1
	Neutral	3	21.4	21.4	28.6
	Agree	5	35.7	35.7	64.3
	Strongly Agree	5	35.7	35.7	100.0
	Total	14	100.0	100.0	

Question 16 asked, "To what extent do you agree that your district promotes a culture that considers electronic communication as fundamental?"

Table 19: Q16

Q16

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	2	14.3	14.3	14.3
	Agree	6	42.9	42.9	57.1
	Strongly Agree	6	42.9	42.9	100.0
	Total	14	100.0	100.0	

Question 17 asked, "To what extent do you agree that student discipline issues are an impediment to teacher use of technology in their practice?"

Table 20: Q17

Q17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1	7.1	7.1
	Disagree	7	50.0	50.0	57.1
	Neutral	3	21.4	21.4	78.6
	Agree	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 18 asked, "To what extent do you agree that equipment security concerns are an impediment to teacher use of technology in their practice?"

Table 21: Q18

Q18

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1	7.1	7.1
	Disagree	6	42.9	42.9	50.0
	Neutral	4	28.6	28.6	78.6
	Agree	2	14.3	14.3	92.9
	Strongly Agree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 19 asked, "To what extent do you agree that your district encourages a constructivist (i.e., collaborative, project-based, student-centered learning) rather than a traditional approach to teaching and learning?"

Table 22: Q19

Q19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	2	14.3	14.3	14.3
	Agree	12	85.7	85.7	100.0
	Total	14	100.0	100.0	

Question 20 asked, "To what extent do you agree that the technology training program for teachers in your district models a constructivist format (i.e., teachers work collaboratively using the technology in an exploratory and non-threatening way with time for reflection)?"

Table 23: Q20

Q20

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	7.1	7.1	7.1
	Neutral	2	14.3	14.3	21.4
	Agree	8	57.1	57.1	78.6
	Strongly Agree	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 21 asked, "To what extent do you agree that the technology training program in your district makes an effort to demonstrate how teachers can be a dynamic part of a larger community (such as reaching out to parents via e-mail, maintaining a website, running after-school programs, etc.)?"

Table 24: Q21

Q21

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	7.1	7.1	7.1
	Agree	12	85.7	85.7	92.9
	Strongly Agree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 22 asked, "To what extent do you agree that teachers are discouraged from integrating technology into their practice by the pressures of standardized testing?"

Table 25: Q22

Q22

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1	7.1	7.1
	Disagree	7	50.0	50.0	57.1
	Neutral	2	14.3	14.3	71.4
	Agree	4	28.6	28.6	100.0
	Total	14	100.0	100.0	

Question 23 asked, "To what extent do you agree that teachers' recommendations are always included in instructional software purchasing decisions?"

Table 26: Q23

Q23

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	14.3	14.3	14.3
	Neutral	3	21.4	21.4	35.7
	Agree	8	57.1	57.1	92.9
	Strongly Agree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 24 asked, "To what extent do you agree that teachers' recommendations are always included in instructional equipment purchases?"

Table 27: Q24

Q24

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	28.6	28.6	28.6
	Neutral	3	21.4	21.4	50.0
	Agree	6	42.9	42.9	92.9
	Strongly Agree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 25 asked, "To what extent do you agree that curriculum revision committees always include extensive and appropriate use of technology integration in revised curricula?"

Table 28: Q25

Q25

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	28.6	28.6	28.6
	Neutral	2	14.3	14.3	42.9
	Agree	7	50.0	50.0	92.9
	Strongly Agree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 26 asked, "To what extent do you agree that your Superintendent supports technology and models its use?"

Table 29: Q26

Q26

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1	7.1	7.1
	Disagree	2	14.3	14.3	21.4
	Agree	4	28.6	28.6	50.0
	Strongly Agree	7	50.0	50.0	100.0
	Total	14	100.0	100.0	

Question 27 asked, "To what extent do you agree that your Principals support technology and model its use?"

Table 30: Q27

Q27

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	7.1	7.1	7.1
	Neutral	4	28.6	28.6	35.7
	Agree	7	50.0	50.0	85.7
	Strongly Agree	2	14.3	14.3	100.0
	Total	14	100.0	100.0	

Question 28 asked, "To what extent do you agree that your Curriculum Director supports technology and models its use?"

Table 31: Q28

Q28

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	3	21.4	21.4	21.4
	Agree	4	28.6	28.6	50.0
	Strongly Agree	7	50.0	50.0	100.0
	Total	14	100.0	100.0	

Question 29 asked, "To what extent do you agree that your community is supportive of educational technology?"

Table 32: Q29

Q29

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	7.1	7.1	7.1
	Agree	7	50.0	50.0	57.1
	Strongly Agree	6	42.9	42.9	100.0
	Total	14	100.0	100.0	

As can be noted from the tables above, the respondents generally reported a school climate that was supportive of educational technology.

Subscale Three: Support

Section 5. Questions 30 through 35 comprised the Subscale Three: Support. These questions included the use of mentoring, onsite tech support, and Internet and equipment availability. Table 33 gives the descriptive data and a Cronbach's alpha (α) of .671. Note that in order to reach an acceptable level of internal consistency Questions 32 and 35 were not used in the analysis of the data.

Table 33: Subscale Three: Support

Reliability
Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	14	100.0
	Excluded[a]	0	.0
	Total	14	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.671	.695	4

Inter-Item Correlation Matrix

	Q30	Q31	Q33	Q34
Q30	1.000	.166	.471	.343
Q31	.166	1.000	.409	.308
Q33	.471	.409	1.000	.480
Q34	.343	.308	.480	1.000

Question 30 asked, "To what extent do you agree that mentoring or other one-on-one support in integrating technology is available to all teachers?"

