RELATIONSHIP OF TECHNOLOGY LEVEL OF PROGRESS TO SCHOOL DISTRICT DEMOGRAPHIC VARIABLES

A Dissertation

by

TRINA JOY DAVIS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2005

Major Subject: Curriculum and Instruction

RELATIONSHIP OF TECHNOLOGY LEVEL OF PROGRESS TO

SCHOOL DISTRICT DEMOGRAPHIC VARIABLES

A Dissertation

by

TRINA JOY DAVIS

Submitted to Texas A&M University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Approved as to style and content by:

Francis E. Clark (Co-Chair of Committee)	Lauren D. Cifuentes (Co-Chair of Committee)
Jon J. Denton (Member)	James F. McNamara (Member)
Dennie Smith (Head of Department)	

May 2005

Major Subject: Curriculum and Instruction

ABSTRACT

Relationship of Technology Level of Progress to

School District Demographic Variables. (May 2005)

Trina Joy Davis, B.S., Virginia Commonwealth University;

M.S., Prairie View A&M University

Co-Chairs of Advisory Committee: Dr. Francis E. Clark
Dr. Lauren D. Cifuentes

An exploratory study, using Texas public school district data, was conducted to determine the relationship between each of two demographic characteristics, student enrollment and the percentage of economically disadvantaged students, and the technology level of progress. In addition, the relationship between the two demographic characteristics, taken together, and the technology level of progress was investigated.

The researcher found that across each of the six Educator Preparation and Development (EPD) focus areas, student enrollment, and the percentage of economically disadvantaged students were not related to the technology level of progress. The researcher also found that there was no meaningful multivariate relationship for linking student enrollment and the percentage of economically disadvantaged students, taken together, to the technology level of progress.

A major finding that emerged from the analyses was the fact that the majority of school districts across the student enrollment and percentage of economically disadvantaged students categories were at the same level of technology progress, Developing Tech. Moreover, the percent of school districts not progressing beyond the

Developing Tech level was differential for each of the six EPD focus areas. Two conclusions emerged from the empirical evidence. First, although the Target Tech level percentages were all small, two of the 20 types of Texas school districts consistently yielded the highest percents across the six EPD focus areas. These were school district type four (SE Under 500, PEDS 75% or Greater) and school district type twelve (SE 1,001-5,000, PEDS 75% or Greater). Second and more significant in terms of creating future interventions, programs, and incentives, empirical evidence in this study suggests that much work still remains to be done if all Texas school districts are to reach the ultimate objective where all school districts reach the Target Tech level on all six focus areas. The current study informs the digital divide literature as it relates to school district characteristics. The findings from this study suggest that long-range technology planning and funding initiatives in recent years have been successful, in beginning to address digital divide issues related to Educator Preparation and Development technology progress in public school districts.

DEDICATION

This completed work and milestone in my educational journey is dedicated to my remarkable family and dear friends who I am forever indebted to for their love and support. First, I dedicate this to my parents, Mr. Earl Davis and Reverend Leautry Davis, who have taught me so much about the importance of faith, integrity, perseverance, and academic excellence. To my sister Erwann, you continue to make such an extraordinary difference in the lives of so many children; I especially thank you for all that you are in my life. To my best friend Missy, I am profoundly grateful for your friendship, and the encouragement and support that you have given me throughout this process. Thank you for surrounding me with your beautiful art work. Ronald thanks so much for all of your support. Christine, thank you for the early morning prayers with mother. To all of you, we made it!

This work is also dedicated to my amazing brother Toussaint and my nephews, Isaac, Juwan, Toussaint, and David. May you always know that through God's blessings, the sky is the limit. Finally, this work is dedicated to my grandmother, Beatrice Cotton. I know that you are proud, you really wanted this for me. To my entire circle of family and friends, thank you.

ACKNOWLEDGMENTS

The completion of this work marks the end of an amazing journey. I would like to thank and acknowledge the members of my committee for the unique contributions, guidance, and support that they have offered. First, I would like to thank my co-chairs, Dr. Francis Clark and Dr. Lauren Cifuentes, for helping to guide this effort. I have learned a lot. I would like to thank Dr. James McNamara for his insights, and the generosity of time that he provided in this effort. I would also like to thank Dr. Jon Denton for the extraordinary mentoring and support that he has given me. I can't thank you enough for allowing me to grow and soar at eEducation under your leadership. I would also like to thank my friends and colleagues in the eEducation Group and across the college, for their ongoing support.

Finally, the development and alignment of the *Texas STaR Chart* to the *Long-Range Plan for Technology* was a visionary effort on the part of the educational technology leaders at the Texas Education Agency and the Educational Technology Advisory Committee. I was honored to serve as a member and co-chair of the ETAC from 2001-2003, which was made up of pioneers and technology leaders from across the state. I extend my deepest gratitude and thanks to Anita, Nancy, Don and my fellow ETAC members for their support as I began this undertaking.

TABLE OF CONTENTS

Page

LIST OF TABLES

TABLE Page

LIST OF FIGURES

FIGURES Page

CHAPTER I

INTRODUCTION

Central to strategic technology planning efforts, states, districts, and schools should continually measure progress against educational objectives. Progress measures and improvement strategies can be employed that move educational institutions and thus learners and other stakeholder groups along a continuum toward effectively integrating technology in schools (Chief Executive Officer [CEO] Forum, 1999; Educational Technology Advisory Committee [ETAC], 2001). Progress measures should span all types of districts to insure digital equity across states, districts, and schools.

As evidenced by initiatives like the CEO Forum on Education and Technology (1997, 1999, 2000, 2001), a recent national trend has focused on the need for continual data collection that helps in gauging progress related to school district technology readiness and use. Authors of several national studies (Barron, Kemker, Harmes & Kalaydjian, 2003; Hall & Loucks, 1981; Lemke & Coughlin, 1998) suggest that educators pass through distinct stages when adopting technologies or innovations. For example, Lemke and Coughlin (1998) present a framework which provides a set of indicators for educators to chart their course toward the effective use of technology. Consistent with these efforts, the CEO Forum on Education and Technology (1997) established a baseline measure to track the progress of schools in integrating and

---

This dissertation follows the style of the *American Educational Research Journal*.

using technology in classrooms. The CEO Forum on Education and Technology (1997) report offered a snapshot of where the nation's schools stood in terms of key technology areas. The report included findings which were derived from the administration of the CEO Forum STaR Chart. Developed by the CEO Forum, to be used at the school district level, the chart features a continuum of indicators that range from Early Tech practices (with little or no technology in use) to Target Tech practices (the model for innovative use of educational technology).

Consistent with national trends, Texas educators have been committed to strategic planning for technology, as demonstrated by the development and alignment of the Texas School Technology and Readiness (STaR) Chart to the Texas *Long-Range Plan for Technology (LRPT), 1996-2010* (ETAC, 2001; Texas State Board of Education, 1996). The Texas STaR Chart, patterned after the national CEO Forum STaR Chart (CEO Forum on Education and Technology, 1997) was developed around the four key areas of the Texas *Long-Range Plan for Technology 1996-2010* (ETAC): 1) Teaching and Learning, 2) Educator Preparation and Development, 3) Administration and Support Services, and 4) Infrastructure for Technology. In the Texas STaR Chart, each key area was comprised of focus areas. For example, the six focus areas for the Educator Preparation and Development (EPD) key area were: 1) content of training; 2) capabilities of educators; 3) leadership and capabilities of administrators; 4) models of professional development; 5) levels of understanding and patterns of use; and 6) technology budget allocated to technology professional development. Ultimately, the Texas STaR Chart was designed to help school district administrators determine their progress toward meeting the goals of the Texas *Long-Range Plan for Technology* as well as the educational benchmarks established in their district (ETAC; Texas State Board of Education). In addition, stakeholders can chart progress, at the state level, toward meeting the goals of the Texas *Long-Range Plan for Technology* (Texas State Board of Education).

Although prominent in the progress reports on the Texas *Long-Range Plan for Technology*, few studies have focused on the four key areas of the plan. While Shapley, Benner, Heikes and Pieper (2002) presented the results around the four key areas of the Texas *Long-Range Plan for Technology*, a comprehensive progress measure like the Texas STaR Chart was not used in their study. The Shapley et al. study focused on evaluating the Texas Technology Literacy Challenge Fund grant program. In addition, absent from the literature are studies that specifically focus on the Educator Preparation and Development key area of the Texas *Long-Range Plan for Technology*.

Statement of the Problem

Recent large-scale, technology-related inquiries involving Texas public school districts have focused on financial support, infrastructure, content of training, professional development, capabilities of educators, capabilities of administrators, teacher and student use of technology, and program evaluation (Denton, Davis & Strader, 2001; Denton, Davis, Strader & Durbin, 2003; Denton, Davis, Strader, Jessup & Jolly, 1999; Shapley, Benner, Heikes & Pieper, 2002). These efforts have predominantly been survey research studies that have looked at areas like capabilities of educators and capabilities of administrators, in isolation. What is missing from the literature are large-scale studies that employ an integrative approach in capturing Educator Preparation and Development technology levels of progress across school districts within the state of Texas.

Statement of the Purpose

For each of the six Educator Preparation and Development (EPD) focus areas (content of training, capabilities of educators, leadership and capabilities of administrators, models of professional development, levels of understanding and patterns of use, technology budget allocated to technology professional development), the purpose was to determine the relationship between each of two demographic characteristics, student enrollment and percentage of economically disadvantaged students, and the technology level of progress. In addition, the relationship between the two demographic characteristics, taken together, and the technology level of progress was investigated.

Three questions were used to guide the empirical efforts of this study. The questions that follow were used to explore two separate bivariate relationships. Specifically, for each of the six EPD focus areas:

1. What is the bivariate relationship between student enrollment and the technology level of progress?
2. What is the bivariate relationship between the percentage of economically disadvantaged students and the technology level of progress?

The third question moves beyond the information provided in the separate bivariate relationships. Specifically, it was used to explore how two demographic characteristics taken together might be related to the technology level of progress of a school district. Accordingly, for each of the six EPD focus areas:

3. What is the multivariate relationship between student enrollment and the percentage of economically disadvantaged students, taken together, and the technology level of progress?

Definition of Terms

Student Enrollment refers to the size of the school district. The five categories used by the Texas Education Agency (TEA) in the Public Education Information Management System (PEIMS) will be used in this study: 1) Under 500; 2) 500 – 1,000; 3) 1,001 – 5,000; 4) 5,001 – 20,000; and 5) Over 20,000 (TEA, 2001a).

Economically Disadvantaged Students refers to students that are eligible for free or reduced-price meals. The four categories used by the TEA in the PEIMS to define the percentage of economically disadvantaged students under the National School Lunch and Child Nutrition Program will be used in this study: 1) Fewer than 35%; 2) 35% - 49%; 3) 50% - 74%; 4) 75% or more (CEO Forum on Education and Technology, 1997, 1999, 2001; National Center for Education Statistics [NCES], 2000; TEA, 2001a).

Technology Level of Progress refers to the School Technology and Readiness level of progress. The four technology levels of progress used by the TEA on the Texas STaR Chart will be used in this study: 1) Early Tech; 2) Developing Tech; 3) Advanced Tech; and 4) Target Tech (ETAC, 2001; TEA, 2002a).

EPD Focus Areas refer to the six Educator Preparation and Development technology focus areas. The six focus areas used by the TEA on the Texas STaR Chart will be used in this study: 1) Content of Training; 2) Capabilities of Educators; 3) Leadership and Capabilities of Administrators; 4) Models of Professional Development; 5) Levels of Understanding and Patterns of Use; and 6) Technology Budget Allocated to Technology Professional Development. Indicators are provided within each of the six focus areas (ETAC, 2001; TEA, 2002a).

CHAPTER II

REVIEW OF LITERATURE

The review of relevant literature used to guide this study is provided in this chapter. In many cases, recent technology-related inquiries involving Texas public school districts have focused on content of training, professional development, capabilities of educators, capabilities of administrators, teacher use of technology, and technology expenditures (Denton, Davis & Strader, 2001; Denton, Davis, Strader & Durbin, 2003; Denton, Davis, Strader, Jessup & Jolly, 1999; Shapley, Benner, Heikes & Pieper, 2002; TEA, 2000). In this study, these areas will be examined, not in isolation, but as focus areas for Educator Preparation and Development. The relationship between school district demographic characteristics, student enrollment and percentage of economically disadvantaged students, and the technology level of progress, for each of the six Educator Preparation and Development focus areas measured by the Texas STaR Chart will be investigated. In order to investigate these relationships, an understanding of the current educational system as it relates to the Educator Preparation and Development focus areas, must be established. The theoretical underpinnings of this study are based on a conceptual understanding and literature review of these Educator Preparation and Development focus areas. The literature review will begin with a national and state context including planning initiatives and span the six Educator Preparation and Development focus areas measured by the Texas STaR Chart: a) content of training b) capabilities of educators; c) leadership and capabilities of administrators; d) models of professional development, e) levels of understanding and patterns of use; and f) technology funding and budget allocations.

National Context

Beyond our nation's school walls, technology has fundamentally transformed the way we live and work (CEO Forum on Education and Technology, 1999; Coley, Cradler & Engel, 1997; Rylander, 2000; Web-based Education Commission, 2000). It has transformed the workplace with a number of different and emerging jobs that require increased proficiency with technology and other employability skills (Lemke & Coughlin, 1998; Rylander; Sivin-Kachala, 1998). Such rapid and continuous advancements in technology require a well trained workforce committed to lifelong learning and capable of adapting to continuous change (Lemke & Coughlin; President's Committee of Advisors on Science and Technology [PCAST], 1997; Web-based Education Commission; Willis, 2001). To effectively address the needs of the new knowledge learners of this century, dramatic shifts in paradigms and strategic planning will have to occur (CEO Forum on Education and Technology, 2001; ETAC, 2001; Tapscott, 1998; TEA, 2000). In order to produce well-prepared learners with twenty-first century skills and broad-based knowledge, faculty, staff and administrators in institutions of learning will have to shift their thinking. The knowledge-based practices, methodologies, and models that currently define and dominate educational programs, may not address the needs of twenty-first century learners. Learners should have authentic experiences that help to stimulate and build strong creativity, critical thinking, advanced problem-solving and decision-making skills (CEO Forum on Education and

Technology; Tapscott). Shifts in paradigms and classroom practices will only occur if preservice and inservice teachers are well-prepared and highly skilled (CEO Forum on Education and Technology, 2000; PCAST; Web-based Education Commission).

According to an Office of Educational Research and Improvement (OERI) 1998 report, federal legislation, including the Improving America's School Act (IASA), Goals 2000, the Individuals with Disabilities Act (IDEA), and the School-to-Work Act, had at their core, the reality of an education system inadequately preparing large groups of students for higher education and/or the workforce. IASA in particular, underscores the need to improve schools for groups of children who have been left behind (OERI). At the center of an evolving school improvement climate, the increased penetration of emerging technologies in schools adds new complexities, challenges, and opportunities for both practitioners and policy makers. In 1996, in response to the recognition that advanced technologies may play a key role in improving education, then President Clinton, announced his educational technology initiatives. The initiatives centered around four overarching goals, often referred to as the "four pillars:"

1. Professional Development - All teachers in the nation will have the training and support they need to help students learn using computers and the information superhighway;
2. Hardware - All teachers and students will have modern multimedia computers in their classrooms;
3. Connectivity - Every classroom will be connected to the information superhighway; and

4. Software and Online Resources - Effective software and on-line learning resources will be an integral part of every school's curriculum (OERI, 1998; PCAST, 1997; USDOE, 1996).

The PCAST (1997) report stated that "equitable access to information technologies in education has been a central concern of policy makers since microcomputers first entered the nation's schools some twenty years ago" (p. 30). Authors of the report added that it's the way that educational technologies are deployed and used that will determine whether or not they narrow historical disparities or widen them. Moreover, the PCAST report stated that equitable access is not merely defined by the number of computers that are available, but the extent to which computers and other educational technologies are being used by all groups, including underserved groups. For example, students from families classified as low in socioeconomic status (SES) reported 14 percent less usage of computers than did students from high-SES families. Notably, the PCAST report stated:

> Among the factors that may be contributing to the disadvantages experienced by low-SES students in both the amount and nature of computer use are (putative) differences in the degree to which teachers in wealthy and impoverished schools have acquired the knowledge and skills necessary to use technology effectively in their teaching. While the Panel is aware of no research that explicitly compares the technology-related preparation of and ongoing support available to teachers in schools of different socioeconomic composition, anecdotal evidence suggests that significant differences may in fact prevail across socioeconomic lines. (p. 31)

According to a Benton Foundation (1998) report, historically we have looked to schools and libraries to help address disparities in access to information resources. Despite significant progress, reports in recent years have revealed that schools in low-income communities have fewer computers and less classroom Internet access than schools serving wealthier students (Benton Foundation; Carvin, 1999; National Telecommunications and Information Administration [NTIA], 1999; Wenglinsky, 1998). According to *Computers and Classrooms: The Status of Technology in U.S. Schools*, a study by Coley, Cradler, and Engel (1997), poor and minority students had significantly less access to computers in their classes than more affluent students. Echoed again in this report is that insufficient hardware and connectivity weren't the only problems in the poorer communities. Because of inadequate teacher training, schools in poorer communities may not be using computers in meaningful ways that have the greatest long-term benefits for students (Carvin; Web-based Education Commission, 2000; Wenglinsky). It is the teacher, after all, who guides instruction and shapes the instructional context in which the Internet and other technologies are used (Web-based Education Commission). The Web-based Commission further reports that it is the teacher's skill, more than any other factor that determines the degree to which students learn. Most notably, the commission reports that two-thirds of all teachers feel they are not at all prepared or only somewhat prepared to use technology in their teaching.

A National Telecommunications and Information Administration (2000) study revealed that, overall our nation is moving toward digital inclusion. The number of Americans who are utilizing digital tools in many aspects of their lives is increasing rapidly. However, NTIA researchers suggested that a digital divide may still remain (NTIA). The 2000 *Falling through the Net* report revealed that not everyone is progressing at the same pace (NTIA). The "digital divide" has been defined as the technological gap that exists between those who have access to computers and the Internet and the ability to use them and those who do not.

State Context

During the 2001-2002 school year, there were more than 4 million (4,146,653) public school students in the state of Texas. More than one-fourth of them (1,059,003 or 25.5%) were enrolled in the 13 largest school districts in the state. Additionally, over 2 million (2,093,511 or 50.5%) of all public school students in the state are economically disadvantaged. In a report developed by CORD and Concord Consortium (2001), its authors point out that although Texas has been a leader in educational technology, the state faces issues that may challenge conventional approaches. They assert that although Texas is among the top ten most populous states in the nation, the state's population density is the lowest. In addition, Texas has the most farms (194,000 in 1997) and in 1999, 439 (42 percent) of the 1042 school districts in the state were classified as rural (CORD and Concord Consortium). These demographic factors can create unique problems in terms of teachers and students being isolated from learning communities or obtaining adequate resources like laboratory or computer equipment. According to Rylander (2000), as the Texas economy becomes more reliant on information technology for conducting business and communicating needs and services, smaller, rural Texas cities without the proper tools will be at an economic, technological, and educational disadvantage. Notably, because Texas is extremely large and populous, socioeconomic and other demographic factors like school district size can affect large numbers of students (CORD & Concord Consortium). Some of the challenges faced by educators in Texas are common nationally, but the size of the state can magnify them.

Long-Range Technology Planning

Essential to strategic technology planning efforts, states, districts, and schools should continually measure progress against educational objectives. Consistent with national trends, Texas educators have been committed to strategic planning for technology. In accordance with legislation passed in 1985, the Texas State Board of Education developed the *1988-2000 Long-Range Plan for Technology*. The plan was adopted by the State Board of Education in 1988; its overarching goal was to provide a blueprint for meeting educational needs through technology at all stakeholder levels. Probably most significant, $6 million was appropriated to begin implementation of the plan. This Texas legislation was the first in the country to appropriate funds to be used exclusively for technology in schools (Texas State Board of Education, 1996). The 1988-2000 LRPT established technology as an essential priority in achieving equitable access to information, resources, and services for all Texas schools, regardless of size, geographic location, or wealth (TEA, 2000).

By 1995, substantial changes in legislation, developments in technology, changing expectations of business and industry, higher education changes, and national and local needs dictated that the LRPT be updated (TEA, 2000). In 1996, the *Long-Range Plan for Technology 1996-2010* was adopted. The goals of the LRPT 1996-2010 are reflected in the four main sections of the plan: Teaching and Learning, Educator Preparation and Development, Administration and Support Services, and Infrastructure for Technology. In addition to the need for updating the LRPT, progress reports were developed periodically to report the status of meeting the LRPT goals (TEA, 2000, 2002). The following recommendations were made to local education agencies (local school districts) in the Educator Preparation and Development section of the LRPT 1996-2010 (Texas State Board of Education, 1996):

1. Allocate at least 30% of the Technology Allotment for professional development;
2. Provide opportunities, incentives, and support for educators to develop model practices using technology;
3. Provide training in data examination and analysis through technology to support sound decision-making;
4. Provide professional development on integrating technology into teaching and learning, instructional management, professional development and administration;
5. Integrate planning for technology into all classroom, campus, and district planning;
6. Design and implement educator development, on site and by distance and distributed learning, to meet expectations for technology proficiencies by educators; and
7. Make available and provide incentives for educators to participate in distributed, just-in-time professional development.

Progress Measures

The CEO Forum School Technology and Readiness (STaR) Chart is an instrument that was developed to help educational institutions evaluate their technological readiness and plan ahead to meet technology goals. Schools and districts at all levels, as well as departments of education, can use the chart to identify their current technology profile and set goals for the future, including funding priorities and allocating resources to fill professional development and training gaps. The chart was developed by the CEO Forum on Education and Technology (1997), a group of industry leaders representing computer, communications, and educational entities, following discussions with then Secretary of Education Riley, on the role of technology in improving teaching. Authors of recent studies have found that most new teachers graduate with a limited use of technology, and less than 25 percent of new teachers feel well prepared to integrate technology into their curriculum (CEO Forum on Education and Technology, 1997). The goal of the CEO Forum STaR Chart was for educational organizations to move from an Early Tech ranking, where computer skills are a low priority, up through the Developing and Advanced levels, to Target Tech, where teachers, for example, use technology effortlessly as a tool to accomplish a variety of management and instructional goals (CEO Forum on Education and Technology).

With the rapid advancement of technology and significant funding in the recent past to allow districts to implement technology, there is a critical need for the continual analyses of district educational technology progress across the state of Texas. Organizational profiles can be used to chart progress and determine gaps at the local and state level (CEO Forum on Education and Technology, 1997, 1999, 2000, 2001; ETAC, 2001; Lemke & Coughlin). The ongoing progress reports on the *Long-Range Plan for Technology* have been visionary and mostly descriptive in nature. However, until 2002, absent from the progress reports, has been the implementation of comprehensive progress measures like the Texas STaR Chart (TEA, 2002a). The Texas STaR Chart was developed out of a critical need to have an instrument that was aligned with the LRPT. Stakeholders determined that to authentically measure progress in the state of Texas, congruence between the Texas STaR Chart and the Texas LRPT was key (ETAC, 2001; TEA, 2002a). The Texas STaR Chart produces technology profiles of a district's level of progress toward reaching the goals of the *Texas Long-Range Plan for Technology 1996-2010*. It is a tool designed for use in technology planning, budgeting for resources, and/or evaluation of progress in integrating technology into the school district's curriculum and instruction, professional development programs, and overall practices. It models the national CEO Forum STaR Chart in structure and draws measures from a variety of national and state technology guidelines (CEO Forum on Education & Technology, 1997; TEA, 2001b; SBEC, 2002). The Texas STaR Chart establishes a framework for measuring how well districts are prepared to meet the goals of the *Long-Range Plan for Technology* (CEO Forum on Education & Technology, 1997; ETAC, 2001).

Although prominent in the progress reports on the Texas *Long-Range Plan for Technology*, few studies have focused on the four key areas of the plan. While Shapley, Benner, Heikes and Pieper (2002) presented the results around the four key areas of the

Texas LRPT, a comprehensive progress measure like the Texas STaR Chart was not used in their study. The Shapley et al. study focused on evaluating the Texas Technology Literacy Challenge Fund grant program, or Technology in Education (TIE) program. Also absent from the literature are studies that have specifically focused on the Educator Preparation and Development key area of the LRPT.

According to the *2002 Update to the Long-Range Plan for Technology* (TEA, 2002a), "Texas needs new teachers with new technology skills and current teachers capable of learning how to integrate technology effectively" (p. 61). Moreover, according to the progress report, students, teachers, administrators, new teachers and faculty must be skilled at using educational technologies for problem solving and critical thinking. They must also be skilled at using technology for learning new content. Yet there is evidence that, in mathematics and other subject areas as well, teachers are woefully under-prepared. Neither current preservice education programs nor standard professional development practices offer teachers the experiences and tools they need for in-depth pedagogical and subject area understanding (TEA, 2000, 2002a). Technology adds yet another skill set that teachers must master. The literature suggests that professional development and teacher preparation programs have not caught up with the needs of teachers in learning the skills necessary for using technology to support effective learning environments (Denton, Davis & Strader, 2001; ETAC, 2001; ISTE, 1998; Moursund & Bieldfeldt, 1999; TEA, 2002a; Web-based Education Commission, 2000). The remainder of this chapter will focus on the literature related to this six Educator Preparation and Development technology focus areas.

Content of Training

According to the Office of Technology Assessment (OTA, 1995) report, the kind of technology training is just as important to teachers as the availability of training. Large numbers of teachers reported that the content of training they received was inadequate. The focus was on basic computer training that addressed the mechanics of operating computers (Shapley, Benner, Heikes & Pieper, 2002), with little training or professional development that focused on integrating technology across various subject areas (CEO Forum on Education and Technology, 2000). Moreover, little training was directed towards using technology as a pedagogical tool (CEO Forum on Education and Technology). Authors of recent survey research studies suggest that training and professional development improvements have been modest (Denton, Davis, Strader & Durbin, 2003; Shapley et al.).

Using the National Center for Education Statistics (NCES) Fast Response Survey System (FRSS), researchers administered the 1999 teacher survey of technology use and asked teachers a number of questions about the professional development that was available to them (NCES, 2000). Specifically, teachers were asked if the following types of professional development were available: use of computers and basic computer training, software applications, use of the Internet, integration of technology in the curriculum and classroom instruction, follow-up and/or advanced training and use of other advanced telecommunications (NCES; OERI, 2000). Teachers reported that professional development training on the use of computers and basic computer training was the type most likely to be available to them (96 percent), this response was followed by software applications (88 percent), use of the Internet was close (87 percent), and integration of technology into the curriculum and classroom and classroom instruction (79 percent). These findings are consistent with other survey research efforts; authors of several studies found that training or professional development that focused on curriculum integration was the least prevalent and most needed (Denton, Davis & Strader, 2001; Denton, Davis, Strader & Durbin, 2003; Shapley, Benner, Heikes & Pieper, 2002). The teachers also reported that follow-up and/or advanced training (67 percent) and use of other advanced technologies (54 percent) were least likely to be available to them.

In addition, the U.S. Department of Education, OERI (2000) reports that teachers in schools with low percents of students eligible for free or reduced-price lunch were more likely to report that they received training in the use of the Internet, compared to teachers in schools with higher percents of students eligible for free or reduced-price lunch. Specifically, 94 percent of teachers in schools with less than 11 percent of students eligible for free or reduced-price lunch, reported that training in the use of the Internet was available to them. Compared to only 79 percent of teachers in schools with more than 70 percent of students eligible for free or reduced-price lunch, reported that training in the use of the Internet was available to them.

In 2001, a research team began evaluating the Texas' Technology Literacy Challenge Grant (TLCF) grant program, to measure progress towards meeting national goals (Shapley, Benner, Heikes & Pieper, 2002). Shapley et al. discussed the findings from three statewide technology surveys that were administered to Texas principals, teachers, and students. The survey results were presented around the four key areas of the Texas *Long-Range Plan for Technology*. Shapley et al. found that teachers' training needs varied by school characteristics. As student enrollment increased, principals reported more often the need for "teacher training on creating content-specific lesson plans, integration in the one computer classroom, and in-depth theories supporting integration" (p. 10). By contrast, principals from smaller campuses and districts cited the need for training teachers on basic technology applications, applications for student basic skills, and advanced telecommunications. Similarly, trends were discussed related to the percentage of economically disadvantaged students. As the percentage of economically disadvantaged students increased, principals reported that teachers needed training in basic technology applications and administrative tasks. By contrast, as the percentage of economically disadvantaged students decreased, principals identified more advanced technology training needs targeting integration issues like electronic portfolios, in-depth integration theories, and telecommunications. The findings from Shapley, Benner, Heikes and Pieper, are consistent with authors of past literature that discussed digital divide concerns (Carvin, 1999; Coley, Cradler & Engel, 1997; Web-based Education Commission, 2000).

In another study, Denton, Davis, Strader and Durbin (2003) compared four statewide survey efforts related to technology infrastructure, implementation, and use in Texas public school districts. The survey efforts were conducted in 1996, 1998, 2000 and again in 2002. Key findings were reported on professional development related to technology. Denton et al. reported that in the six years covered by the surveys, the emphasis placed on technology related professional development increased substantially. For example, in 1996 only 9% of the districts reported that they received *More than 10* sessions on technology training, while in 1998, 2000, and 2002, 30%, 29% and 25% of the districts reported receiving *More than 10* sessions, respectively. Similarly, in 1996 20% of the districts reported that they received *No sessions* on technology training, while in 1998, 2000, and 2002, 4%, 4% and 1% of the districts reported receiving *No sessions*, respectively. The topic noted most by approximately 80% of the responding districts during the six year period was a need for professional development on technology integration (Denton, Davis, Strader & Durbin). While the trends reported in these survey efforts are encouraging, Denton, Davis, Strader and Durbin also reported that the results from the 2002 effort indicated that just 12% of the reporting districts' teachers actually use the ideas learned in professional development experiences in designing their classroom lessons.

Capabilities of Educators

Numerous studies can be found on technology competencies for educators (Fisher, 1997, Hirumi & Grau, 1996; Niess, 1990; Sheffler & Logan, 1999; SBEC, 1997). Several stakeholder groups recognize the need for both preservice and inservice teachers to be technology proficient and to be able to effectively integrate technology into instruction (ISTE, 2000; Schrum, 1999; TEA, 2000, 2002a; Wang, 2002; Willis, 2001). In 1991, the Secretary of Labor's Commission on Achieving Necessary Skills (SCANS) issued its report on the proficiencies, skills, and personal qualities needed to succeed in the high performance workplace. The SCANS competencies include: the ability to use resources productively, master interpersonal skills, locate and manipulate information, understand systems thinking, and operate technologies. Similarly, according to Moursund and Bieldfeldt (1999), in response to shortcomings in teacher preparation and training, state and national standards were developed to address what teachers should know about technology and its integration in the classroom. State and national standards and quality indicators addressed what teachers should know and be able to do (ISTE; Sheffler & Logan; Moursund & Bieldfeldt; SBEC, 2002; Willis).

In the same year, Sheffler and Logan (1999) described their research on computer competencies. The purpose of the research was two-fold: to update previous competency studies to incorporate recent software and hardware advances and to develop a list of competencies that were important for teachers. A Delphi panel developed a survey instrument that included 67 computer competencies. Fifteen of the competencies related to networks, email, and the Internet. 437 technology coordinators, teacher educators, and secondary teachers responded to the surveys. The results from this study showed that the most important computer competencies dealt with the integration of computers into curricula and using computers in instruction. According to the authors, findings from this study seemed to place greater emphasis on technology integration than has been true in other studies on computer competencies.

Texas educators have been committed to strategic planning for technology and the development of educator proficiencies (SBEC, 2002; TEA, 2002a). In 1993, 10,000 Texas educators were surveyed to determine the proficiencies that were important for all educators to possess. Public school teachers, administrators, and teacher educators participated in the study. The proficiencies on the survey were rated by 95 percent of the public school teachers as of great importance or very great importance (SBEC, 1997). In 1997, SBEC approved and adopted proficiencies for teachers, administrators, and counselors. In addition, in 1999 SBEC approved Technology Applications standards for all beginning teachers (SBEC, 2002; TEA, 2002a). The SBEC Technology Applications Standards for all beginning teachers are (SBEC, 2002):

- Standard I. All teachers use technology-related terms, concepts, data input strategies, and ethical practices to make informed decisions about current technologies and their applications.
- Standard II. All teachers identify task requirements, apply search strategies, and use current technology to efficiently acquire, analyze, and evaluate a variety of electronic information.
- Standard III. All teachers use task-appropriate tools to synthesize knowledge, create and modify solutions, and evaluate results in a way that supports the work of individuals and groups in problem-solving situations.
- Standard IV. All teachers communicate information in different formats and for diverse audiences.
- Standard V. All teachers know how to plan, organize, deliver, and evaluate instruction for all students that incorporates the effective use of current technology for teaching and integrating the Technology Applications, Texas Essential Knowledge and Skills (TEKS) into the curriculum.

Shapley, Benner, Heikes, and Pieper (2002) reported that Texas teachers made strong gains in technology proficiency over the past five years. Their findings included the following. 43% of the teachers cited *little to no technology experience* (level 1) in 1998, but only 2% identified their proficiency at level 1 in 2002. Next, 30% of the respondents cited *Use on basic level* (level 2) in 1998, but only 13% reported to be at this level in 2002. In contrast, 16% of the teachers cited *Enhanced productivity & instructional use* (level 3) in 1998, while 44% rated their proficiency at this level in 2002. Similarly, 11% of the teachers reported that they were *Skillfully using technology* (level 4) in 1998, but in 2002 41% of the teachers rated themselves at the highest level. Notably, Shapley et al. report that teacher technology use is related to characteristics of teachers' schools. For example, teachers in larger districts and campuses use technology for more activities and for more sophisticated purposes (lesson plans, multimedia etc.).

Leadership and Capabilities of Administrators

According to Allen and Wing (2003) "leadership is a key element in creating the systemic, sustained transformation of learning communities required to meet the challenges that face education today. Among these challenges is understanding how technology can help all students to realize their academic potential" (p. 157). Allen and Wing further state that administrators and decision makers not only need to be able to visualize new kinds of learning environments, but must also provide the planning, commitment of resources, staff development, and reward systems necessary for the realization of these visions.

Several authors discuss the importance of strong leadership to impact technology integration in schools (Allen & Wing, 2003; Clark & Denton, 1998; Sheffler & Logan, 1999; Willis, 2001). Willis, for example, discusses the importance of committed leaders to support the goals of technology integration in schools. Willis maintains that those in leadership roles need to have the knowledge and skills of integrating technology in the curriculum. Moreover, they need to serve as role models in effectively integrating technology as well as communicate that technology is valued in educational settings.