Table 34: Q30

Q30

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	21.4	21.4	21.4
	Neutral	2	14.3	14.3	35.7
	Agree	6	42.9	42.9	78.6
	Strongly Agree	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

Question 31 asked, "To what extent do you agree that every building in your district has at least one full-time, onsite staff person to provide technical assistance and equipment maintenance services?"

Table 35: Q31

Q31

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	35.7	35.7	35.7
	Disagree	3	21.4	21.4	57.1
	Neutral	1	7.1	7.1	64.3
	Agree	5	35.7	35.7	100.0
	Total	14	100.0	100.0	

Question 33 asked, "To what extent do you agree that your district offers support to all teachers through electronic networks and online forums (e.g., NEA's School Renewal Network; Tapped In; BigChalk; Blackboard, Inc.; eBoards)?"

Table 36: Q33

Q33

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1	7.1	7.1
	Disagree	5	35.7	35.7	42.9
	Neutral	4	28.6	28.6	71.4
	Agree	3	21.4	21.4	92.9
	Strongly Agree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 34 asked, "To what extent do you agree that when new equipment and software are purchased in your district training is always provided to the teachers who are expected to use it?"

Table 37: Q34

Q34

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	7.1	7.1	7.1
	Agree	9	64.3	64.3	71.4
	Strongly Agree	4	28.6	28.6	100.0
	Total	14	100.0	100.0	

As can be observed in the above tables, respondents generally reported that their districts provide support to their teachers with the exception of onsite technical support and online access to teacher forums.

Subscale Four: Incentives

Section 6. Questions 36 through 41 comprised Subscale Four: Incentives. These questions covered the topics of extra pay, release time, personal use of equipment, attendance at conferences, and certificates or other special acknowledgments. Table 38 gives the descriptive data and a reliability measurement. The averaged responses of items within Subscale Four resulted in a Cronbach's alpha (α) of .741 indicating that the scale has an acceptable internal consistency.

Table 38: Subscale Four: Incentives

Reliability
Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	14	100.0
	Excluded[a]	0	.0
	Total	14	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.741	.750	6

Inter-Item Correlation Matrix

	Q36	Q37	Q38	Q39	Q40	Q41
Q36	1.000	.225	.098	.314	.226	.344
Q37	.225	1.000	.172	.477	.200	.353
Q38	.098	.172	1.000	.473	.408	.263
Q39	.314	.477	.473	1.000	.642	.340
Q40	.226	.200	.408	.642	1.000	.459
Q41	.344	.353	.263	.340	.459	1.000

Question 36 asked how often extra pay is offered.

Table 39: Q36

Q36

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	6	42.9	42.9	42.9
	Sometimes	5	35.7	35.7	78.6
	Often	1	7.1	7.1	85.7
	Always	2	14.3	14.3	100.0
	Total	14	100.0	100.0	

Question 37 asked how often credit is given to the teachers' "100 hours" of required professional development.

Table 40: Q37

Q37

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	1	7.1	7.1	7.1
	Always	13	92.9	92.9	100.0
	Total	14	100.0	100.0	

Question 38 asked how often laptops or other pieces of equipment are lent to teachers for personal use.

Table 41: Q38

Q38

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	14.3	14.3	14.3
	Sometimes	6	42.9	42.9	57.1
	Often	5	35.7	35.7	92.9
	Always	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 39 asked how often release time is given to teachers for taking technology training.

Table 42: Q39

Q39

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	7.1	7.1	7.1
	Sometimes	5	35.7	35.7	42.9
	About half the time	1	7.1	7.1	50.0
	Often	5	35.7	35.7	85.7
	Always	2	14.3	14.3	100.0
	Total	14	100.0	100.0	

Question 40 asked how often teachers are sent to out-of-district conferences with expenses paid.

Table 43: Q40

Q40

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	7.1	7.1	7.1
	Sometimes	7	50.0	50.0	57.1
	Often	5	35.7	35.7	92.9
	Always	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Question 41 asked how often certificates or other special acknowledgements are awarded to teachers.

Table 44: Q41

Q41

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	5	35.7	35.7	35.7
	Often	6	42.9	42.9	78.6
	Always	3	21.4	21.4	100.0
	Total	14	100.0	100.0	

As can be noted from the above tables, incentives that cost little (e.g., certificates and credit hours) are used more often than those that cost more (e.g., extra pay and equipment for personal use).

Section 7. Question 42 asked participants to identify their District Factor Group (DFG). This question was required to address Research Question 2:

What is the impact of District Factor Group (i.e., socioeconomic status) on the level of technology integration in the practice of Essex County teachers?

Two of the respondents gave their DFG as "A"; three gave their DFG as "B-H"; seven gave their DFG as "I"; and two gave their DFG as "J." This question will be addressed more fully below under "Hypothesis 2."

Table 45: DFG

DFG

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A	2	14.3	14.3	14.3
	B-H	3	21.4	21.4	35.7
	I	7	50.0	50.0	85.7
	J	2	14.3	14.3	100.0
	Total	14	100.0	100.0	

Section 8. At the end of the survey, participants were given space to "add any comments that you feel would be helpful in understanding your responses to the questions above and/or to express any thoughts about the technology integration program in your district." Four participants wrote comments that will be addressed in Chapter V:

1. "My Superintendent does not know how to turn the computer on!"

2. "Limited funding does not allow the district to spend the appropriate amount of monies on the integration of technology."

3. "Overall, I find the skills/practice implementation of technology increases with grade level. 2nd grade teachers vs HS teachers (example) HS teacher's skills (overall) are much better"

4. "Answers reflect K-12 overall practices and realities (K-5, 6-8, 9-12). Some configurations do better than others for various implementation initiatives. Insufficient staff and budgets to support teachers has been the predominant barrier."