Similarly, Clark and Denton (1998) discussed technology integration in the school community through the principal's lens. They also discussed how the Texas *Long-Range Plan for Technology 1996-2010* provided recommendations for technology-management and preservice programs for educators. *LRPT* recommendations included: integrate planning for technology into all classroom, campus and district planning; integrate technology into instructional management and administration; increase students' technology proficiencies; and increase educators' effectiveness in using technology. Clark and Denton presented a highly successful technology integration model. They described how the model evolved from a building principal's vision in developing and implementing a training approach that facilitated the integration of technology applications across many school functions. Key elements of the Technology Integration Model included employing a site coordinator, establishing a technology cadre, establishing a core decision group, and the benchmarking process. Clark and Denton also discussed evidence of success, as determined by the project evaluator. Manus (1997) as cited in Clark and Denton, compiled extensive, evaluation data on the hours of staff development completed by teachers over a three year period. Manus found a statistically significant correlation (r=.70) between staff development hours and technology applications in classrooms of teachers that benefited from the implementation of the Technology Integration Model. What this meant in practical terms is that teachers who experienced greater amounts of staff development training in technology were observed to use technology more with their students.

In another study, Anderson and Dexter (2000) investigated the question of whether or not technology leadership differs across different types of schools. Their analyses focused on an overall measure of technology leadership that was based on eight indicators: technology committee, technology budget, principal days, principal e-mail, district support, grants, staff development policy, and intellectual property policy. When comparing schools by the number of students enrolled within each of the three school levels (elementary, middle, high), the larger schools tended to have each of the technology leadership characteristics more often. The exceptions were district technology support and having a staff development policy in place. Another difference was that principals in smaller schools were more likely than those in larger schools to spend 5 or more days per year on technology issues. One possible explanation that Anderson and Dexter offered is that in larger schools, the principal may be more likely to delegate technology functions to others. In most cases, the leadership indicators tended to favor larger schools. Anderson and Dexter suggested that this may be because the indicators represented mostly formal policies that were probably less necessary in smaller schools, where informal solutions are more feasible. For example, a separate technology committee probably wouldn't be necessary if there were only 5 teachers in a particular school.

In the same Anderson and Dexter (2000) study, the researchers indicated that there was a definite decline in overall technology leadership when the percentage of Title-I eligible students (those meeting official poverty criteria) was large. In addition, schools at the lowest SES level were more likely (60% compared to 47 %) to report having received a grant covering technology costs. Also, principals in these lower SES schools were more likely to spend time on technology (technology planning, maintenance or administration during the previous year). Despite these slight disadvantages, the principals in higher SES schools were more likely to use e-mail more extensively.

In the state of Texas, significant technology-related professional development has been provided to administrators in recent years by the Texas Association of School Administrators (TASA). According to Veselka (2003), the Texas Association of School Administrators completed a four year technology leadership training program for school superintendents and principals. The program was supported by the Bill and Melinda Gates Foundation. The TASA Technology Leadership Academies began in 2000 with topics and activities that included:

- What technology integration should look like, using national and state standards, and how to successfully support teachers in technology integration,
- How technology can positively influence student achievement,
- Professional development best practices,

- To develop and implement a personal action plan using what is learned in the academy on your campus and in your district,
- Total cost of ownership, and
- Hot topics, such as Digital Divide.

Through this TASA initiative, it is estimated that more than 4,200 school leaders, representing close to 700 school districts, were allowed to participate during the years 2000 to 2004. In addition to covering critical topics like those related to technology integration standards, technology support, best practices, and digital divide issues, administrators received a notebook computer and were able to implement personal action plans on their campus and/or district as a result of participating in the leadership academy. 2004 was the final year of Gates Foundation funding for this TASA initiative.

Models of Professional Development

There is extensive literature on professional development (CEO Forum on Education and Technology, 2000; Clark, Smith, Davis & Denton, 2000; Consortium for Policy Research in Education [CPRE], 1995; Joyce & Showers, 2002; National Staff Development Council [NSDC], 2001; Ronnkvist, Dexter & Anderson, 2000; Schrum, 1999). Professional development has long been focused on one-shot workshops where particular methodologies or topics are introduced. Model practices like follow-up study, classroom observations, cognitive apprenticeship models of teachers helping teachers, or linking the professional development to student activities, have not been as prevalent (CEO Forum on Education and Technology; Schrum). Authors suggest that professional development should be continuous and ongoing (Sheffler & Logan, 1999), involving follow-up and support for further learning-including support from sources external to the school that can provide necessary resources (CPRE; Hodges, 1996; OTA, 1995; Schrum). Professional development should be integrated into a comprehensive change process that addresses both the facilitation of and barriers to student learning (NSDC). Moreover, it is important that educators have time to practice what they learn (OTA, 1995; Schrum, 1999).

Earlier literature on technology-professional development focused on methods of staff development that followed a training paradigm (Fulton et al., 1996). This training typically was short-term and focused on imparting discrete skills. In many settings the training approach has been predominant. Fulton et al. suggest that professional development must help teachers move beyond the "mechanical use" of curriculum and technology to become facilitators of inquiry. Cifuentes (1997) discusses the evolving role of the teacher as a facilitator of learning, a guide, rather than the traditional role of sage-on-the-stage. The role of the teacher becomes one of a guide and co-learner. In addition, Fulton et al. assert that more recent professional development programs promote new norms of collegiality. Effective models of professional development can involve coaching, modeling best practices (Clark & Denton, 1998), mentoring (Clark, Smith, Davis & Denton, 2000) or study groups. Whether or not a new innovation like technology integration takes hold depends on the extent to which the school creates a professional community (Fulton et al.).

According to the Office of Technology Assessment (OTA, 1995), school technology programs must move beyond focusing on teachers' mastery of operational skills. The OTA national study reported that teachers identified areas beyond operational skills that they needed to more effectively use computers in their classrooms:

- A broader understanding of what technologies can do,
- Provision for the time and effort that are required for educating themselves about a particular piece of hardware or software, and its applications for their classroom,
- Knowledge about how to organize and effectively manage their students in technology-based environments, and
- Knowledge about how to teach with technology or to orchestrate learning activities in order to make optimal use of it.

The OTA report included several key findings, among them are that school districts are using a number of approaches for training teachers and implementing technology. These approaches include model schools that are technology-rich, having technology cadres who train other faculty members (Clark & Denton, 1998), laptops or computers as incentives, and training administrators and teachers together. OTA researchers maintain that their results are inconclusive as to whether any one approach is more successful, rather implementing multiple approaches based on educational goals may be most effective. The CEO Forum on Education and Technology (2000) report states, “to be effective, professional development programs need to accommodate the program goals of the institution, the targeted results for students, the level of sophistication of teachers who participate, and the technology available” (p. 13).

Levels of Understanding and Patterns of Use

Several groups have investigated teachers' levels of understanding and patterns of technology use (Becker, 1994, 1998; CEO Forum on Education and Technology, 1997, 2000; Denton, Davis & Strader, 2001; Denton, Davis, Strader & Durbin, 2003; Dwyer, Ringstaff & Sandholtz, 1990). Authors suggest that teachers typically pass through several distinct stages before they become education technology integrators or innovators (CEO Forum on Education and Technology, 1997; Dwyer, Ringstaff & Sandholtz). Dwyer et al. discussed findings related to examining Apple Classrooms of Tomorrow (ACOT) teachers at five school sites. Stages of evolution were developed from the widely referenced ACOT longitudinal studies: entry, adoption, adaptation, appropriation, and invention. Notably, at the beginning of the ACOT project, although the presence of technology radically altered the physical nature of the classrooms, instruction remained almost the same. Over time, new patterns of teaching and learning emerged across the five ACOT sites. According to Dwyer et al., as teachers moved through the stages, traditional approaches were gradually replaced by active and engaged learning activities.

Similarly, the CEO Forum on Education and Technology (1997) discussed the five stages of teacher technology adoption:

- Stage 1: Entry – Students Learn to Use Technology. At this stage, teachers are not themselves the technology users.

- Stage 2: Adoption – Teachers Use Technology to Support Traditional Instruction. Teachers are beginning to use technology usually to enhance their own productivity, mandated by either the school or through their own initiative.
- Stage 3: Adaptation – Technology Used to Enrich Curriculum. Teachers begin to use technology in ways that are connected to the curriculum, in ways that are already familiar.
- Stage 4: Appropriation – Technology is Integrated, Used for its Unique Capabilities. Teachers view technology as a relevant tool for Teaching and Learning and they design learning experiences and environments to take advantage of its capabilities to meet objectives and desired outcomes.
- Stage 5: Invention – Discover New Uses for Technology. Teachers are redefining classroom environments and creating learning experiences that truly leverage the power of technology to involve students in tasks that require higher order thinking skills as well as mastering basic concepts skill. (p. 14)

Shapley, Benner, Heikes and Pieper (2002) reported that Texas teachers have made strong gains in technology proficiency *over the past five years*. While 43% of the teachers estimated little to no technology experience five years ago (level 1), only 2% identified their current proficiency (in 2002) at level 1. By contrast, the percentage of teachers reporting they skillfully use technology to accomplish instructional and productivity goals (level 4), increased from 11% (five years ago) to 41% (currently). According to Shapley et al., although teachers are making strides in curricular integration, most report that they are not using technology as an integral part of the curriculum. Notably, two-thirds of the teachers (68%), reported little or no classroom integration use (level 1) five years ago, and merely 9% estimated they used technology as an integral part of the curriculum (level 4). By contrast, only 11% currently use classroom technology very little or not at all (level 1), while 32% report that they currently use technology as an integral part of the curriculum and daily classroom activities to create a new learning environment (level 4).

Technology Funding and Budget Allocations

Over the past decade significant funding for technology has been allocated to public schools both nationally and in the state of Texas. Moreover, in recent years several studies have shown significant gains in terms of Infrastructure for Technology (Becker & Anderson, 1998; CORD & Concord Consortium, 2001; Denton, Davis, & Strader 2001; Denton, Davis, Strader & Durbin, 2003; Ronnkvist, Dexter and Anderson, 2000; Shapley, Benner, Heikes & Pieper, 2002; TEA, 2002a). For example, Shapley, Benner, Heikes and Pieper (2002) reported that technology resources have increased considerably in the past five years. Teachers participating in their study reported that the average number of computers per classroom increased from one computer in 1997 to almost three computers in 2002. Shapley et al. noted that Texas classrooms had greater resources than nationally. Texas teachers more frequently reported having two or more computers in their classrooms compared to teachers nationally, 67% versus 48%. Notably, Denton, Davis, Strader and Durbin reported the results from the most recent of four Texas public school district surveys, and suggested a leveling rather than a large increase of district technology infrastructure. For example, across the surveys the number of Internet-accessible computers per classroom did not change much from the 2000 to 2002 efforts. Elementary classrooms had an average of 2.2 Internet-accessible computers per classroom in both years. The average number of middle school classroom computers went from 2.2 in 2000 to 2.1 in 2002, and the average number of high school classroom computers went from 2.3 to 2.6 from 2000 to 2002.

In addition, in recent years several technology funding initiatives have been implemented in the state of Texas to facilitate student achievement and the implementation of the *Long-Range Plan for Technology 1996-2010* (TEA, 2004):

- E-Rate - provides discounts to schools and libraries on telecommunications services. Funding to Texas from 1998 through 2000 was approximately $128.8 M, $133.2 M and $153.4 M.
- Technology Applications Readiness Grants for Empowering Texas (TARGET) – are a local response of Enhancing Education Through Technology to the No Child Left Behind Act of 2001.
- Technology Allotment - all school districts in Texas continue to receive a $30 per pupil technology allotment. A $100 million dollar investment has been made since 1992 (CORD & Concord Consortium, 2001).
- Technology Integration in Education (TIE) Grants – were funded under the federal Technology Literacy Challenge Fund Grants Program. The TIE awards have totaled $151 million dollars in funding.

Specifically from 1997 to 2001 the Texas Education Agency funded 148 TIE awards totaling $151 million dollars. In 1999, applicants were not allowed to apply for funds solely to enhance their technology infrastructure (TEA, 2001). Table 2.1 provides a summary of the TIE awards from 1997 to 2001 across the four categories of the Texas *Long-Range Plan for Technology, 1996-2010*.

Table 2.1
Summary of the TIE Awards Across LRPT Categories

Funding Year	Teaching and Learning	Educator Preparation	Administration and Support	Infrastructure	Total
1997	7 Awards	5 Awards	1 Award	6 Awards	$15.5 M
1998	10 Awards	11 Awards	2 Awards	13 Awards	$33 M
1999	12 Awards	16 Awards	3 Awards	N/A	$33 M
2000	9 Awards	15 Awards	1 Award	N/A	$33 M
2001	19 Awards	12 Awards	2 Awards	N/A	$36 M
Total					$151 M

Moreover, from 1995 to 2002, the Telecommunications Infrastructure Fund (TIF) Board awarded approximately $1.2 billion in telecommunication grants to public schools, libraries, institutions of higher education, and not for profit healthcare facilities. The Telecommunications Infrastructure Fund has funded more than 7,000 awards (Denton, Davis, Strader & Durbin, 2003).

Denton, Davis, Strader and Durbin (2003), examined the overall technology expenditures in Texas school districts and reported that districts increased technology expenditures substantially from 1996 to 1998. Yet, they reported that from 1998 to 2000 the expenditures by the districts leveled off, and they began to decrease between 2000 and 2002. Despite these significant levels of funding in recent years for technology, both nationally and in the state of Texas, authors and various stakeholders suggest that not enough funding has been allocated for technology professional development (CORD & Concord Consortium, 2001; Denton, Davis, & Strader, 2001; PCAST, 1997; Web-based Commission, 2000). For example, among the recommendations that were outlined in the PCAST (1997) report was the directive that special attention be given to professional development. Substantial investment in infrastructure, hardware, and software will be wasted if sufficient investments are not made to technology-related professional development. Teachers must be provided with the preparation (at the preservice or inservice level) and support they need to effectively and seamlessly integrate informational technologies in their classrooms (PCAST). The PCAST report recommended that at least 30 percent of school districts' educational technology expenditures be allocated to professional development for teachers (Sheffler & Logan, 1999; TEA, 2002a, Web-based Commission, 2000).

In another study, based on their 1996 survey results, Denton, Davis, and Strader (2001) stated that twenty percent of the reporting districts reported no professional development on technology was provided in their schools; while eighty percent of the responding districts planned to spend 10 cents of each dollar budgeted for technology on professional development activities over the next three year period. Denton, Davis, Strader and Durbin (2003) also compared results from their 2000 and 2002 survey efforts related to technology budgets in Texas public school districts. They reported that in 2000 the average amount spent on technology across all responding districts was $596,490, while the average amount spent on technology professional development across all responding districts was $98,877 (16.6%). The Denton, Davis, Strader and Durbin results show that in 2002, the average amount spent on technology decreased to $451,403, and the average amount spent on technology professional development also decreased and was $64,372 (14.2%). The results from both efforts reinforced the fact that the amount spent on technology professional development across Texas public school districts falls short of the 30% recommendation made by several stakeholder groups (PCAST, 1997; Sheffler & Logan, 1999; TEA, 2002a, Web-based Commission, 2000).

CHAPTER III

METHODOLOGY

An exploratory study, using Texas public school district data collected by TEA, was conducted to investigate the relationship between each of two demographic characteristics, student enrollment and the percentage of economically disadvantaged students, and the technology level of progress. In addition, the relationship between the two demographic characteristics, taken together, and the technology level of progress was investigated. This chapter includes the research questions examined in this study, and a description of the setting, data sources, procedures, and data analyses.

Three questions were used to guide the empirical efforts of this study. The questions that follow were used to explore two separate bivariate relationships. Specifically, for each of the six EPD focus areas:

1. What is the bivariate relationship between student enrollment and the technology level of progress?
2. What is the bivariate relationship between the percentage of economically disadvantaged students and the technology level of progress?

The third question moves beyond the information provided in the separate bivariate relationships. Specifically, it was used to explore how two demographic characteristics taken together might be related to the technology level of progress of a school district. Accordingly, for each of the six EPD focus areas:

3. What is the multivariate relationship between student enrollment and the percentage of economically disadvantaged students, taken together, and the technology level of progress?

Setting

During the 2001-2002 school year, there were more than 4 million (4,146,653) public school students enrolled in 1,040 school districts in the state of Texas. More than one-fourth of the students (1,059,003 or 25.5%) were enrolled in the 13 largest school districts. The 2001-2002 enrollment represented a 2.1% statewide increase from the 2000-2001 school year. The smallest school district in the state had a student enrollment of 20, while the largest school district in the state had a student enrollment of 210,993. The largest percentage of districts in the state (33%) had student enrollments between 1,001 to 5,000 students. Additionally, over 2 million (2,093,511 or 50.5%) of all public school students in the state were economically disadvantaged, which represented a 4.6% increase from the 2000-2001 school year (TEA, 2001, 2002). School districts in the state ranged from having 0% economically disadvantaged students to 100%. The largest percentage of districts in the state (37%) had between 50 to 74 percent of economically disadvantaged students.

Data Sources

Two archival data sets were used in this study: the 2001-2002 Economically Disadvantaged PEIMS Report data (TEA, 2001a), and the 2001-2002 Texas STaR Chart data (TEA, 2002b). Both data sets were merged to facilitate a complete analysis of Texas school district Educator Preparation and Development focus area technology levels of progress. The first data set (2001-2002 Economically Disadvantaged PEIMS Report data) was comprised of the target population for this study (i.e., the population to which the findings apply). The population consisted of the 1,040 public independent school districts in Texas. All 1,040 school districts reported PEIMS data for the 2001-2002 school year. The second data set was comprised of those school districts that responded to a TEA online resource designed to facilitate educational technology planning and assessment. Specifically, 755 districts submitted responses to the 2001-2002 Texas STaR Chart (TEA, 2001).

Public Education Information Management System (PEIMS)

The 2001-2002 Economically Disadvantaged *PEIMS* Report data set was downloaded from the Texas Education Agency *Public Education Information Management System* (*PEIMS*) web site at http://www.tea.state.tx.us/adhocrpt/. The Texas Education Agency produced several web-based reports using *PEIMS* data. TEA Standard Reports included data requested by TEA about public education, related to Geographic Information, Student Reports, Financial Reports, and Staff Reports. The Student Reports included Graduate Reports, Economically Disadvantaged Reports, and Enrollment Reports. Information was collected electronically from school districts via standardized computer files, as defined by the TEA Data Standards (TEA, 2001a). Economically Disadvantaged *PEIMS* Report data were available for the 1996-1997, 1997-1998, 1998-1999, 1999-2000, 2000-2001, 2001-2002, and 2002-2003 school years. The 2001-2002 Economically Disadvantaged *PEIMS* Report data, downloaded from the TEA web site, included district information across the following eight variable fields:

Region, District Name, District Number, Eligible For Free Meals Count, Eligible For Free Meals Percent, Eligible For Reduced Meals Count, Eligible For Reduced Meals Percent, and Total Count.

Texas School Technology and Readiness (STaR) Chart

Texas STaR Chart summary data were generated from the Internet. For the purpose of this study, a data file of responses to the Texas STaR Chart was obtained from the Texas Education Agency. To obtain the Texas STaR Chart data file, a public information request was submitted to the Texas Education Agency. This request was granted October 28, 2002 (Appendix A) and the data file with fields that were in comma-delimited format was sent electronically.

The Texas Education Agency began the first collection of the Texas STaR Chart district data during the 2001-2002 school year. Data collection began in August 2001 and ended in May 2002. Texas STaR Charts were entered by districts on the Internet at http://www.tea.state.tx.us/technology/etac/campus_txstar/.

Procedures

First, district technology directors, along with their technology leadership teams, completed the print-based Texas STaR Chart Summary form (Appendix C). Technology directors referred to the Texas STaR Chart indicators as they completed the summary forms. The Texas STaR Chart, aligned with the goals of the *Long Range Plan for Technology*, is comprised of four key areas: 1) Teaching and Learning, 2) Educator Preparation and Development, 3) Administration and Support Services, and 4)

Infrastructure for Technology. Each key area was divided into focus areas.

The six focus areas for the Educator Preparation and Development key area were:

1. Content of Training,
2. Capabilities of Educators,
3. Leadership and Capabilities of Administrators,
4. Models of Professional Development,
5. Levels of Understanding and Patterns of Use, and
6. Technology Budget Allocated to Technology Professional Development.

Figure 3.1 provides a visual representation of the Texas STaR Chart key areas and six EPD focus areas.

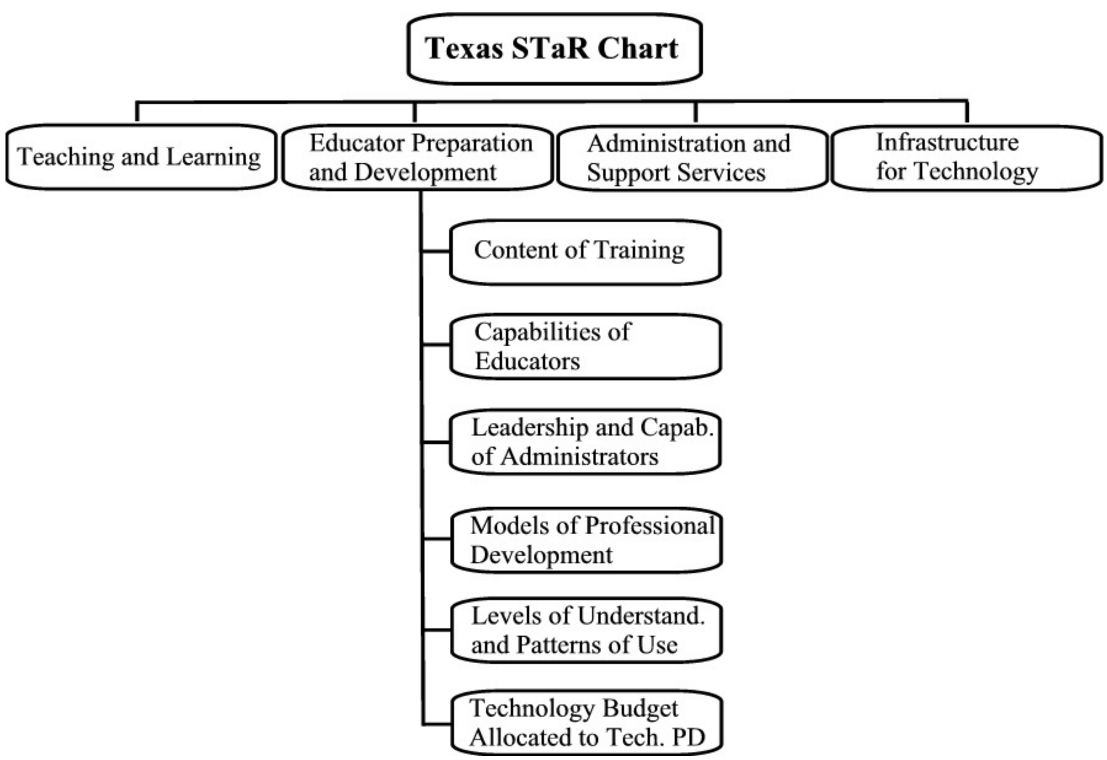

Figure 3.1. **Texas STaR Chart Key Areas and EPD Focus Areas.**

Within each focus area, indicators were provided to help district technology directors assess their technology level of progress (Table 3.1). Technology directors were instructed to select the level of progress that best described their district's technology practices in the four key areas of the Texas STaR Chart. Levels of progress ranged from *Early Tech*, to *Developing Tech*, to *Advanced Tech* to *Target Tech*. Using the Texas STaR Chart indicators (Appendix B), district technology directors entered a value from 1 to 4 that best described the district's level of progress related to technology within each of the six focus areas. For example, if a district met an indicator that fell under *Early Tech*, a value of 1 was assigned. If a district met an indicator that fell under *Developing Tech*, a value of 2 was assigned. Similarly, if a district met an indicator that fell under *Advanced Tech*, a value of 3 was assigned. Finally, if a district met an indicator that fell under *Target Tech*, a value of 4 was assigned. Under *Content of Training*, for example, a district technology director, along with input from the technology leadership team, might rate the district as *Developing Tech*, if the overall *Content of Training* in their district was best described by the following indicator: *"Technology, including multimedia and the Internet, in support of learning, Use of technology in the administration and management of the classroom."* Since the level of progress for this focus area is *Developing Tech*, the technology director would enter a 2 for this particular Educator Preparation and Development (EPD) focus area. Table 3.1 presents a sample of indicators that were used by district technology directors to determine their district's technology level of progress for a particular EPD focus area.

Table 3.1
Texas STaR Chart Indicators for EPD Technology Level of Progress

Level of Progress	Sample Indicators G - I		
	G. Content of Training	H. Capabilities of Educators	I. Leadership and Capabilities of Administrators
Early Tech	Technology literacy skills	10% meet SBEC proficiencies and implement in the classroom	Recognizes benefits of technology in instruction; minimal personal use
Developing Tech	Technology, including multimedia and the Internet, in support of learning Use of technology in the administration and management of the classroom	30 % meet SBEC proficiencies and implement in the classroom	Expects teachers to use technology for administrative and classroom management tasks; uses technology in some aspects of daily work
Advanced Tech	Integration of technology, including multimedia and the Internet, into the curriculum and instruction	50 % meet SBEC proficiencies and implement in the classroom	Recognizes and identifies exemplary use of technology in instruction; models use of technology in daily work
Target Tech	Regular creation and communication of new technology-supported, learner-centered projects; vertical alignment of Technology Application TEKS; anytime anywhere use of TLC by entire school community	100 % meet SBEC proficiencies and implement in the classroom	Ensures integration of appropriate technologies to maximize learning and teaching; involves and educates the school community around issues of technology integration

As district technology directors completed the print-based Texas STaR Chart summary form (Appendix C), they were given the following instructions.

Using the Texas STaR Chart, select the cells in each category that best describe your district. Enter the corresponding number in the chart using this scale: 1=Early Tech; 2=Developing Tech; 3=Advanced Tech; and 4=Target Tech (ETAC, 2001). Figure 3.2 shows an example of a district response for the Educator Preparation and Development portion of the Texas STaR Chart summary form.

G. Content of Training	H. Capabilities of Educators	I. Leadership and Cap. of Admin.	J. Models of Professional Development	K. Levels of Understanding and Patterns of Use	L. Tech. Budget Allocated to Tech. Prof. Development
3	1	2	3	1	3

Figure 3.2. **EPD Portion of the Texas STaR Chart Summary Form.**

Similarly, district technology directors were instructed to determine and record their technology levels of progress within each of the focus areas for the other three key areas. Once technology directors completed all of the information on the print-based Texas STaR Chart Summary form, they were instructed to enter the information online at http://www.tea.state.tx.us/technology/etac/campus_txstar/.

School districts were identified by a six-digit county district number in both the 2001-2002 Economically Disadvantaged *PEIMS* Report data file and the 2001-2002 Texas STaR Chart response data file. The two data files were opened in MS Excel and saved as MS Excel worksheets. The MS Excel application program was used to prepare the 2001-2002 Texas STaR Chart data to be merged with the 2001-2002 Economically Disadvantaged *PEIMS* report data. The 2001-2002 Economically Disadvantaged *PEIMS* report data provided the demographic data needed for this study (i.e. the Student Enrollment (SE) and Percentage of Economically Disadvantaged Students (PEDS) data for all Texas independent school districts). To facilitate data analyses, a new MS Excel worksheet was created which included the following variables: Region, District Name, District Number, Student Enrollment and Percentage of Economically Disadvantaged Students. Note, Student Enrollment was labeled Total Count in the original data file. In addition, the Percentage of Economically Disadvantaged Students data were not included in the original data file. However, Percentage of Economically Disadvantaged Students data were readily calculated by summing the Eligible For Free Meals Percent and Eligible For Reduced Meals Percent across all 1040 school districts.

The second data source, the 2001-2002 Texas STaR Chart response data provided the Educator Preparation and Development (EPD) focus area technology level of progress data needed for this study. A data file with fields that were in comma-delimited format was sent electronically from TEA. The data file was opened in MS Excel and saved as a MS Excel worksheet. The worksheet included 30 variable fields. Variables were grouped by the four key areas and included all of the fields related to the respective focus areas. A final step in preparing the data files was to use the district number to create a combined MS Excel worksheet that included all focus area, student enrollment, and percentage of economically disadvantaged students variable fields that were used in this study.

Data Analyses

A preliminary analysis in this study was to show that the 755 participating school districts sufficiently represented the target population of all 1,040 school districts in the state of Texas (McNamara, 1994). Specifically, the sample data and population data were analyzed in terms of the categories for the two independent variables, student enrollment and percentage of economically disadvantaged students. The sample showed sufficient representation across all student enrollment categories; therefore, the 755 participating districts (73%) were defined as a purposive sample that accurately represents the target population of all 1,040 Texas school districts (McNamara). For example, for the population in the *Under 500* category, 310 districts represented 30 percent of the total 1,040 school districts in the state. Similarly, for the sample responses in the *Under 500* category, 215 responding districts represented 28 percent of the total 755 participating districts. Likewise, for the population in the *5,001-20,000* category, 126 districts represented 12 percent of the total 1,040 school districts in the state. Similarly, for the sample responses in the *5,001-20,000* category, 96 responding districts represented 13 percent of the total 755 participating districts. Table 3.2 provides response percents across all of the student enrollment categories used in this study.

Table 3.2
Population and Sample Breakdown in SE Categories

Variable	n	%
Student Enrollment		
Population Breakdown		
Under 500	310	30
500-1,000	216	21
1,001-5,000	342	33
5,001-20,000	126	12
Over 20,000	46	4
Sample Response Breakdown		
Under 500	215	28
500-1,000	145	19
1,001-5,000	264	35
5,001-20,000	96	13
Over 20,000	35	5

The sample also showed sufficient representation across all of the economically disadvantaged categories (McNamara, 1994). For example, for the population in the *Fewer Than 35%* category, 305 districts represented 29 percent of the total 1,040 school districts in the state. Similarly, for the sample in the *Fewer Than 35%* category, 221 responding districts represented 29 percent of the total 755 participating districts. Table 3.3 provides response percents across all of the economically disadvantaged categories used in this study.

Table 3.3

Population and Sample Breakdown in PEDS Categories

Variable	n	%
Economically Disadvantaged		
Population Breakdown		
Fewer Than 35%	305	29
35% – 49%	299	29
50% - 74%	380	37
75% or Greater	56	5
Sample Response Breakdown		
Fewer Than 35%	221	29
35% – 49%	227	30
50% - 74%	273	36
75% or Greater	34	5

Next, using the SPSS application program, quantitative methods were employed to analyze EPD focus area technology levels of progress, across Texas school districts. The data were disaggregated by student enrollment and by percentage of economically disadvantaged students categories. The independent variables, student enrollment and percentage of economically disadvantaged students, were classified as categorical variables, with five and four levels, respectively (Agresti, 1996). The categories for the independent variables were coded using the SPSS application program. Table 3.4 presents the coding for these two categorical variables.

Table 3.4
Coding for Independent Variables

Code for Analysis	Category
Student Enrollment Coding	
1	Under 500
2	500-1,000
3	1,001-5,000
4	5,001-20,000
5	Over 20,000
Percentage of Economically Disadvantaged Students Coding	
1	Fewer Than 35%
2	35% - 49%
3	50% - 74%
4	75% or Greater

Next, using the SPSS application program, Crosstabulations and Chi-square test statistics were calculated. Chi-square test statistics and the corresponding coefficients of determination were examined, in order to evaluate the research questions. Specifically, analyses were completed to determine the relationship between the demographic variables (student enrollment, percentage of economically disadvantaged students, and SE-PEDS) and the technology level of progress, for each of the six EPD focus areas (Agresti, 1996; George & Mallery, 2002). These data analyses procedures were chosen because the dependent variable, technology level of progress, and the two independent variables, student enrollment and percentage of economically disadvantaged students, were all categorical variables. Moreover, all three variables were comprised of ordinal scales.

The analyses of data were completed in three phases. The first phase explored six bivariate relationships to answer research question one. For each of the six EPD focus areas, what is the bivariate relationship between student enrollment and the technology level of progress? Similarly, the second phase explored six bivariate relationships to answer research question two. For each of the six EPD focus areas, what is the bivariate relationship between the percentage of economically disadvantaged students and the technology level of progress? These relationships were explored by running Crosstabulations and Chi-square test statistics, using the SPSS application program. For each of the six EPD focus areas, the following decision rule was employed to examine the Chi-square test statistic and the corresponding coefficients of determination. The Chi-square test statistic and the corresponding coefficients of determination, resulted in meaningful (practically significant) correlations when the r-square value was greater than or equal to 0.10 (ten percent explained variance). In addition, trend statements were formulated based on the results for each of the six EPD focus areas.

The third phase focused on answering the third research question which moved beyond the information provided in the separate bivariate relationships. Specifically, it was used to explore how two demographic characteristics taken together might be related to the technology level of progress of a school district. Accordingly, the third question follows. For each of the six EPD focus areas, what is the multivariate relationship between student enrollment and the percentage of economically disadvantaged students, taken together, and the technology level of progress? In order to explore the third research question, a set of interaction variables based on SE and PEDS needed to be created. Table 3.5 presents the coding for the 20 SE – PEDS interaction variables.

Table 3.5
Coding for SE-PEDS Interaction Variable

SE Coding	PEDS Coding	SE – PEDS Interaction Variable Coding
1	1	1 = Under 500, Fewer Than 35%
1	2	2 = Under 500, 35% - 49%
1	3	3 = Under 500, 50% - 74%
1	4	4 = Under 500, 75% or Greater
2	1	5 = 500-1,000, Fewer Than 35%
2	2	6 = 500-1,000, 35% - 49%
2	3	7 = 500-1,000, 50% - 74%
2	4	8 = 500-1,000, 75% or Greater
3	1	9 = 1,001-5,000, Fewer Than 35%
3	2	10 = 1,001-5,000, 35% - 49%
3	3	11 = 1,001-5,000, 50% - 74%
3	4	12 = 1,001-5,000, 75% or Greater
4	1	13 = 5,001-20,000, Fewer Than 35%
4	2	14 = 5,001-20,000, 35% - 49%
4	3	15 = 5,001-20,000, 50% - 74%
4	4	16 = 5,001-20,000, 75% or Greater
5	1	17 = Over 20,000, Fewer Than 35%
5	2	18 = Over 20,000, 35% - 49%
5	3	19 = Over 20,000, 50% - 74%
5	4	20 = Over 20,000, 75% or Greater

Using the 20 school district interaction variables that emerged when the SE and PEDS predictor variables are combined, the response for research question three was developed using a logistic regression approach. This approach allows one to isolate three potential contributions for explaining the variability in each of the six EPD focus area outcome variables. These three contributions are variability accounted for by (a) the interaction effect of SE and PEDS, (b) the main effect of SE and (c) the main effect of PEDS.