Research Questions

Research Question 1: What is the impact of district educational technology programs for Essex County teachers on the level of technology integration into their practice as perceived by district technology coordinators?

The research question was formulated on the prediction that level of technology integration would have a statistically significant impact on teacher practice. Because the respondents were not paired and selected only the first two of the three possible choices (Low, Medium, or High) on Question 1, an Independent Samples *t-test* was run. As indicated in Table 46, the mean for the Low group (n=4) was 103.25 with a standard deviation of 18.55398, and the mean for the Medium group (n=10) was higher at 110.30. The observed *t*-value for this test was -.855 with a p-value of .409 and degrees of freedom equal to 12. Because the p-value is greater than the .05 level of significance, the test revealed that overall, there is no significant impact of the level of technology integration on teacher practice as perceived by district technology coordinators.

Table 46: T-Test for Level of Teachers' Technology Integration

Group Statistics

	Level of Teachers' Technology Integration	N	Mean	Std. Deviation	Std. Error Mean
Total	Low	4	103.2500	18.55398	9.27699
	Medium	10	110.3000	12.01897	3.80073

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Total	Equal variances assumed	2.754	.123	-.855	12	.409	-7.05000	8.24872
	Equal variances not assumed			-.703	4.054	.520	-7.05000	10.02537

Based on Research Question 1, four null hypotheses were formulated:

H_1 - There is no significant difference between access to technology and the level of technology integration by teachers in Essex County school districts.

To test this Hypothesis, a *t*-test was performed using the variables related to Access. See Table 47.

Table 47: T-Test Hypothesis 1

Group Statistics

	Level of Teachers' Technology Integration	N	Mean	Std. Deviation	Std. Error Mean
Access	Low	4	18.7500	7.63217	3.81608
	Medium	10	22.6000	7.21418	2.28133

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Access	Equal variances assumed	.005	.943	-.889	12	.392	-3.85000	4.33111
	Equal variances not assumed			-.866	5.302	.424	-3.85000	4.44600

For the Low group (n=4), the mean was 18.75 with a standard deviation of 7.63217, and the mean for the Medium group (n=10) was higher at 22.60 with a standard deviation of 7.21418. The observed *t*-value is -.889 with degrees of freedom equal to 12. The two-tailed probability value of .392 is greater than .05 and is, therefore, not considered significant. This test revealed that there is no significant influence of access to technology on teacher practice with regard to level of technology integration as perceived by district technology coordinators.

H_2 - There is no significant difference between school climate factors related to technology and the level of technology integration by teachers in Essex County school districts.

To test this Hypothesis, a *t*-test was performed using the variables related to School Climate. See Table 48.

Table 48: T-Test Hypothesis 2

Group Statistics

	Level of Teachers' Technology Integration	N	Mean	Std. Deviation	Std. Error Mean
School Climate	Low	4	51.5000	6.02771	3.01386
	Medium	10	55.7000	4.78539	1.51327

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
School Climate	Equal variances assumed	.833	.379	-1.385	12	.191	-4.20000	3.03157
	Equal variances not assumed			-1.245	4.606	.273	-4.20000	3.37244

For the Low group (n=4), the mean was 51.50 with a standard deviation of 6.02771, and the mean for the Medium group (n=10) was higher at 55.70 with a standard deviation of 4.78539. The observed *t*-value is -1.385 with degrees of freedom equal to 12. The two-tailed probability value of .191 is greater than .05 and is, therefore, not considered significant. This test revealed that there is no significant influence of school climate factors related to technology on teacher practice with regard to level of technology integration as perceived by district technology coordinators.

H_3 - There is no significant difference between teacher support factors related to technology and the level of technology integration by teachers in Essex County school districts.

To test this Hypothesis, a *t*-test was performed using the variables related to Support. See Table 49.

Table 49: T-Test Hypothesis 3

Group Statistics

	Level of Teachers' Technology Integration	N	Mean	Std. Deviation	Std. Error Mean
Support	Low	4	14.0000	1.41421	.70711
	Medium	10	12.7000	3.56059	1.12596

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Support	Equal variances assumed	2.294	.156	.695	12	.501	1.30000	1.87161
	Equal variances not assumed			.978	11.931	.348	1.30000	1.32958

For the Low group (n=4), the mean was 14.00 with a standard deviation of 1.41421, and the mean for the Medium group (n=10) was lower at 12.70 with a standard deviation of 3.56059. The observed *t*-value is .695 with degrees of freedom equal to 12. The two-tailed probability value of .501 is greater than .05 and is, therefore, not considered significant. This test revealed that there is no significant influence of technology support factors related to technology on teacher practice with regard to level of technology integration as perceived by district technology coordinators.

H_4 - There is no significant difference between incentives provided for professional development and the level of technology integration by teachers in Essex County school districts.

To test this Hypothesis, a *t*-test was performed using the variables related to Incentives. See Table 50.

Table 50: T-Test Hypothesis 4

Group Statistics

	Level of Teachers' Technology Integration	N	Mean	Std. Deviation	Std. Error Mean
Incentives	Low	4	19.0000	7.87401	3.93700
	Medium	10	19.3000	3.74314	1.18369

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Incentives	Equal variances assumed	8.433	.013	-.099	12	.922	-.30000	3.01710
	Equal variances not assumed			-.073	3.557	.946	-.30000	4.11110

For the Low group (n=4), the mean was 19.00 with a standard deviation of 7.87401, and the mean for the Medium group (n=10) was higher at 19.3 with a standard deviation of 3.74314. The observed *t*-value is -.099 with degrees of freedom equal to 12. The two-tailed probability value of .922 is greater than .05 and is, therefore, not considered significant. This test revealed that there is no significant influence of providing incentives to teachers for professional development on their practice with regard to level of technology integration as perceived by district technology coordinators.