The combined effect of SE and PEDS (the interaction effect) is determined by running two logistic regression models for each of the six EPD focus areas. The first logistic regression model determines the predictability for all three effects specified above. The second model determines the predictability associated with only the two main effects. The difference in predictability for these two models yields the unique predictability for the interaction effect. This interaction effect yields a meaningful multivariate relationship when the difference in predictability is a Cox and Snell R^2 value of at least 0.05.

The SPSS program for logistics regression provides all the information needed to accomplish this task. Specifically, the SPSS program is used to generate 12 logistic regression models (two models per EPD focus area). In addition, this program provides the Cox and Snell R^2 value for each model so that the unique predictability due to the interaction effect can be determined directly for each of the six EPD focus areas.

CHAPTER IV

RESULTS

The findings for the three research questions used to guide the empirical efforts undertaken in this study, are presented in this chapter. The chapter is divided into four sections. Each of the first three sections provides the findings for one of the three research questions. The fourth section provides an overall summary of findings.

Research Question One

The first research question follows. For each of the six EPD focus areas, what is the bivariate relationship between student enrollment and the technology level of progress? The five categories for student enrollment used in this study were 1) Under 500; 2) 500-1,000; 3) 1,001-5,000; 4) 5,001-20,000; 5) Over 20,000 (TEA, 2001a). The four technology levels of progress were 1) Early Tech; 2) Developing Tech; 3) Advanced Tech; 4) Target Tech (ETAC, 2001; TEA, 2002a).

For each of the six EPD focus areas, the Chi-square test statistic and the corresponding coefficients of determination indicated that there was no relationship between student enrollment (SE) and technology level of progress. The complete bivariate student enrollment by technology level of progress distributions, for each of the six EPD focus areas and the corresponding test statistics, are documented in Appendix D. Inspection of Table 4.1 reveals both the Chi-square test statistics and the corresponding coefficients of determination which result in meaningful (practically significant) correlations when the r-square value is greater than or equal to 0.10 (ten percent explained variance).

Table 4.1
Chi-Square Test Statistics for SE by Technology Level of Progress

EPD Focus Area	χ^2 Results (Value)	(prob)	R^2
Content of Training	10.94	0.534	0.001
Capabilities of Educators	28.708	0.004	0.026
Leadership and Capabilities of Administrators	21.744	0.040	0.017
Models of Professional Development	22.449	0.033	0.009
Levels of Understanding and Patterns of Use	17.936	0.118	0.007
Technology Budget Allocated to Technology Professional Development	16.478	0.170	0.002

The summary provided in Table 4.2 adds another indicator to guide interpretation and the formation of trend statements. To facilitate data analyses, the technology level of progress variable was collapsed into two categories, Early/Developing and Advanced/Target. The first category reflects the early levels of progress by combining the Early and Developing Tech responses from school districts into a single group. Similarly, the second category reflects the more advanced levels by combining the Advanced and Target Tech responses into a single group. Thus, with regard to technology, each of the 755 Texas school districts in the sample can be classified as either in the early stages (452) or advanced stages (303) of technology level of progress. The statewide results indicated that the modal value for the technology level of progress variable was Developing Tech for each of the six EPD focus areas. A summary of these findings is presented in the table that follows.

Table 4.2
Technology Level of Progress Statewide Summary

EPD Focus Area	Early/ Developing (%)	Advanced/ Target (%)	Modal Value (%)
Content of Training	59.8	40.2	Developing (51.8)
Capabilities of Educators	72.3	27.7	Developing (55.2)
Leadership and Capabilities of Administrators	48.6	51.4	Developing (45.4) Advanced (43.2)
Models of Professional Development	67.4	32.6	Developing (53.6)
Levels of Understanding and Patterns of Use	81.5	18.5	Developing (64.8)
Technology Budget Allocated to Technology Professional Development	84.5	15.5	Developing (54.2)

The results across the six EPD focus areas are elaborated below.

SE and Content of Training

Using the decision rule for the content of training focus area, the results indicated there was no significant relationship between student enrollment and the technology level of progress (R^2 = .001). Given this outcome, two trends emerged for the content of training focus area. First, for the Texas school districts in the sample, the most likely response option chosen by school district technology directors was Developing Tech

(51.8%). Second, the findings suggest that a majority of Texas school districts (59.8%) have not progressed beyond the Developing Tech level.

SE and Capabilities of Educators

For the capabilities of educators focus area, the results indicated there was no relationship between student enrollment and the technology level of progress (R^2 =.026). Given this outcome, two trends were gleaned related to the capabilities of educators focus area. For Texas school districts in the sample, the most likely response option chosen by school district technology directors was Developing Tech (55.2%). As a result, the findings suggest that a majority of Texas school districts (72.3%) have not progressed beyond the Developing Tech level.

SE and Leadership and Capabilities of Administrators

Similarly, for the leadership and capabilities of administrators focus area, there was no relationship between student enrollment and the technology level of progress (R^2= .017). Given the results, two trends emerged related to leadership and capabilities of administrators. The distribution of responses for this focus area was bimodal. Notably, the results were the most favorable for this focus area. First, for the Texas school districts in the sample, the most likely response options chosen by school district technology directors were Developing Tech (45.4%) and Advanced Tech (43.2%). Second, the findings suggest that the majority of Texas school districts are either at the Developing Tech or Advanced Tech levels, 48% have not progressed beyond the Developing Tech level.

SE and Models of Professional Development

For the models of professional development focus area, there was no relationship between student enrollment and the technology level of progress (R^2 = .009). The results indicate that for the Texas school districts in the sample, the most likely response option chosen by school district technology directors was Developing Tech (54%). As a result, the findings suggest that a majority of Texas school districts (68%) have not progressed beyond the Developing Tech level for this focus area as well.

SE and Levels of Understanding and Patterns of Use

For the levels of understanding and patterns of use focus area, there was no relationship between student enrollment and the technology level of progress (R^2=.007). Given this result, two trends were gleaned related to the levels of understanding and patterns of use focus area. Again for the Texas school districts in the sample, the most likely response option chosen by school district technology directors was Developing Tech (65%). Thus, the findings suggest that a majority of Texas school districts (82%) have not progressed beyond the Developing Tech level.

SE and Technology Budget Allocated to Technology Professional Development

Finally, for the technology budget allocated to technology professional development focus area, there was also no relationship between student enrollment and the technology level of progress (R^2=.002). The results indicate that for the Texas school districts in the sample, the most likely response option chosen by school district technology directors was Developing Tech (65%). Therefore, the findings suggest that a majority of Texas school districts (84%) have not progressed beyond the Developing Tech level.

Research Question One Summary

The results related to exploring the first research question indicated that there was no relationship between student enrollment and the technology level of progress. Across all six EPD focus areas, the Chi-square test statistics and the corresponding coefficients of determination indicated that there were no significant relationships. Based on the results across the six EPD focus areas, several trends were gleaned. Table 4.3 provides a summary of these trends. The trends are rank ordered in the table, from the least developed focus areas to the more advanced focus areas.

The two least developed EPD focus areas were technology budget allocated to technology professional development, and levels of understanding and patterns of use. The results showed that 84% of Texas school districts have not progressed beyond the Developing Tech level for the technology budget allocated to technology professional development focus area. The results also showed that 82% of Texas school districts have not progressed beyond the Developing Tech level for the levels of understanding and patterns of use focus area.

By contrast, the two most advanced EPD focus areas were leadership and capabilities of administrators, and content of training. The results showed that 52% of Texas school districts have progressed to the more advanced stages (Advanced and Target Tech), for the leadership and capabilities of administrators focus area. The results also showed that 40% of Texas school districts have progressed to the more advanced stages for the content of training focus area.

Table 4.3
EPD Focus Area Trends

EPD Focus Area	Trend
Technology Budget Allocated to Technology Professional Development	A majority of Texas school districts (84%) have not progressed beyond the Developing Tech level.
Levels of Understanding and Patterns of Use	A majority of Texas school districts (82%) have not progressed beyond the Developing Tech level.
Capabilities of Educators	A majority of Texas school districts (72%) have not progressed beyond the Developing Tech level.
Models of Professional Development	A majority of Texas school districts (68%) have not progressed beyond the Developing Tech level.
Content of Training	A majority of Texas school districts (60%) have not progressed beyond the Developing Tech level.
Leadership and Capabilities of Administrators	A majority of Texas school districts (48%) have not progressed beyond the Developing Tech level.

For the Texas school districts in the sample, the most likely response option chosen by school district technology directors, for all six EPD focus areas, was Developing Tech. Therefore the overall findings were that a majority of Texas school districts have not progressed beyond the Developing Tech level.

Research Question Two

The second research question is as follows. For each of the six EPD focus areas, what is the bivariate relationship between the percentage of economically disadvantaged students and the technology level of progress? The four categories for the percentage of economically disadvantaged students used in this study were – 1) Fewer than 35%; 2) 35-49%; 3) 50-74%; and 4) 75% or More (TEA, 2001a).

For each of the six EPD focus areas, the Chi-square test statistic and the corresponding coefficients of determination indicated that there was no relationship between the percentage of economically disadvantaged students and technology level of progress. The complete bivariate distributions (the percentage of economically disadvantaged students by technology level of progress), for each of the six EPD focus areas and the corresponding test statistics are documented in Appendix E. Table 4.4 reveals both the Chi-square test statistics and the corresponding coefficients of determination. Correlations were considered to be practically significant, if the r-square value was greater than or equal to 0.10 (ten percent explained variance). A summary of these findings is presented in Table 4.4.

Table 4.4

Chi-Square Test Statistics for PEDS by Technology Level of Progress

EPD Focus Area	χ^2 Results (Value)	(prob)	R^2
Content of Training	8.557	0.479	0.000
Capabilities of Educators	18.478	0.030	0.002
Leadership and Capabilities of Administrators	6.133	0.727	0.002
Models of Professional Development	8.033	0.531	0.000
Levels of Understanding and Patterns of Use	6.354	0.704	0.001
Technology Budget Allocated to Technology Professional Development	12.042	0.211	0.001

The overall results indicated that there was no relationship between the percentage of economically disadvantaged students and technology level of progress. Based on these results, the trends that were outlined in Table 4.3 hold for this bivariate relationship as well. For the Texas school districts in the sample, the most likely response option chosen by school district technology directors, for all six EPD focus areas, was Developing Tech. Therefore the overall findings were that a majority of Texas school districts have not progressed beyond the Developing Tech level.

Research Question Three

The third research question follows. For each of the six focus areas, what is the multivariate relationship between student enrollment and the percentage of economically disadvantaged students, taken together, and the technology level of progress?

Sampling Units

When both predictor variables are considered simultaneously, the 755 school districts in the sample yield twenty unique types of school districts. These twenty types (samples) are described in Tables 4.5 using student enrollment as the control variable and in Table 4.6 using the percentage of economically disadvantaged students in a school district as the control variable. In addition, these two tables reveal the percent of school districts within their control group and their proportion of the entire sample consisting of 755 districts. For example, the largest group (SE = 3 and PEDS = 3) has 96 school districts which represents 12.7 percent of the entire sample.

Table 4.5
Twenty Samples for Studying Interaction Using SE as the Control

		Type of District	N	Percents	
SE	PEDS	SE-PEDS		Within Group	Population
1	1	1 = Under 500, Fewer Than 35%	46	21.4	6.1
1	2	2 = Under 500, 35% - 49%	65	30.2	8.6
1	3	3 = Under 500, 50% - 74%	90	41.9	11.9
1	4	4 = Under 500, 75% or Greater	14	6.5	1.9
			215	100.0	28.5
2	1	5 = 500-1,000, Fewer Than 35%	44	30.3	5.8
2	2	6 = 500-1,000, 35% - 49%	52	35.9	6.9
2	3	7 = 500-1,000, 50% - 74%	45	31.0	6.0
2	4	8 = 500-1,000, 75% or Greater	4	2.8	0.5
			145	100.0	19.2
3	1	9 = 1,001-5,000, Fewer Than 35%	78	29.5	10.3
3	2	10 = 1,001-5,000, 35% - 49%	82	31.1	10.9
3	3	11 = 1,001-5,000, 50% - 74%	96	36.4	12.7
3	4	12 = 1,001-5,000, 75% or Greater	8	3.0	1.1
			264	100.0	35.0
4	1	13 = 5,001-20,000, Fewer Than 35%	41	42.7	5.4
4	2	14 = 5,001-20,000, 35% - 49%	20	20.8	2.6
4	3	15 = 5,001-20,000, 50% - 74%	28	29.2	3.7
4	4	16 = 5,001-20,000, 75% or Greater	7	7.3	0.9
			96	100.0	12.7
5	1	17 = Over 20,000, Fewer Than 35%	12	34.3	1.6
5	2	18 = Over 20,000, 35% - 49%	8	22.9	1.1
5	3	19 = Over 20,000, 50% - 74%	14	40.0	1.9
5	4	20 = Over 20,000, 75% or Greater	1	2.9	0.1
			35	100.1	4.6

Note. Any difference from 100.0 is due to rounding error.

The twenty types of school districts are also described in Table 4.6 using the percentage of economically disadvantaged students as the control variable.

Table 4.6
Twenty Samples for Studying Interaction Using PEDS as the Control

		Type of District	N	Percents	
SE	PEDS	SE-PEDS		Within Group	Population
1	1	1 = Under 500, Fewer Than 35%	46	20.8	6.1
2	1	2 = 500-1,000, Fewer Than 35%	44	19.9	5.8
3	1	3 = 1,001-5,000, Fewer Than 35%	78	35.3	10.3
4	1	4 = 5,001-20,000, Fewer Than 35%	41	18.6	5.4
5	1	5 = Over 20,000, Fewer Than 35%	12	5.4	1.6
			221	100.0	29.3
1	2	6 = Under 500, 35% - 49%	65	28.6	8.6
2	2	7 = 500-1,000, 35% - 49%	52	22.9	6.9
3	2	8 = 1,001-5,000, 35% - 49%	82	36.1	10.9
4	2	9 = 5,001-20,000, 35% - 49%	20	8.8	2.6
5	2	10 = Over 20,000, 35% - 49%	8	3.5	1.1
			227	100.0	30.1
1	3	11 = Under 500, 50% - 74%	90	33.0	11.9
2	3	12 = 500-1,000, 50% - 74%	45	16.5	6.0
3	3	13 = 1,001-5,000, 50% - 74%	96	35.2	12.7
4	3	14 = 5,001-20,000, 50% - 74%	28	10.3	3.7
5	3	15 = Over 20,000, 50% - 74%	14	5.1	1.9
			273	100.0	36.2
1	4	16 = Under 500, 75% or Greater	14	41.2	1.9
2	4	17= 500-1,000, 75% or Greater	4	11.8	0.5
3	4	18 = 1,001-5,000, 75% or Greater	8	23.5	1.1
4	4	19 = 5,001-20,000, 75% or Greater	7	20.6	0.9
5	4	20 = Over 20,000, 75% or Greater	1	2.9	0.1
			34	100.0	4.5

Interaction Tests

Using these two predictor variables provides three unique contributions to the explained variance. Specifically, these are 1) the independent influence of the SE variable, 2) the independent influence of the PEDS variable, and 3) the joint influence of both predictor variables considered simultaneously.

Using two predictor models (Interaction Model and Main Effects Model), the interaction test results for all six EPD focus areas are elaborated in Table 4.7 (also see Appendix F). Inspection of this table suggests that there are no meaningful interaction effects (R^2 difference between the Interaction Model and Main Effects Model exceeds 0.05) for any of the six criterion variables reflecting the different focus areas.

Table 4.7
Interaction Variance R^2 Differences

EPD Focus Area	Interaction Model R^2(C&S)	Main Effects Model R^2(C&S)	Met Interaction Criterion* (Yes/No)
Content of Training	.026	.012	No
Capabilities of Educators	.045	.026	No
Leadership and Capabilities of Administrators	.032	.021	No
Models of Professional Development	.044	.021	No
Levels of Understanding and Patterns of Use	.018	.010	No
Technology Budget Allocated to Technology Professional Development	.036	.012	No

* The interaction test criterion requires the R^2 (Cox and Snell) difference to be at least 0.05. When the interaction model R^2 (Cox and Snell) is below 0.05, the percent not beyond the Developing Tech level is estimated using the block zero estimate from the logistics regression model.

Implications

Given the interaction test results, indicating no interaction effects for any of the six focus areas, the interpretations elaborated in Table 4.3 hold for all twenty school district types. Specifically, given no interaction effect for the content of training focus area, the best estimate for the percent of school districts in any of the twenty district types that have not progressed beyond the Developing Tech level is 60 percent. Similar interpretations can be made for each of the other five EPD focus areas using the information provided in Table 4.3.

Summary

This chapter provided the answers for each of the three research questions raised at the outset of the study. For all three research questions, no meaningful significant relationships were found. The statewide results indicated that the modal value for technology level of progress was **Developing Tech** for each of the six EPD focus areas. The major finding emerging from the analyses is the fact that the percent of school districts not progressing beyond the Developing Tech level is differential for each of the six EPD focus areas. In more specific terms, these percents range from 52 percent for the **leadership and capabilities of administrators** focus area to 84 percent for the **technology budget allocated to technology professional development** focus area. These findings will be revisited in the final chapter, where the overall conclusions of the study will be presented.

CHAPTER V

SUMMARY AND CONCLUSIONS

The final chapter is divided into three sections. The first section summarizes the purpose and design of the study. The second section elaborates the empirical findings for the Texas STaR Chart data. The last section provides recommendations for practice and future research.

Purpose and Design

For each of the six Educator Preparation and Development (EPD) focus areas (content of training, capabilities of educators, leadership and capabilities of administrators, models of professional development, levels of understanding and patterns of use, technology budget allocated to technology professional development), the purpose was to determine the relationship between each of two demographic characteristics, student enrollment and the percentage of economically disadvantaged students, and the technology level of progress. In addition, the relationship between the two demographic characteristics, taken together, and the technology level of progress was investigated.

Three questions were used to guide the empirical efforts of this study. The questions that follow were used to explore two separate bivariate relationships. Specifically, for each of the six EPD focus areas:

4. What is the bivariate relationship between student enrollment and the technology level of progress?

5. What is the bivariate relationship between the percentage of economically disadvantaged students and the technology level of progress?

The third question moves beyond the information provided in the separate bivariate relationships. Specifically, it was used to explore how two demographic characteristics taken together might be related to the technology level of progress of a school district. Accordingly, for each of the six EPD focus areas:

6. What is the multivariate relationship between student enrollment and the percentage of economically disadvantaged students, taken together, and the technology level of progress?

The demographic data, student enrollment and percentage of economically disadvantaged students, were obtained from the *PEIMS* data. The technology level of progress data were derived from the 2001-2002 Texas STaR Chart data (TEA, 2002b). The population for this study consisted of the 1,040 public independent school districts in Texas that reported *PEIMS* data to the TEA for the 2001-2002 school year (TEA, 2001a). The sample consisted of the 755 public independent school districts that submitted Texas STaR Chart data to the TEA for the 2001-2002 school year. The two data sets were merged to facilitate a complete analysis of the relationship between school district demographic characteristics, and the technology level of progress.

Findings

The findings for this study are presented below in five parts. Parts one through three provide answers for the three research questions elaborated above. Given the responses to these three research questions, part four shares the relevant trend statements that emerge for each of the six EPD focus areas. The last part reviews the empirical evidence for school districts in terms of reaching the Target Tech level on the Texas STaR Chart.

Research Question One

Data analysis for the first research question suggests that there was no meaningful bivariate relationship for linking student enrollment to the technology level of progress. Using student enrollment as a predictor variable did not yield differential predictions for the technology level of progress in the 755 participating school districts. These results hold for all six EPD focus areas.

Research Question Two

Data analysis for the second research question suggests that there was no meaningful bivariate relationship for linking the percentage of economically disadvantaged students to the technology level of progress. Accordingly, using the percentage of economically disadvantaged students as a predictor variable did not yield differential predictions for the technology level of progress in the 755 participating school districts. Once again, these results hold for all six EPD focus areas.

Research Question Three

Data analysis for the third research question suggests that there was no meaningful multivariate relationship for linking student enrollment and the percentage of economically disadvantaged students, taken together, to the technology level of progress. Accordingly, there was no meaningful interaction when both student enrollment and the percentage of economically disadvantaged students were used to predict the technology level of progress in the 755 participating school districts. Once again, these results hold for all six EPD focus areas.

Trends

A major finding emerging from the analyses is the fact that the majority of school districts across the student enrollment and percentage of economically disadvantaged students categories are at the same level of technology progress, Developing Tech. However, the percent of school districts not progressing beyond the Developing Tech level is differential for each of the six EPD focus areas. Given the responses for the three research questions, six specific trends emerge. Using a rank order from highest to lowest for the outcome variable implying that Texas school districts have not advanced beyond the Developing Tech level, these trends are:

1. In the **technology budget allocated to technology professional development** focus area, a majority of Texas school districts (**84%**) have not progressed beyond the Developing Tech level.
2. In the **levels of understanding and patterns of use** focus area, a majority of Texas school districts (**82%**) have not progressed beyond the Developing Tech level.
3. In the **capabilities of educators** focus area, a majority of Texas school districts (**72%**) have not progressed beyond the Developing Tech level.
4. In the **models of professional development** focus area, a majority of Texas school districts (**68%**) have not progressed beyond the Developing Tech level.

5. In the **content of training** focus area, a majority of Texas school districts (**60%**) have not progressed beyond the Developing Tech level.
6. In the **leadership and capabilities of administrators** focus area, slightly less than one-half of the Texas school districts (**48%**) have not progressed beyond the Developing Tech level.

Accordingly, the least progress in moving beyond the Developing Tech level has been made for the focus area dealing with technology budget allocated to technology professional development (84%). Similarly, the most progress on this criterion has been made for the focus area dealing with leadership and capabilities of administrators. Specifically, trend six above implies that a slight majority of Texas school districts (52%) have progressed beyond the Developing Tech level. Also noteworthy is the fact that this is the only one of the six EPD focus areas where a majority of Texas school districts have progressed beyond the Developing Tech level.

Implications

The researcher offers the following explanations for the findings that were brought forward in this study. The Texas Education Agency funded 148 TIE awards totaling $151 million dollars, from 1997 to 2001. Moreover, from 1995 to 2002, the TIF Board awarded approximately $1.2 billion (TIF Board, 2002) in telecommunication grants to public schools, libraries, institutions of higher education, and not for profit healthcare facilities. In total, TIF funded more than 7,000 awards (Denton, Davis, Strader & Durbin, 2003). The researcher hypothesizes that the significant planning and funding initiatives and strong leadership at both the state and local levels, had tremendous impact on the leveling or equalization of practices in terms of the Educator Preparation and Development technology focus areas. The researcher suggests that the impact of these significant funding initiatives helps to explain the findings that student enrollment, the percentage of economically disadvantaged students, and SE-PEDS, were not related to the technology level of progress, across each of the six EPD focus areas. The TEA-administered, TIE grants, and later TARGET grants as well as the TIF Board grant programs served as outreach vehicles for districts around the state, including high need school districts. High need districts were identified by having large percentages of economically disadvantaged students, as well as other demographic qualifiers.

Progress has occurred in Texas school districts since 1996 in terms of technology infrastructure, implementation, use and professional development. The researcher suggests that the strategic planning and funding initiatives that have occurred over the past four legislative sessions were successful in addressing some disparities. Specifically, the findings from this study indicated that the majority of school districts in the state are performing at the same level, Developing Tech. However, much work still remains. While these results may be encouraging, the goals put forth by the Texas Education Agency in the *Long-Range Plan for Technology 1996-2010* (ETAC, 2001) will be accomplished only when all Texas school districts reach the Target Tech level for all six Educator Preparation and Development focus areas. With this intent in mind, Table 5.1 summarizes the progress made to date for each of the 20 Texas school district types examined in this study. For each focus area in this table, the top three highest percents among the 20 types of Texas school districts are printed in bold.

Table 5.1
Percent of Districts by Type Reaching Target Tech for Six Focus Areas

Type of District	Focus Area* (1)	(2)	(3)	(4)	(5)	(6)
1 = Under 500, Fewer Than 35%	2.2	4.3	10.9	4.3	4.3	2.2
2 = Under 500, 35% - 49%	1.5	0	9.2	6.2	3.1	6.2
3 = Under 500, 50% - 74%	2.2	1.1	10	1.1	4.4	1.1
4 = Under 500, 75% or Greater	**14.3**	**14.3**	**21.4**	**7.1**	**7.1**	0
5 = 500-1,000, Fewer Than 35%	0	2.3	6.8	0	4.5	9.1
6 = 500-1,000, 35% - 49%	0	1.9	9.6	0	1.9	3.8
7 = 500-1,000, 50% - 74%	4.4	2.2	15.6	2.2	**8.9**	4.4
8 = 500-1,000, 75% or Greater	0	0	**25**	0	0	0
9 = 1,001-5,000, Fewer Than 35%	5.1	0	7.7	3.8	1.3	3.8
10 = 1,001-5,000, 35% - 49%	1.2	1.2	7.3	0	0	2.4
11 = 1,001-5,000, 50% - 74%	3.1	2.1	5.2	3.1	1	6.3
12 = 1,001-5,000, 75% or Greater	**12.5**	**25.0**	**25**	**12.5**	**12.5**	**12.5**
13 = 5,001-20,000, Fewer Than 35%	4.9	2.4	2.4	0	0	4.9
14 = 5,001-20,000, 35% - 49%	0	0	5	0	0	5
15 = 5,001-20,000, 50% - 74%	3.6	0	0	**7.1**	0	0
16 = 5,001-20,000, 75% or Greater	0	0	0	0	0	0
17 = Over 20,000, Fewer Than 35%	**8.3**	0	8.3	**16.7**	0	**16.7**
18 = Over 20,000, 35% - 49%	0	0	12.5	0	0	**12.5**
19 = Over 20,000, 50% - 74%	0	**14.3**	0	**7.1**	0	0
20 = Over 20,000, 75% or Greater	0	0	0	0	0	0

Focus Areas are defined as follows:
(1) = Content of Training
(2) = Capabilities of Educators
(3) = Leadership and Capabilities of Administrators
(4) = Models of Professional Development
(5) = Levels of Understanding and Patterns of Use
(6) = Technology Budget Allocated to Technology Professional Development

Two conclusions emerge from the empirical evidence documented in Table 5.1. First, although the Target Tech level percentages are all small, two of the 20 types of Texas school districts consistently yield the highest percents across these six focus areas. These are **school district type four** (SE Under 500, PEDS 75% or Greater) which was among the highest percents in five of the six focus areas and **school district type twelve** (SE 1,001-5,000, PEDS 75% or Greater) which was among the highest percents in all six focus areas.

Second and more significant in terms of creating future interventions, programs, and incentives, empirical evidence in this study suggests that much work still remains to be done if all Texas school districts are to reach the ultimate objective where all Texas schools reach the Target Tech level on all six focus areas. The current study informs the digital divide literature as it relates to school district characteristics. The findings from this study suggest that long-range technology planning and funding initiatives in recent years have been successful, in beginning to address digital divide issues related to Educator Preparation and Development technology progress in public school districts.

Recommendations

Based on the experience gained in conducting this inquiry, six specific recommendations are offered for continuing the research agenda initiated in this study.

Recommendation One: Campus Level Reporting

The 2001-2002 benchmark year Texas STaR Chart district level data were used in the current study. District response data in some cases may be dependent on the perceptions of one person (with input from campus technology leadership teams). This may not be problematic for smaller school districts, but can be problematic for larger districts. For example, Houston Independent School District has approximately 300 campuses. Such a large number of campuses may make communication at the district level difficult in terms of collecting accurate and comprehensive data. Therefore, this study should be replicated using campus level data. In this case, a district level analysis can be conducted by merely aggregating the campus data within each school district.

Recommendation Two: Within School District Comparisons

If recommendation one is implemented with a view toward studies that focus on both campus and school district comparisons, follow-up studies should also be conducted to investigate potential within district variations. For example, there may be several significant differences among the 300 campuses in the Houston Independent School District.

Recommendation Three: Accuracy of Self Report Data

The data in the current study were based on self reports. Whether or not district or campus becomes the unit of data collection in future studies, the accuracy of self reporting should be verified. The overall accuracy of the response data in future studies can be determined by generating direct observation data that can be compared to the initial self reports. Assuming all school districts or campuses provide self reports, one feasible approach for accomplishing this recommendation would be to compare self reports to direct observations for a 10% sample of Texas school districts.

Recommendation Four: Learning from Model School Districts

Given the results from the current inquiry, follow-up case studies should be conducted to provide insights for explaining why two school district types consistently had larger percentages of Target Tech districts

Recommendation Five: Relationships Among Focus Areas

Follow-up studies should be conducted to investigate the relationships among the response distributions for the six EPD focus areas. For example, the bivariate relationship between (a) the technology budget allocated to technology professional development and (b) capabilities of educators could be investigated. Similarly, the bivariate relationship between the technology budget allocated to technology professional development and each of the other four focus areas could be explored. In more general terms, given there are six EPD focus areas, there are 15 potential bivariate relationships and 20 potential trivariate relationships that can be explored for this recommendation.

Recommendation Six: Impact of Federal and State Funding

Significant cuts in federal and state funding for educational technology have occurred in the last two years. Accordingly, follow-up studies should be conducted to determine if the findings from the current study still hold.

REFERENCES

Agresti, A. (1996). *An introduction to categorical data analysis.* New York: John Wiley & Sons.

Allen, N. J., & Wing, L. (2003). Leadership for a changing world. In G. Solomon, N. Allen, & P. Resta (Eds.), *Toward digital equity: Bridging the divide in education.* (pp. 156-174). Boston: Allyn & Bacon.

Anderson, R. E., & Dexter, S. L. (2000). School technology leadership: Incidence and impact. In *Teaching, learning, and computing: 1998 national survey*. Center for Research on Information Technology and Organizations: University of CA, Irvine. Retrieved January 14, 2004, from *http://www.crito.uci.edu/tlc/findings /report_6*

Barron, A. E., Kemker, K., Harmes, C., & Kalaydjian, K. (2003, Summer). Large-Scale research study on technology in k-12 schools: Technology integration as it relates to the national technology standards. *Journal of Research on Technology in Education, 25*(4), 489-507.

Becker, H. J. (1994). *Analysis and trends of school use of new information technologies.* Paper prepared for the Office of Technology Assessment, U.S. Congress: Washington, DC. (NTIS No. 95-170981).

Becker, H. J. (1998). *The influence of computer and Internet use on teachers pedagogical practices and perceptions.* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Becker, H. J. & Anderson, R. (1998). *Teaching, learning and computing: A national survey of schools and teachers.* Retrieved January 14, 2004, from *http://www. crito.uci.edu/tlc/html/tlc_home.html*

Benton Foundation. (1998). *What's going on losing ground bit by bit: Low-income communities in the information age*. Retrieved January 28, 2004, from *http://www.benton.org/publibrary/losing-ground/home.html*

Carvin, A. (1999). *Technology professional development for teachers: Overcoming a pedagogical digital divide*. Retrieved January 28, 2004, from *http://www.benton. org/publibrary/digitalbeat/db093099.html*

CEO Forum on Education and Technology. (1997). *The CEO Forum school technology and readiness report*: *From pillars to progress.* Retrieved January 14, 2004, from *http://www.ceoforum.org/downloads/report97.pdf*

CEO Forum on Education and Technology. (1999). *The CEO Forum school technology and readiness report: Professional development: A link to better learning.* Retrieved January 14, 2004, from *http://www.ceoforum.org/downloads/99report.pdf*

CEO Forum on Education and Technology. (2000). *The CEO Forum school technology and readiness report: The power of digital learning: Integrating digital content.* Retrieved January 14, 2004, from *http://www.ceoforum.org/downloads/report3.pdf*

CEO Forum on Education and Technology. (2001). *The CEO Forum school technology and readiness report: Key building blocks for student achievement in the 21st century: assessment, alignment, accountability, access and analysis.* Retrieved January 14, 2004, from *http://www.ceoforum.org/downloads/report4.pdf*

Cifuentes, L. (1997). From sages to guides: A professional development story. *Journal of Technology and Teacher Education, 5*(1), 67-77.

Clark, F., Smith, B., Davis, T. & Denton, J. (2000*). The technology mentor program: An intergenerational model for professional development.* Paper presented at the U.S. Department of Education, Preparing Tomorrow's Teachers to Use Technology (PT3) Grantees' Meeting, Washington, D.C.

Clark, S. E. & Denton, J. (1998). *Integrating technology in the school environment: Through the principal's lens.* College Station, TX: Texas A&M University. (ERIC Document Reproduction Service No. ED 417 696)

Coley, R., Cradler, J. & Engel, P. (1997). *Computers and classrooms: The status of technology in U.S. schools.* Princeton, NJ: Educational Testing Service, Policy Information Center.

Consortium for Policy Research in Education. (1995, June). *Helping teachers teach well: Transforming professional development*. New Brunswick, NJ: Rutgers University.

CORD and The Concord Consortium (2001, May) *Technology to improve Texas education: Recommendations for policy consideration and funding*. Waco, TX: The Concord Consortium.

Denton, J., Davis, T., & Strader, A. (2001, Summer). 2000 Texas public school technology survey. *INSIGHT*, *15*(2), 13-23.

Denton, J., Davis, T., Strader, A., & Durbin, B. (2003, Winter). 2002 Texas public school technology survey. *INSIGHT*, *17*(3), 13-28.

Denton, J., Davis, T., Strader, A., Jessup, G., & Jolly, D. (1999, Summer). The changing technology infrastructure in Texas public schools. *INSIGHT, 13*(2), 34-38.

Dwyer, D. C., Ringstaff, C., & Sandholtz, J. H. (1990). *Teachers' beliefs and practices: Part I. Patterns of change*. Apple Classroom of Tomorrow Research Report. Available at *http://www.apple.com/education/k12/leadership/acot/library.html*

Educational Technology Advisory Committee. (2001). *Texas STaR Chart.* Available at *http://starchart.esc12.net/*

Fisher, M. M. (1997). The voice of experience: Inservice teacher technology competency recommendations for preservice teacher preparation programs. *Journal of Computing in Teacher Education*, *5*(2/3), 139-147.

Fulton, K., Wasser, D. J., Rubin, A., Grant, C. M., McConachie, M., Feldman, A., Spitzer, W., McNamara, E., & Porter, B. (1996). *Technology infusion and school change*. Retrieved January 14, 2004, from *http://ra.terc.edu/publications/ TERC_pubs/tech-infusion/front.html*

George, D. & Mallery, P. (2002). *SPSS for Windows step by step: A simple guide and reference* (4th ed.). Needham Heights, MA. Allyn and Bacon.

Hall, G., & Loucks, S. (1981). *The concept of innovation configurations: An approach to addressing program adaptation. Research on concerns-based adoption.* Paper presented at the annual meeting of the American Educational Research Association, Los Angeles. (ERIC Document Reproduction Service No. ED 226 454)

Hirumi, A., & Grau, I. (1996). A review of computer-related state standards, textbooks, and journal articles: Implications for preservice teacher education and professional development. *Journal of Computing in Teacher Education, 12*(4), 6-17.