In conclusion regarding Research Question 1, all four tests of the subscales show that the difference between the means is not statistically significant and that the null hypotheses should not be rejected. In terms of this study, district technology programs as measured by the factors of access, school climate, support, and incentives with regard to technology have no significant effect on teacher practice when assessed by level of technology integration as Low or Medium. This finding may be attributed to the small number of participants, but more likely, is the result of none of the participants selecting the High level of technology integration to characterize their teachers. Without

participation from teachers with a high degree of technology integration, it may have been impossible to determine which factors most influence their use of technology.

Research Question 2: What is the impact of District Factor Group (i.e., socioeconomic status) on the level of technology integration in the practice of Essex County teachers?

This research question was formulated on the prediction that socioeconomic status (DFG) would have a statistically significant impact on teacher practice as it relates to technology integration. Respondents selected one of the four possible choices on Question 42, and a one-way analysis of variance (ANOVA) was calculated to compare the means between the DFG groups to answer this research question. As indicated in Table 51, the ANOVA with an f-value of .305 is not statistically significant at the .821 level suggesting that there is no significant impact of socioeconomic factors on teacher practice as perceived by district technology coordinators.

Table 51: ANOVA Impact of DFG

Oneway

ANOVA

Total

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	207.690	3	69.230	.305	.821
Within Groups	2267.167	10	226.717		
Total	2474.857	13			

Because the ANOVA treatment only determines if there is a statistically significant difference between group means and not which pair of means demonstrated

the difference, a Tukey post hoc test was performed. (See Table 52.) The results of this post hoc test reveal that the comparison of paired means showed no statistically significant results. Thus, there is no statistical significance overall in the influence of DFG's on the level of technology integration in teacher practice as perceived by district technology coordinators.

Table 52: Post Hoc Tests Impact of DFG

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Total

Tukey HSD

(I) DFG	(J) DFG	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B-H	11.33333	13.74520	.842	-30.7181	53.3848
	I	7.00000	12.07255	.936	-29.9342	43.9342
	J	12.50000	15.05711	.839	-33.5651	58.5651
B-H	A	-11.33333	13.74520	.842	-53.3848	30.7181
	I	-4.33333	10.39040	.974	-36.1212	27.4546
	J	1.16667	13.74520	1.000	-40.8848	43.2181
I	A	-7.00000	12.07255	.936	-43.9342	29.9342
	B-H	4.33333	10.39040	.974	-27.4546	36.1212
	J	5.50000	12.07255	.967	-31.4342	42.4342
J	A	-12.50000	15.05711	.839	-58.5651	33.5651
	B-H	-1.16667	13.74520	1.000	-43.2181	40.8848
	I	-5.50000	12.07255	.967	-42.4342	31.4342

Homogeneous Subsets

Total

Tukey HSD[a,b]

DFG	N	Subset for alpha = .05
		1
J	2	103.5000
B-H	3	104.6667
I	7	109.0000
A	2	116.0000
Sig.		.771

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 2.710.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Based on Research Question 2, four null hypotheses were formulated:

H_5 - There is no significant difference between access to technology and the District Factor Group of Essex County school districts.

To test this Hypothesis, an ANOVA was performed using the variables related to Access which reported an f-value of .701 which, at p=.573, is not statistically significant. The Tukey report of the subsets related to Access compared by DFG showed a significance level of .736 which is not statistically significant and, therefore, indicates that there is no significant impact on Access to technology by DFG. See Table 53.

Table 53: ANOVA Hypothesis 5

Oneway

ANOVA

Access

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	119.119	3	39.706	.701	.573
Within Groups	566.381	10	56.638		
Total	685.500	13			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Access

Tukey HSD

(I) DFG	(J) DFG	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B-H	6.66667	6.87011	.769	-14.3514	27.6848
	I	.42857	6.03409	1.000	-18.0318	18.8890
	J	6.00000	7.52583	.854	-17.0242	29.0242
B-H	A	-6.66667	6.87011	.769	-27.6848	14.3514
	I	-6.23810	5.19332	.640	-22.1263	9.6501
	J	-.66667	6.87011	1.000	-21.6848	20.3514
I	A	-.42857	6.03409	1.000	-18.8890	18.0318
	B-H	6.23810	5.19332	.640	-9.6501	22.1263
	J	5.57143	6.03409	.793	-12.8890	24.0318
J	A	-6.00000	7.52583	.854	-29.0242	17.0242
	B-H	.66667	6.87011	1.000	-20.3514	21.6848
	I	-5.57143	6.03409	.793	-24.0318	12.8890

Homogeneous Subsets

Access

Tukey HSD[a,b]

DFG	N	Subset for alpha = .05
		1
B-H	3	17.3333
J	2	18.0000
I	7	23.5714
A	2	24.0000
Sig.		.736

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 2.710.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

H_6 - There is no significant difference between school climate factors related to technology and the District Factor Group of Essex County school districts.

To test this Hypothesis, an ANOVA was performed using the variables related to School Climate which reported an f-value of .383 which, at p=.768, is not statistically significant. The Tukey report of the subsets related to School Climate compared by DFG showed a significance level of .744 which is not statistically significant and, therefore, indicates that there is no significant impact on school climate factors related to technology by DFG. See Table 54.