Hodges, H. L. B. (1996). Using research to inform practice in school: 10 key strategies for success. *Educational Policy*, *10*(2), 223-252.

International Society for Technology in Education (2000). *National educational technology standards for teachers*. Eugene, OR: Author.

Joyce, B. & Showers, B. (2002). *Student achievement through staff development* (3rd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Kulik, J. (1994). Meta-analytic studies of findings on computer-based instruction. In E. L. Baker and H. F. O'Neil, Jr. (Eds.), *Technology assessment in education and training*. Hillsdale, NJ: Lawrence Erlbaum.

Lemke, C. & Coughlin, E. (1998). *Technology in American schools: Seven dimensions for gauging progress*. Milken Exchange on Educational Technology. Retrieved October 28, 2002, from *http://www.mff.org/publications/ publications.taf?page=158*

Manus A. L. (1997). *The impact of using technology on student achievement in evolving professional development schools.* Unpublished doctoral dissertation. Texas A&M University.

McConnaughey, J., Lader, W., Chin, R. & Everette, D. (1997). *Falling through the NET II: New data on the digital divide*. Washington, DC: National Telecommunications and Information Administration, U.S. Department of Commerce. Retrieved January 28, 2004, *http://www.ntia.doc.gov/ntiahome/ net2/falling.html*

McNamara, J. F. (1994). *Surveys and experiments in education research.* Lancaster, PA: Technomic Publishing Company.

Moursund, D., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Santa Monica, CA: The Milken Exchange on Education Technology.

National Center for Education Statistics (2000). *Teachers' tools for the 21st century: A report on teachers' use of technology* (NCES 2000-102).Washington, DC: Author.

National Staff Development Council. (2001). *Standards for staff development (Revised).* Oxford, OH: National Staff Development Council.

National Telecommunications and Information Administration (2000). *Falling through the net: Defining the digital divide*. Retrieved October 28, 2002, from *http://www.ntia.doc.gov/ntiahome/fttn99/FTTN.pdf*

Niess, M. L. (1990). Preparing computer-using educators for the 90s. *Journal of Computer Teacher Education*, *7*(2), 11-14.

Office of Educational Research and Improvement. (1998). *Fulfilling the promise of technologies for teaching and learning through the support of regional technology in education consortia program: A summary and resource guide*. Washington, DC: Office of Educational Research and Improvement.

Office of Educational Research and Improvement. (2000). *Teachers' tools for the 21st century: A report of teachers' use of technology.* Washington, DC: Office of Educational Research and Improvement.

Office of Technology Assessment (1995). *Teachers and technology: Making the connection.* OTA-HER-616. Washington, DC: U.S. Government Printing Office.

President's Committee of Advisors on Science and Technology, Panel on Educational Technology. (1997, March). *Report to the President on the use of technology to strengthen K-12 education in the United States.* Washington, DC: Author.

Ronnkvist, A. M., Dexter, S. L., & Anderson, R. E. (2000). *Technology support: Its depth, breadth, and impact in America's schools. Teaching, learning and computing: 1998. A national survey*. Irvine, CA: University of California, Irvine and University of Minnesota. Retrieved January 28, 2004, from *http://www.crito.uci.edu/tlc/findings/technology-support*

Rylander, C. K. (2000). *Texas economic update: Looking ten years back and ten years forward*. Retrieved January 28, 2004, from *http://www.window.state.tx.us/ecodata/teu00/teu00_1a.html*

Schacter, J. (1995). The Impact of Educational Technology on Student Achievement. The Milken Exchange on Educational Technology. Retrieved January 28, 2004, from *http://www.mff.org/publications/publications.taf?page=161*

Schrum, L. (1999). Technology professional development for teachers. *Educational Technology Research and Development, 47*(4), 83-90.

Secretary's Commission on Achieving Necessary Skills. (1991). *What work requires of schools, a SCANS report for America 2000.* Washington, DC: U.S. Department of Labor.

Shapley, Benner, Heikes and Pieper (September 2002). *Technology integration in education initiative: Statewide survey report.* Retrieved January 14, 2004, from *http://www.tea.state.tx.us/technology/grants/grantdownloads/statewideexecutive.pdf*

Sheffler, F. L., & Logan, J. P. (1999). Computer technology in schools: What teachers should know and be able to do. *Journal of Research on Computing in Education*. 31(3), 305-326.

Sivin-Kachala, J. (1998). *Report on the effectiveness of technology in schools, 1990-1997.* Washington, DC: Software Publisher's Association.

State Board for Educator Certification (1997). *Learner centered schools for Texas, A vision of Texas educators.* Austin, TX: State Board for Educator Certification.

State Board for Educator Certification (2001). *Educator standards*. Retrieved January 14, 2004, from *http://www.sbec.state.tx.us/SBECOnline/default.asp/*

State Board for Educator Certification (2002). *Technology applications standards*. Available at *http://www.sbec.state.tx.us/SBECOnline/default.asp/*

Tapscott, D. (1998). *Growing up digital: The rise of the Net generation*. New York: McGraw-Hill.

Texas Education Agency (2000). *Progress report on the Texas long-range plan for technology, 1996-2010.* Austin, TX: Publications Office, Texas Education Agency.

Texas Education Agency (2001a). *Public Education Information Management System.* Retrieved October 28, 2002, from *http://www.tea.state.tx.us/peims*

Texas Education Agency (2001b). *Texas Essential Knowledge and Skills*. Retrieved October 1, 2002, from *http://www.tea.state.tx.us/teks*

Texas Education Agency (2002a). *2002 Update to the Texas Long-Range Plan for Technology, 1996-2010.* Austin, TX: Publications Office, Texas Education Agency.

Texas Education Agency (2002b). *Texas STaR Chart 2001-2002 data*. [Data File]. Austin, TX: Texas Education Agency.

Texas Education Agency (2004). *TARGET Grants: Awards.* Retrieved January 28, 2004, from *http://www.tea.state.tx.us/technology/target/target_awards.html*

Texas State Board of Education (1996). *Long-Range plan for technology (1996-2010).* Austin, TX: Publications Office, Texas Education Agency.

U.S. Department of Education (1996). *Getting America's students ready for the 21st century-Meeting the technology literacy challenge: A report to the nation on technology and education*. Retrieved October 28, 2002, from *http://www.ed.gov/about/offices/list/os/technology/plan/national/index.html*

Veselka, J. (2003, Winter). Executive director's view: Developing leaders. *INSIGHT*, *17*(3), 11.

Wang, L. (2002) *Investigating how participation in a technology-based project has influenced education faculty members' beliefs and practices with technology integration: Factors that influence faculty's technology integration and implications for faculty's integration of technology*. Unpublished doctoral dissertation, University of New Orleans, New Orleans, LA.

Web-Based Education Commission. (2000). *The power of the Internet for learning: Moving from promise to practice.* Report of the Web-Based Education Commission to the President and the Congress of the United States. Washington, DC: Author.

Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics*. Princeton, NJ: Educational Testing Service. Retrieved October 28, 2002, from *ftp://ftp.ets.org/pub/res/ technolog.pdf*

Willis, J. M. (2001). *Moving beyond the training environment to a vision of technology integration in the classroom curriculum: A case study*. Unpublished doctoral dissertation, Texas A&M University.

APPENDIX A

PUBLIC INFORMATION REQUEST

TEXAS EDUCATION AGENC

1701 North Congress Ave.★ Austin, Texas 78701-1494 ★ 512/463-9734 ★ FAX: 512/463-9838 ★ http://www.tea.state.

Felipe T. Alanis
Commissioner of Education

October 28, 2002

Trina Davis
804 Harrington Tower
College Station, TX 77843

RE: Public Information Request Number 1068

Dear Ms. Davis:

This letter is in response to your public information request to the Texas Education Agency, which we received on October 25, 2002, and in which you are requesting:

Requesting Texas STaR Chart data from the benchmark year from the Technology Division at TEA. This will be used for my dissertation research at Texas A&M University.

The Texas Education Agency has reviewed its files and has located information that is responsive to your request. Although the Texas Public Information Act allows a governmental body to charge for copying documents in accordance with Tex. Gov't Code § 552.267, the enclosed copies of documents are being provided to you at no charge.

If you have any questions, you may contact me at (512) 463-9538.

Sincerely,

Gracie Perez
TEA Public Information Custodian
Education Technology

CC: Gloria Barnes
Enc:

APPENDIX B

TEXAS STAR CHART EPD INDICATORS

Texas STaR Chart EPD Indicators

and Readiness (STaR) Chart

EDUCATOR PREPARATION AND DEVELOPMENT						
	(G) Content of Training	(H) Capabilities of Educators	(I) Leadership and Capabilities of Administrators	(J) Models of Professional Development	(K) Levels of Understanding and Patterns of Use	(L) Technology Budget Allocated to Technology Professional Development
Early Tech	Technology literacy skills	10 % meet SBEC proficiencies and implement in the classroom	Recognizes benefits of technology in instruction Minimal personal use	Whole group	Most at **entry** or adoption stage (Students learning to use technology; teachers use technology to support traditional instruction)	5% or less
Developing Tech	Technology, including multimedia and the Internet, in support of learning Use of technology in the administration and management of classroom	30 % meet SBEC proficiencies and implement in the classroom	Supports use of technology in instruction Uses technology in some aspects of daily work	Whole group, with follow-up to facilitate implementation	Most at adaptation stage (Technology used to enrich curriculum) Most beginning to use with students	6-24 %
Advanced Tech	In... technology, including multimedia and the Internet, into the curriculum and instruction	...et SBEC proficiencies and implement in the classroom	Recognizes and identifies exemplary use of technology in instruction Often uses technology skills in daily work such as research and communications	Coaching, modeling best practices, campus-based mentoring Involvement in a development/ improvement process Study groups	Most at appropriation stage (Technology is integrated, used for its unique capabilities)	25-29 %
Target Tech	C... communication of new technology-supported, student-centered projects Vertically aligned integration of all Technology Application TEKS	...meet SBEC proficiencies and implement in the classroom	Promotes exemplary use of technology in instruction Models use in daily work in communications, presentations, on-line collaborative projects, and management tasks Advocates to the community integration of technology in instruction	Creates communities of inquiry and knowledge building Anytime learning available through a variety of delivery systems Inquiry/action research Individually guided activities	Most at **invention** stage (Teachers discover and accept new uses for technology)	30 % or more

APPENDIX C

TEXAS STAR CHART SUMMARY FORM

Texas STaR Chart Summary Form

STaR Chart Summary

9

Using the Texas STaR Chart, select the cells in each category that best describe your district.
Enter the corresponding number in the chart below using this scale.

1 = Early Tech **2 = Developing Tech** **3 = Advanced Tech** **4 = Target Tech**

Key Area I: Teaching and Learning

A. Teacher Role and Collaborative Learning	B. Patterns of Teacher Use	C. Frequency/ Design of Instructional Setting	D. Curriculum Areas	E. T.A. TEKS/ Assessment	F. Patterns of Student Use	*Total

Key Area II: Educator Preparation and Development

G. Content of Training	H. Capabilities of Educators	I. Leadership and Capabilities of Administrators	J. Models of Professional Development	K. Levels of Understanding and Patterns of Use	L. Technology Budget for Technology Professional Development	*Total

Key Area III: Administration and Support Services

M. Vision and Planning	N. Technical Support	O. Instructional and Administrative Staffing	P. Budget	Q. Funding	*Total

Key Area IV: Infrastructure for Technology

R. Students per Computer	S. Internet Access/ Connectivity/ Speed	T. Distance Learning	U. LAN/WAN	V. Other Technologies	*Total

Key Area Summary

Copy your Key Area totals into the first column below and use the Key Area Rating Range to indicate the Key Area rating for each category.

Key Area	*Key Area Total		Key Area STaR Classification
I. Teaching and Learning	__________		_______________
(6 - 8 Early Tech	9 - 14 Developing Tech	15 - 20 Advanced Tech	21-24 Target Tech)
II. Educator Preparation and Development	__________		_______________
(6 - 8 Early Tech	9 - 14 Developing Tech	15 - 20 Advanced Tech	21-24 Target Tech)
III. Administration and Support Services	__________		_______________
(5 - 7 Early Tech	8 - 12 Developing Tech	13 - 17 Advanced Tech	18 - 20 Target Tech)
IV. Infrastructure for Technology	__________		_______________
(5 - 7 Early Tech	8 - 12 Developing Tech	13 - 17 Advanced Tech	18 - 20 Target Tech)

District Name: ____________________ County/District Number: ____________________

School Year: ____________________ Data Completion Date: ____________________

Completed by: ____________________ Email: ____________________

Please go to the on-line STaR Chart Assessment (www.tea.state.tx.us/technology/etac/txstar) to enter your results and print summary charts and graphs. Statewide aggregated data will be available in Fall 2001.

APPENDIX D

SE SPSS CROSSTABULATION OUTPUTS

Student Enrollment by Technology Level of Progress Crosstabulations

Content of Training

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SE * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

SE * Technology Level of Progress

			Technology Level of Progress				Total
			Early	Developing	Advanced	Target	
SE	Under 500	Count	18	114	77	6	215
		Expected Count	17.4	111.3	80.3	6.0	215.0
		% within SE	8.4%	53.0%	35.8%	2.8%	100.0%
	500-1,000	Count	12	77	54	2	145
		Expected Count	11.7	75.1	54.2	4.0	145.0
		% within SE	8.3%	53.1%	37.2%	1.4%	100.0%
	1,001-5,000	Count	19	138	98	9	264
		Expected Count	21.3	136.7	98.6	7.3	264.0
		% within SE	7.2%	52.3%	37.1%	3.4%	100.0%
	5,001-20,000	Count	10	51	32	3	96
		Expected Count	7.8	49.7	35.9	2.7	96.0
		% within SE	10.4%	53.1%	33.3%	3.1%	100.0%
	Over 20,000	Count	2	11	21	1	35
		Expected Count	2.8	18.1	13.1	1.0	35.0
		% within SE	5.7%	31.4%	60.0%	2.9%	100.0%
Total		Count	61	391	282	21	755
		Expected Count	61.0	391.0	282.0	21.0	755.0
		% within SE	8.1%	51.8%	37.4%	2.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.936[a]	12	.534
Continuity Correction			
Likelihood Ratio	10.853	12	.542
Linear-by-Linear Association	1.321	1	.250
N of Valid Cases	755		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is .97.

Symmetric Measures

		Value	Asymp. Std. Error [a]	Approx. T [b]	Approx. Sig.
Interval by Interval	Pearson's R	.042	.037	1.150	.251[c]
Ordinal by Ordinal	Spearman Correlation	.036	.037	.986	.324[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Capabilities of Educators

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SE * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

SE * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
SE	Under 500	Count	28	111	71	5	215
		Expected Count	36.7	118.7	55.0	4.6	215.0
		% within SE	13.0%	51.6%	33.0%	2.3%	100.0%
	500-1,000	Count	22	74	46	3	145
		Expected Count	24.8	80.1	37.1	3.1	145.0
		% within SE	15.2%	51.0%	31.7%	2.1%	100.0%
	1,001-5,000	Count	44	160	55	5	264
		Expected Count	45.1	145.8	67.5	5.6	264.0
		% within SE	16.7%	60.6%	20.8%	1.9%	100.0%
	5,001-20,000	Count	25	54	16	1	96
		Expected Count	16.4	53.0	24.5	2.0	96.0
		% within SE	26.0%	56.3%	16.7%	1.0%	100.0%
	Over 20,000	Count	10	18	5	2	35
		Expected Count	6.0	19.3	8.9	.7	35.0
		% within SE	28.6%	51.4%	14.3%	5.7%	100.0%
Total		Count	129	417	193	16	755
		Expected Count	129.0	417.0	193.0	16.0	755.0
		% within SE	17.1%	55.2%	25.6%	2.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.708[a]	12	.004
Likelihood Ratio	27.602	12	.006
Linear-by-Linear Association	17.112	1	.000
N of Valid Cases	755		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is .74.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.151	.037	-4.182	.000[c]
Ordinal by Ordinal	Spearman Correlation	-.160	.036	-4.460	.000[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Leadership and Capabilities of Administrators

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SE * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

SE * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
SE	Under 500	Count	6	88	98	23	215
		Expected Count	6.8	97.7	92.8	17.7	215.0
		% within SE	2.8%	40.9%	45.6%	10.7%	100.0%
	500-1,000	Count	2	62	65	16	145
		Expected Count	4.6	65.9	62.6	11.9	145.0
		% within SE	1.4%	42.8%	44.8%	11.0%	100.0%
	1,001-5,000	Count	11	115	119	19	264
		Expected Count	8.4	119.9	114.0	21.7	264.0
		% within SE	4.2%	43.6%	45.1%	7.2%	100.0%
	5,001-20,000	Count	3	58	33	2	96
		Expected Count	3.1	43.6	41.5	7.9	96.0
		% within SE	3.1%	60.4%	34.4%	2.1%	100.0%
	Over 20,000	Count	2	20	11	2	35
		Expected Count	1.1	15.9	15.1	2.9	35.0
		% within SE	5.7%	57.1%	31.4%	5.7%	100.0%
Total		Count	24	343	326	62	755
		Expected Count	24.0	343.0	326.0	62.0	755.0
		% within SE	3.2%	45.4%	43.2%	8.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.744[a]	12	.040
Likelihood Ratio	23.346	12	.025
Linear-by-Linear Association	13.311	1	.000
N of Valid Cases	755		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is 1.11.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T [b]	Approx. Sig.
Interval by Interval	Pearson's R	-.133	.035	-3.679	.000[c]
Ordinal by Ordinal	Spearman Correlation	-.130	.036	-3.596	.000[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Models of Professional Development