Table 54: ANOVA Hypothesis 6

Oneway

ANOVA

School Climate

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	37.643	3	12.548	.383	.768
Within Groups	327.857	10	32.786		
Total	365.500	13			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: School Climate
Tukey HSD

(I) DFG	(J) DFG	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B-H	4.50000	5.22699	.824	-11.4912	20.4912
	I	4.64286	4.59092	.747	-9.4024	18.6881
	J	5.00000	5.72588	.818	-12.5175	22.5175
B-H	A	-4.50000	5.22699	.824	-20.4912	11.4912
	I	.14286	3.95123	1.000	-11.9454	12.2311
	J	.50000	5.22699	1.000	-15.4912	16.4912
I	A	-4.64286	4.59092	.747	-18.6881	9.4024
	B-H	-.14286	3.95123	1.000	-12.2311	11.9454
	J	.35714	4.59092	1.000	-13.6881	14.4024
J	A	-5.00000	5.72588	.818	-22.5175	12.5175
	B-H	-.50000	5.22699	1.000	-16.4912	15.4912
	I	-.35714	4.59092	1.000	-14.4024	13.6881

Homogeneous Subsets

School Climate

Tukey HSD[a,b]

DFG	N	Subset for alpha = .05
		1
J	2	53.5000
I	7	53.8571
B-H	3	54.0000
A	2	58.5000
Sig.		.744

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 2.710.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

H_7 - There is no significant difference between teacher support factors and the District Factor Group of Essex County school districts.

To test this Hypothesis, an ANOVA was performed using the variables related to Support which reported an f-value of 4.805 which, at p=.025, is not statistically significant. The Tukey report of the subsets related to Support compared by DFG showed

a significance level of .072 which is not statistically significant and, therefore, indicates that there is no significant impact on support factors related to technology by DFG. See Table 55.

Table 55: ANOVA Hypothesis 7

Oneway

ANOVA

Support

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	73.762	3	24.587	4.805	.025
Within Groups	51.167	10	5.117		
Total	124.929	13			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Support

Tukey HSD

(I) DFG	(J) DFG	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B-H	.83333	2.06492	.977	-5.4840	7.1507
	I	5.50000	1.81364	.052	-.0486	11.0486
	J	3.50000	2.26201	.448	-3.4203	10.4203
B-H	A	-.83333	2.06492	.977	-7.1507	5.4840
	I	4.66667	1.56093	.056	-.1088	9.4421
	J	2.66667	2.06492	.588	-3.6507	8.9840
I	A	-5.50000	1.81364	.052	-11.0486	.0486
	B-H	-4.66667	1.56093	.056	-9.4421	.1088
	J	-2.00000	1.81364	.696	-7.5486	3.5486
J	A	-3.50000	2.26201	.448	-10.4203	3.4203
	B-H	-2.66667	2.06492	.588	-8.9840	3.6507
	I	2.00000	1.81364	.696	-3.5486	7.5486

Homogeneous Subsets

Support

Tukey HSD[a,b]

DFG	N	Subset for alpha = .05 1
I	7	11.0000
J	2	13.0000
B-H	3	15.6667
A	2	16.5000
Sig.		.072

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 2.710.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

H_8 - There is no significant difference between incentives provided to teachers and the District Factor Group of Essex County school districts.

To test this Hypothesis, an ANOVA was performed using the variables related to Incentives which reported an f-value of .354 which, at p=.787, is not statistically significant. The Tukey report of the subsets related to Support compared by DFG showed a significance level of .861 which is not statistically significant and, therefore, indicates that there is no significant impact on incentives for professional development related to technology by DFG. See Table 56.

Table 56: ANOVA Hypothesis 8

Oneway

ANOVA

Incentives

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29.976	3	9.992	.354	.787
Within Groups	282.381	10	28.238		
Total	312.357	13			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Incentives

Tukey HSD

(I) DFG	(J) DFG	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B-H	-.66667	4.85095	.999	-15.5075	14.1741
	I	-3.57143	4.26064	.835	-16.6062	9.4634
	J	-2.00000	5.31395	.981	-18.2573	14.2573
B-H	A	.66667	4.85095	.999	-14.1741	15.5075
	I	-2.90476	3.66698	.856	-14.1233	8.3138
	J	-1.33333	4.85095	.992	-16.1741	13.5075
I	A	3.57143	4.26064	.835	-9.4634	16.6062
	B-H	2.90476	3.66698	.856	-8.3138	14.1233
	J	1.57143	4.26064	.982	-11.4634	14.6062
J	A	2.00000	5.31395	.981	-14.2573	18.2573
	B-H	1.33333	4.85095	.992	-13.5075	16.1741
	I	-1.57143	4.26064	.982	-14.6062	11.4634

Homogeneous Subsets

Incentives

Tukey HSD[a,b]

DFG	N	Subset for alpha = .05
		1
A	2	17.0000
B-H	3	17.6667
J	2	19.0000
I	7	20.5714
Sig.		.861

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 2.710.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

In conclusion regarding Research Question 2, all four tests of the subscales show that the difference between the means is not statistically significant and that the null hypotheses should not be rejected. In terms of this study, the perceived level of technology integration in teacher practice by district technology coordinators as measured by the factors of access, school climate, support, and incentives with regard to technology

had no significant impact on teacher practice when assessed by level of socioeconomic status (DFG). Again, this finding may be attributed to the small number of participants, but, more likely, it is due to the fact that funding for technology is tight in all districts. More discussion of this situation will be provided in Chapter V.

Summary

In this chapter, the data was analyzed using descriptive statistics. To address the first research question regarding the impact of level of technology integration as perceived by district technology coordinators on teacher practice, t-tests were conducted. These tests indicated that there were no significant impacts by level of teacher integration in their practice either overall or by any of the four subsets of Access, School Climate, Support, and Incentives. To address the second research question regarding the impact of DFG on teacher practice with regard to technology, ANOVA's were performed. These tests indicated that there were no significant impacts by DFG's on teacher practice either overall or by any of the four subsets of Access, School Climate, Support, and Incentives. The next chapter will present further analysis of these findings along with final conclusions and recommendations.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this research was to analyze the perceptions of district technology coordinators in Essex County, New Jersey, with regard to the impact of their technology programs on teacher practice in an effort to ascertain which aspects of their programs had the greatest impact. The project was carried out through a researcher-designed survey which sought to obtain information in the following areas: access to technology, school climate regarding use of technology, support mechanisms available to teachers regarding technology use, and incentives for professional development in technology integration.

The survey was completed by fourteen of the twenty-one district technology coordinators in Essex County. Frequency, descriptive, t-tests, ANOVA, and reliability analyses were conducted through the use of SPSS. Analysis of these quantitative research methods provided answers to the research questions.

Statement of the Research Questions

There were two primary research questions in this study:

Research Question 1: What is the impact of district educational technology programs for Essex County teachers on the level of technology integration into their practice as perceived by district technology coordinators?

Research Question 2: What is the impact of District Factor Group (i.e., socioeconomic status) on the level of technology integration in the practice of Essex County teachers?

These two primary research questions were reflected in the first and last questions of the survey instrument respectively.

Subsidiary Questions

The subsidiary questions were organized into four subsections based on what the review of the literature indicated were salient influences on teacher practice as either barriers or supports. Thus, the subsidiary questions were:

1. Does the level of technology integration or District Factor Group impact access to technology in Essex County school districts?

The literature review indicated that greater access to technology (Caissey, 1987; Sheingold, Martin & Endreweit, 1985; Sturdivant, 1989; Gursky, 1991; OTA Report, 1995; Glennan & Melmed, 1996; Presskill, 1998; *Education Week*, 1999; SRI International, 2002; Dickard, 2003; and Pflaum, 2004) increased the likelihood of teachers integrating technology into their practice. The data analysis of the Subsections on "Access" did not support this contention. As mentioned in Chapter IV, it may be useful to note that comparison of the responses to Questions 3 and 4 indicate that half of the teachers have less access to technology for teaching than they do for personal professional use. This may offer a glimpse into another access issue described in *Education Week* (2005), a shift in emphasis for technology funding from an instructional focus to one of analyzing achievement data. Overall, however, there is insufficient evidence to confirm or refute that access to technology in Essex County school districts has an impact on teacher practice.

2. Does the level of technology integration or District Factor Group impact school climate as it relates to teacher level of technology integration in Essex County school districts?

In regard to school climate, the literature review revealed that lack of support from principals and other administrators (OTA Report, 1995; Langran, 2006); lack of a clear vision for technology use (Glennan & Melmed, 1996); lack of leadership and community support (SRI International, 2002); the pressures of standardized testing (SRI International, 2002; Pflaum, 2004; and *Education Week*, 2005) and lack of a constructivist approach (Carver, 1988; Dimock, 2000; Becker & Reil, 2000; Honey, Culp & Carrigg, 1999; Green & O'Brien, 2002; Thornburg, 2003; and Elkind, 2004) impede the integration of technology by teachers. Again, the results of the analysis of the data were not statistically significant, and, therefore, there is insufficient evidence to confirm or refute the existing literature.

3. Does the level of technology integration or District Factor Group impact teacher support factors as they relate to teacher level of technology integration in Essex County school districts?

The literature related to support suggested that onsite tech support (OTA Report, 1995; SRI International, 2002), mentoring (Sparks & Hirsh, 1999), and training on new equipment (Glennan & Melmed, 1996) are critical factors in optimal use of technology in teacher practice. Again, there is insufficient evidence from the data analyzed in the subsection on support to confirm or refute the existing literature.

4. Does the level of technology integration or District Factor Group impact teacher incentives as they relate to teacher level of technology integration in Essex County school districts?

The final subset of critical factors influencing teacher practice and technology as gleaned from the literature (Bauer, 2002; Gursky, 1991; Glennan & Melmed, 1996; Sparks & Hirsh, 1999; Valdez, et al, 2000; and *Education Week*, 2005) were incentives provided to teachers for participating in technology-related professional development. These included extra pay, credit hours, equipment lending for personal use, release time, conference attendance with expenses paid by the district, and special acknowledgements. Once again, the results of the data analysis were not statistically significant, and, therefore, there is insufficient evidence to confirm or refute the existing literature.

Answering the Primary Research Questions

To answer the primary research questions, it was necessary to ascertain whether levels of technology integration and/or DFG have an impact on teacher practice. In an effort to assure uniformity of external factors, the researcher elected to survey the district technology coordinators in only one of New Jersey's twenty-one counties because the State uses a county-based format to collect data and interact with district technology coordinators. Because of its profile as a microcosm of the State as a whole by virtue of its range of DFG's, Essex County was chosen to be studied. Although a representative sample (N=14) of the twenty-one districts took part in the study, this number may have been too small because none of the fourteen participants characterized his/her district as having a "High" level of technology integration. This was unanticipated as many of the participating school districts have been recognized by the State as recipients of Best

Practices Awards, discretionary grants, and other commendations. That none would rate his/her district as "High" was surprising as well as problematic and may account for the lack of statistical significance in the data analysis. It might have been the case that the definition of "High" was too ill-defined thus leading to hesitation on the part of the technology coordinators to categorize their schools as such because they may have felt that they would have had to "stretch the truth" to fit the criteria which was not at all the intention. While this leaves the researcher unable to offer any definitive answers to the research questions, it does point out the need for more investment in technology programs across the board. This assertion is supported by two of the four comments submitted in the open-ended comment section at the end of survey which referenced the deleterious impact of "tight budgets" and "lack of funds."

Recommendations for Further Research

A review of the results of the data analysis and comments provided in the open-ended section of the survey led to the following suggestions for further research:

1. Because no one in this particular sample (fourteen out of fourteen) rated his/her district as "High" in level of technology integration, further research should attempt to include a broader range of districts to ensure that "High" integrators as well as "Medium" and "Low" are represented. Perhaps this could be accomplished by including private schools in future studies; this research indicates that the gap between private and public appears to be growing and that the issues are more than just economic.

2. While the sample population reflects the diversity of New Jersey school districts, it may, in fact, have included too much diversity of size, socio-economic status,

and population density. Future studies that focus on a narrower band of these factors while including more diversity of technology integration may do better at teasing out statistically significant differences.

3. Two of the respondents in the open-ended section made comments as to the difficulties of answering the survey questions based on their districts as a whole. While this was not mentioned by participants in the field-testing, it appears to be a valid critique, and further research may profit from selecting only elementary, middle, or high school teachers as its focus.

4. As indicated in Chapter III, the literature on technology and teacher practice offers a myriad of factors that influence technology integration. Further studies may do better by limiting their focus to just one of the four subsets, i.e., access, school climate, support, or incentives.

5. As mentioned earlier, the difference between access to technology for personal professional use and classroom instruction might provide a worthwhile research topic for further study.

6. Although only four of the respondents provided comments, these were helpful in gaining additional perspective. Because this study used only quantitative methodology, further studies might find the addition of qualitative methodology such as interviewing the technology coordinators and/or visiting the schools beneficial in order to capture further explanations as to which specific variables impact teacher technology integration.

Recommendations for Policy and Practice

As discussed in Chapter I, the demands on school districts to increase technology integration in teacher practice increases annually with no end in sight. With budgets tight, research to ascertain which factors best assist teachers in their efforts to integrate technology into their practice is essential and timely. Reflection on this research led to three broad policy recommendations:

1. Lack of statistical significance based on DFG's (socio-economic status) suggests that funding is an issue for all districts. Comparing anecdotal evidence of teacher proficiency as demonstrated by Best Practice Awards to the findings that overall levels of teacher integration are not considered "High" reveals the possibility of the unfortunate "pockets of excellence" phenomenon. A realignment of fiscal and administrative support to focus on a more comprehensive effort to improve all teachers' technology integration skills would be helpful. Additional funding streams provided to all districts in New Jersey as was the case years ago through the State (e.g., Distance Learning Network Aid) and federal pass-through funds (e.g., Technology Literacy Challenge Funds) would go a long way in helping districts improve their programs. As noted in Guenther's research (2002) "Teachers from NJTLCF schools included in the sample population reported higher levels of technology integration in six out of twelve classroom computer applications when compared to their counterparts in a non-NJTLCF school" (pp.99-100).

2. According to Harris (2008) "...research evidence indicates that 30 hours of focused professional development, on average, is required to change teachers' professional practices" (p.18). Of the respondents in this survey, only three reported offering 25+ hours of professional development on technology per year (Question 5) and ten of the

fourteen reported that all or most of the training offered in their districts was voluntary not mandatory (Question 6). This apparent disparity between the optimum number of hours of professional development required to change teacher practice and the number actually taken by teachers could be addressed by modifying the State requirements for individual teachers for professional development totaling "100 hours every five years." At present, there is no requirement that any of these hours be spent in technology-related professional development. Setting a mandatory number of hours for such training would begin to address this gap.

3. Finally, it is evident from the responses to the survey that every district participating in the study is attempting to do everything that has been identified as potentially beneficial. This effort is not tacitly sanctioned by the State but is given support by the breadth of questions on the annual State Technology Survey and the District Technology Plans that are required every three years. Those State requirements, as well as each district's "Report Card," put enormous pressure on technology coordinators and superintendents to try to "do it all." If this research offers any possible finding of merit, it may be that it is time for State and federal policy makers to narrow their focus and allow districts to concentrate on what works best for them.

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APPENDIX A

Integration of Technology in Teacher Practice
Technology Coordinators' Survey

Please do NOT put your name or any other identifying information on this questionnaire.

For the following questions, please consider "**teachers**" to mean regular elementary teachers – not "specials" like music, art, physical education, computer, etc. – and for elementary schools with subject-specific teachers and for middle and high schools, consider only language arts, math, science, and social studies teachers including special education teachers who teach those subjects.

Please put a check or an X on the line next to the answer of your choice:

1. How would you characterize the level of technology integration by teachers in your district?

_____ LOW – the **majority** of teachers make some use of technology for personal professional use (i.e., word processing, accessing the Internet, using e-mail, operating district programs for attendance, etc.) and/or to embellish teacher presentations (LoTi levels 0-1; ACOT Entry and Adoption levels).

_____ MEDIUM – the **majority** of teachers use technology for personal professional use AND to support instruction by including software programs, multimedia, and the Internet in their instruction (LoTi levels 2-3; ACOT Adaptation level).

_____ HIGH – the **majority** of teachers have *integrated a wide-range of technologies into the routine of their personal professional life and classroom instruction* using technology as a catalyst for collaborative, project-based, student-centered learning (LoTi levels 4-6; ACOT Appropriation and Invention Levels).

Questions on Access:

2. Which of the following best describes how many computers your teachers have in their classrooms?

___ None ___ 1 ___ 2-4 ___ At least 1 for every 4 students ___ One for each student

3. How would you rate your teachers' access to the Internet for personal professional use?

___ Nonexistent ___ Poor ___ Fair ___ Good ___ Excellent

4. How would you rate your teachers' access to the Internet for their *teaching practice*?

___ Nonexistent ___ Poor ___ Fair ___ Good ___ Excellent

5. On average, how many hours of professional development on technology does your district offer to each teacher per year?

____ None ____ 1-8 ____ 9-16 ____ 17-24 ____ 25+

6. Is this training mandatory or voluntary?

____ No training is provided
____ ALL attendance is voluntary
____ MOST attendance is VOLUNTARY; some is mandatory
____ MOST attendance is MANDATORY; some is voluntary
____ ALL attendance is mandatory

7. On a yearly basis, is teachers' personal professional use of technology (i.e., word processing, accessing the Internet, using e-mail, operating district programs for attendance, etc.) assessed and training designed accordingly?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

8. How often are written surveys used to evaluate teachers' personal professional use of technology?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

9. How often are observed demonstrations used to evaluate teachers' personal professional use of technology?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

10. On a yearly basis, is teachers' *ability to integrate technology into their practice* (i.e., incorporate a wide-range of technologies into their classroom instruction) assessed and training provided accordingly?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

11. How often are written surveys used to evaluate teachers' ability to *integrate technology into their practice*?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

12. How often are observed demonstrations or presentations of final projects used to evaluate teachers' ability to *integrate technology into their practice*?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

13. How often do formal written evaluations of teachers by their supervisors include a category that addresses personal professional use of technology?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

14. How often do formal written evaluations of teachers by their supervisors include a category that addresses *technology integration* into their practice?

___ Never ___ Sometimes ___ About half of the time ___ Often ___ Always

Questions on School Climate:

15. To what extent do you agree that your district promotes a culture that considers digital learning or computer-assisted instruction as fundamental?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

16. To what extent do you agree that your district promotes a culture that considers electronic communication as fundamental?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

17. To what extent do you agree that student discipline issues are an impediment to teacher use of technology in their practice?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

18. To what extent do you agree that equipment security concerns are an impediment to teacher use of technology in their practice?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

19. To what extent do you agree that your district encourages a constructivist (i.e., collaborative, project-based, student-centered learning) rather than a traditional approach to teaching and learning?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

20. To what extent do you agree that the technology training program for teachers in your district models a constructivist format (i.e., teachers work collaboratively using the technology in an exploratory and non-threatening way with time for reflection)?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

21. To what extent do you agree that the technology training program in your district makes an effort to demonstrate how teachers can be a dynamic part of a larger community (such as reaching out to parents via e-mail, maintaining a website, running after-school programs, etc.)?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

22. To what extent do you agree that teachers are discouraged from integrating technology into their practice by the pressures of standardized testing?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

23. To what extent do you agree that teachers' recommendations are always included in instructional *software* purchasing decisions?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

24. To what extent do you agree that teachers' recommendations are always included in instructional *equipment* purchases?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

25. To what extent do you agree that curriculum revision committees always include extensive and appropriate use of technology integration in revised curricula?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

26. To what extent do you agree that your Superintendent supports technology and models its use?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

27. To what extent do you agree that your Principals support technology and model its use?

___ Strongly disagree ___ Disagree ___ Neutral or not applicable ___ Agree ___ Strongly agree

28. To what extent do you agree that your Curriculum Director supports technology and models its use?

___ Strongly disagree ___ Disagree ___ Neutral or not applicable ___ Agree ___ Strongly agree

29. To what extent do you agree that your community is supportive of educational technology?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

Questions on Support:

30. To what extent do you agree that mentoring or other one-on-one support in integrating technology is available to all teachers?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

31. To what extent do you agree that every building in your district has at least one full-time, onsite staff person to provide technical assistance and equipment maintenance services?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

32. To what extent do you agree that students are considered an integral part of your district's technical support system?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

33. To what extent do you agree that your district offers support to all teachers through electronic networks and online forums (e.g., NEA's School Renewal Network; Tapped In; BigChalk, Blackboard, Inc.; eBoards)?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

34. To what extent do you agree that when new equipment and software are purchased in your district training is always provided to the teachers who are expected to use it?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

35. To what extent do you agree that partnerships with institutions of higher education are considered an integral part of your district's professional development program in *technology*?

___ Strongly disagree ___ Disagree ___ Neutral ___ Agree ___ Strongly agree

Questions on Incentives to teachers for participating in technology integration staff development:

36. Extra pay is offered:

___ Never ___ Sometimes ___ Half of the time ____ Often ____ Always

37. Credit is given towards the teachers' "100 hours" of required professional development:

___ Never ___ Sometimes ___ Half of the time ____ Often ____ Always

38. Laptops or other pieces of equipment are lent to teachers for personal use:

___ Never ___ Sometimes ___ Half of the time ____ Often ____ Always

39. Release time is given to teachers for taking technology training:

___ Never ___ Sometimes ___ Half of the time ____ Often ____ Always

40. Teachers are sent to out-of-district conferences with expenses paid:

___ Never ___ Sometimes ___ Half of the time ____ Often ____ Always

41. Certificates or other special acknowledgments are awarded to teachers:

___ Never ___ Sometimes ___ Half of the time ____ Often ____ Always

Demographic Question:

42. In which of the following District Factor Groups (DFG's) is your district classified?
_____ A _____ B - H _____ I _____ J (Note: B to H combined to protect anonymity.)

Please add any comments that you feel would be helpful in understanding your responses to the questions above and/or to express any thoughts about the technology integration program in your district:

THANK YOU for your time and effort in completing this survey. Your participation is sincerely appreciated.