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SE * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

SE * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
SE	Under 500	Count	29	130	48	8	215
		Expected Count	29.6	115.3	64.1	6.0	215.0
		% within SE	13.5%	60.5%	22.3%	3.7%	100.0%
	500-1,000	Count	23	78	43	1	145
		Expected Count	20.0	77.8	43.2	4.0	145.0
		% within SE	15.9%	53.8%	29.7%	.7%	100.0%
	1,001-5,000	Count	36	137	84	7	264
		Expected Count	36.4	141.6	78.7	7.3	264.0
		% within SE	13.6%	51.9%	31.8%	2.7%	100.0%
	5,001-20,000	Count	15	44	35	2	96
		Expected Count	13.2	51.5	28.6	2.7	96.0
		% within SE	15.6%	45.8%	36.5%	2.1%	100.0%
	Over 20,000	Count	1	16	15	3	35
		Expected Count	4.8	18.8	10.4	1.0	35.0
		% within SE	2.9%	45.7%	42.9%	8.6%	100.0%
Total		Count	104	405	225	21	755
		Expected Count	104.0	405.0	225.0	21.0	755.0
		% within SE	13.8%	53.6%	29.8%	2.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.449[a]	12	.033
Likelihood Ratio	23.362	12	.025
Linear-by-Linear Association	7.118	1	.008
N of Valid Cases	755		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is .97.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T [b]	Approx. Sig.
Interval by Interval	Pearson's R	.097	.037	2.679	.008[c]
Ordinal by Ordinal	Spearman Correlation	.097	.036	2.678	.008[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Levels of Understanding and Patterns of Use

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SE * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

SE * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
SE	Under 500	Count	34	132	40	9	215
		Expected Count	35.9	139.3	34.5	5.4	215.0
		% within SE	15.8%	61.4%	18.6%	4.2%	100.0%
	500-1,000	Count	24	91	23	7	145
		Expected Count	24.2	93.9	23.2	3.6	145.0
		% within SE	16.6%	62.8%	15.9%	4.8%	100.0%
	1,001-5,000	Count	39	183	39	3	264
		Expected Count	44.1	171.0	42.3	6.6	264.0
		% within SE	14.8%	69.3%	14.8%	1.1%	100.0%
	5,001-20,000	Count	23	58	15	0	96
		Expected Count	16.0	62.2	15.4	2.4	96.0
		% within SE	24.0%	60.4%	15.6%	.0%	100.0%
	Over 20,000	Count	6	25	4	0	35
		Expected Count	5.8	22.7	5.6	.9	35.0
		% within SE	17.1%	71.4%	11.4%	.0%	100.0%
Total		Count	126	489	121	19	755
		Expected Count	126.0	489.0	121.0	19.0	755.0
		% within SE	16.7%	64.8%	16.0%	2.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.936[a]	12	.118
Likelihood Ratio	20.354	12	.061
Linear-by-Linear Association	6.989	1	.008
N of Valid Cases	755		

a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is .88.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T [b]	Approx. Sig.
Interval by Interval	Pearson's R	-.096	.035	-2.654	.008[c]
Ordinal by Ordinal	Spearman Correlation	-.083	.037	-2.286	.023[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Technology Budget Allocated to Technology Professional Development

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SE * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

SE * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
SE	Under 500	Count	65	122	22	6	215
		Expected Count	65.2	116.5	24.2	9.1	215.0
		% within SE	30.2%	56.7%	10.2%	2.8%	100.0%
	500-1,000	Count	43	77	17	8	145
		Expected Count	44.0	78.5	16.3	6.1	145.0
		% within SE	29.7%	53.1%	11.7%	5.5%	100.0%
	1,001-5,000	Count	92	132	28	12	264
		Expected Count	80.1	143.0	29.7	11.2	264.0
		% within SE	34.8%	50.0%	10.6%	4.5%	100.0%
	5,001-20,000	Count	25	58	10	3	96
		Expected Count	29.1	52.0	10.8	4.1	96.0
		% within SE	26.0%	60.4%	10.4%	3.1%	100.0%
	Over 20,000	Count	4	20	8	3	35
		Expected Count	10.6	19.0	3.9	1.5	35.0
		% within SE	11.4%	57.1%	22.9%	8.6%	100.0%
Total		Count	229	409	85	32	755
		Expected Count	229.0	409.0	85.0	32.0	755.0
		% within SE	30.3%	54.2%	11.3%	4.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.478[a]	12	.170
Likelihood Ratio	16.524	12	.168
Linear-by-Linear Association	2.684	1	.101
N of Valid Cases	755		

a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is 1.48.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.060	.036	1.640	.101[c]
Ordinal by Ordinal	Spearman Correlation	.044	.035	1.198	.231[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

APPENDIX E

PEDS SPSS CROSSTABULATION OUTPUTS

Percentage of Economically Disadvantaged Students by Technology Level of Progress Crosstabulations

Content of Training

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PEDS * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

PEDS * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
PEDS	Fewer than 35%	Count	17	114	82	8	221
		Expected Count	17.9	114.5	82.5	6.1	221.0
		% within PEDS	7.7%	51.6%	37.1%	3.6%	100.0%
	35-49%	Count	19	120	86	2	227
		Expected Count	18.3	117.6	84.8	6.3	227.0
		% within PEDS	8.4%	52.9%	37.9%	.9%	100.0%
	50-74%	Count	22	142	101	8	273
		Expected Count	22.1	141.4	102.0	7.6	273.0
		% within PEDS	8.1%	52.0%	37.0%	2.9%	100.0%
	75% or More	Count	3	15	13	3	34
		Expected Count	2.7	17.6	12.7	.9	34.0
		% within PEDS	8.8%	44.1%	38.2%	8.8%	100.0%
Total		Count	61	391	282	21	755
		Expected Count	61.0	391.0	282.0	21.0	755.0
		% within PEDS	8.1%	51.8%	37.4%	2.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.557[a]	9	.479
Likelihood Ratio	7.965	9	.538
Linear-by-Linear Association	.065	1	.799
N of Valid Cases	755		

a. 2 cells (12.5%) have expected count less than 5. The minimum expected count is .95.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T [b]	Approx. Sig.
Interval by Interval	Pearson's R	.009	.038	.255	.799[c]
Ordinal by Ordinal	Spearman Correlation	.006	.037	.169	.866[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Capabilities of Educators

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PEDS * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

PEDS * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
PEDS	Fewer than 35%	Count	42	123	52	4	221
		Expected Count	37.8	122.1	56.5	4.7	221.0
		% within PEDS	19.0%	55.7%	23.5%	1.8%	100.0%
	35-49%	Count	37	126	62	2	227
		Expected Count	38.8	125.4	58.0	4.8	227.0
		% within PEDS	16.3%	55.5%	27.3%	.9%	100.0%
	50-74%	Count	45	152	70	6	273
		Expected Count	46.6	150.8	69.8	5.8	273.0
		% within PEDS	16.5%	55.7%	25.6%	2.2%	100.0%
	75% or More	Count	5	16	9	4	34
		Expected Count	5.8	18.8	8.7	.7	34.0
		% within PEDS	14.7%	47.1%	26.5%	11.8%	100.0%
Total		Count	129	417	193	16	755
		Expected Count	129.0	417.0	193.0	16.0	755.0
		% within PEDS	17.1%	55.2%	25.6%	2.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.478[a]	9	.030
Likelihood Ratio	11.195	9	.263
Linear-by-Linear Association	2.541	1	.111
N of Valid Cases	755		

a. 3 cells (18.8%) have expected count less than 5. The minimum expected count is .72.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.058	.038	1.596	.111[c]
Ordinal by Ordinal	Spearman Correlation	.047	.037	1.299	.194[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Leadership and Capabilities of Administrators

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PEDS * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

PEDS * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
PEDS	Fewer than 35%	Count	9	105	91	16	221
		Expected Count	7.0	100.4	95.4	18.1	221.0
		% within PEDS	4.1%	47.5%	41.2%	7.2%	100.0%
	35-49%	Count	7	99	102	19	227
		Expected Count	7.2	103.1	98.0	18.6	227.0
		% within PEDS	3.1%	43.6%	44.9%	8.4%	100.0%
	50-74%	Count	7	126	119	21	273
		Expected Count	8.7	124.0	117.9	22.4	273.0
		% within PEDS	2.6%	46.2%	43.6%	7.7%	100.0%
	75% or More	Count	1	13	14	6	34
		Expected Count	1.1	15.4	14.7	2.8	34.0
		% within PEDS	2.9%	38.2%	41.2%	17.6%	100.0%
Total		Count	24	343	326	62	755
		Expected Count	24.0	343.0	326.0	62.0	755.0
		% within PEDS	3.2%	45.4%	43.2%	8.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.133[a]	9	.727
Likelihood Ratio	5.224	9	.814
Linear-by-Linear Association	1.715	1	.190
N of Valid Cases	755		

a. 2 cells (12.5%) have expected count less than 5. The minimum expected count is 1.08.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.048	.037	1.310	.191[c]
Ordinal by Ordinal	Spearman Correlation	.040	.037	1.109	.268[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Models of Professional Development

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PEDS *Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

PEDS * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
PEDS	Fewer than 35%	Count	31	113	70	7	221
		Expected Count	30.4	118.5	65.9	6.1	221.0
		% within PEDS	14.0%	51.1%	31.7%	3.2%	100.0%
	35-49%	Count	34	124	65	4	227
		Expected Count	31.3	121.8	67.6	6.3	227.0
		% within PEDS	15.0%	54.6%	28.6%	1.8%	100.0%
	50-74%	Count	38	151	76	8	273
		Expected Count	37.6	146.4	81.4	7.6	273.0
		% within PEDS	13.9%	55.3%	27.8%	2.9%	100.0%
	75% or More	Count	1	17	14	2	34
		Expected Count	4.7	18.2	10.1	.9	34.0
		% within PEDS	2.9%	50.0%	41.2%	5.9%	100.0%
Total		Count	104	405	225	21	755
		Expected Count	104.0	405.0	225.0	21.0	755.0
		% within PEDS	13.8%	53.6%	29.8%	2.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.033[a]	9	.531
Likelihood Ratio	9.093	9	.429
Linear-by-Linear Association	.270	1	.603
N of Valid Cases	755		

a. 2 cells (12.5%) have expected count less than 5. The minimum expected count is .95.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.019	.037	.519	.604[c]
Ordinal by Ordinal	Spearman Correlation	.010	.037	.276	.782[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Levels of Understanding and Patterns of Use

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PEDS * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

PEDS * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
PEDS	Fewer than 35%	Count	42	137	37	5	221
		Expected Count	36.9	143.1	35.4	5.6	221.0
		% within PEDS	19.0%	62.0%	16.7%	2.3%	100.0%
	35-49%	Count	35	151	38	3	227
		Expected Count	37.9	147.0	36.4	5.7	227.0
		% within PEDS	15.4%	66.5%	16.7%	1.3%	100.0%
	50-74%	Count	44	181	39	9	273
		Expected Count	45.6	176.8	43.8	6.9	273.0
		% within PEDS	16.1%	66.3%	14.3%	3.3%	100.0%
	75% or More	Count	5	20	7	2	34
		Expected Count	5.7	22.0	5.4	.9	34.0
		% within PEDS	14.7%	58.8%	20.6%	5.9%	100.0%
Total		Count	126	489	121	19	755
		Expected Count	126.0	489.0	121.0	19.0	755.0
		% within PEDS	16.7%	64.8%	16.0%	2.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.354[a]	9	.704
Likelihood Ratio	6.115	9	.728
Linear-by-Linear Association	.836	1	.361
N of Valid Cases	755		

a. 1 cells (6.3%) have expected count less than 5. The minimum expected count is .86.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.033	.038	.914	.361[c]
Ordinal by Ordinal	Spearman Correlation	.024	.037	.662	.508[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Technology Budget Allocated to Technology Professional Development

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PEDS * Technology Level of Progress	755	100.0%	0	.0%	755	100.0%

PEDS * Technology Level of Progress

			Technology Level of Progress				
			Early	Developing	Advanced	Target	Total
PEDS	Fewer than 35%	Count	82	104	23	12	221
		Expected Count	67.0	119.7	24.9	9.4	221.0
		% within PEDS	37.1%	47.1%	10.4%	5.4%	100.0%
	35-49%	Count	57	130	30	10	227
		Expected Count	68.9	123.0	25.6	9.6	227.0
		% within PEDS	25.1%	57.3%	13.2%	4.4%	100.0%
	50-74%	Count	82	155	27	9	273
		Expected Count	82.8	147.9	30.7	11.6	273.0
		% within PEDS	30.0%	56.8%	9.9%	3.3%	100.0%
	75% or More	Count	8	20	5	1	34
		Expected Count	10.3	18.4	3.8	1.4	34.0
		% within PEDS	23.5%	58.8%	14.7%	2.9%	100.0%
Total		Count	229	409	85	32	755
		Expected Count	229.0	409.0	85.0	32.0	755.0
		% within PEDS	30.3%	54.2%	11.3%	4.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.042[a]	9	.211
Likelihood Ratio	12.023	9	.212
Linear-by-Linear Association	.216	1	.642
N of Valid Cases	755		

a. 2 cells (12.5%) have expected count less than 5. The minimum expected count is 1.44.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.017	.037	.465	.642[c]
Ordinal by Ordinal	Spearman Correlation	.032	.037	.887	.375[c]
N of Valid Cases		755			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

APPENDIX F

SE-PEDS SPSS LOGISTIC REGRESSION OUTPUTS

Logistic Regression Content of Training - Technology Level of Progress Interaction Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	1017.058	-.395
	2	1017.053	-.400
	3	1017.053	-.400

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 1017.053

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Training-Technology Level of Progress: Early Stages	Predicted: Training-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Training-Technology Level of Progress	Early Stages	452	0	100.0
		Advanced Stages	303	0	.0
	Overall Percentage				59.9

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.400	.074	29.016	1	.000	.670

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	.292	1	.589
		d2	.171	1	.679
		d3	.027	1	.870
		d4	.618	1	.432
		d5	.046	1	.831
		d6	.252	1	.616
		d7	.008	1	.931
		d8	2.873	1	.090
		d9	.059	1	.809
		d10	.066	1	.798
		d11	.181	1	.671
		d12	.300	1	.584
		d13	.417	1	.518
		d14	.433	1	.511
		d15	.068	1	.795
		d16	.317	1	.573
		d17	.022	1	.882
		d18	1.958	1	.162
		d19	.090	1	.764
	Overall Statistics		19.390	19	.432

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	19.769	19	.409
	Block	19.769	19	.409
	Model	19.769	19	.409

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	997.284[a]	.026	.035

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	8	1.000

Contingency Table for Hosmer and Lemeshow Test

		Training-Technology Level of Progress = Early Stages		Training-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	53	53.000	20	20.000	73
	2	62	62.000	35	35.000	97
	3	70	70.000	42	42.000	112
	4	55	55.000	35	35.000	90
	5	25	25.000	16	16.000	41
	6	48	48.000	34	34.000	82
	7	38	38.000	27	27.000	65
	8	41	41.000	31	31.000	72
	9	44	44.000	34	34.000	78
	10	16	16.000	29	29.000	45

Classification Table [a]

			Predicted		
			Training-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Training-Technology Level of Progress	Early Stages	436	16	96.5
		Advanced Stages	274	29	9.6
	Overall Percentage				61.6

a. The cut value is .500

Logistic Regression Content of Training - Technology Level of Progress Main Effects Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	1017.058	-.395
	2	1017.053	-.400
	3	1017.053	-.400

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 1017.053

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Training-Technology Level of Progress: Early Stages	Predicted: Training-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Training-Technology Level of Progress	Early Stages	452	0	100.0
		Advanced Stages	303	0	.0
	Overall Percentage				59.9

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.400	.074	29.016	1	.000	.670

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	.292	1	.589
		d2	.171	1	.679
		d3	.027	1	.870
		d4	.618	1	.432
		d5	.046	1	.831
		d6	.252	1	.616
		d7	.008	1	.931
	Overall Statistics		9.461	7	.221

Block 1: Method = Enter

Iteration History [a,b,c,d]

Iteration		-2 Log likelihood	Coefficients							
			Constant	d1	d2	d3	d4	d5	d6	d7
Step 1	1	1007.793	.827	-.975	-.963	-.889	-1.074	-.291	-.361	-.327
	2	1007.778	.849	-.996	-.984	-.906	-1.102	-.299	-.373	-.337
	3	1007.778	.849	-.996	-.984	-.906	-1.102	-.299	-.373	-.337

a. Method: Enter

b. Constant is included in the model.

c. Initial -2 Log Likelihood: 1017.053

d. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	9.275	7	.233
	Block	9.275	7	.233
	Model	9.275	7	.233

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1007.778[a]	.012	.017

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.323	8	.913

Contingency Table for Hosmer and Lemeshow Test

		Training-Technology Level of Progress = Early Stages		Training-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	56	57.060	33	31.940	89
	2	38	40.762	27	24.238	65
	3	33	32.461	19	19.539	52
	4	55	55.685	35	34.315	90
	5	62	55.753	29	35.247	91
	6	25	26.693	19	17.307	44
	7	48	49.681	34	32.319	82
	8	60	57.342	36	38.658	96
	9	44	45.863	34	32.137	78
	10	31	30.700	37	37.300	68

Classification Table [a]

			Predicted		
			Training-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Training-Technology Level of Progress	Early Stages	439	13	97.1
		Advanced Stages	281	22	7.3
	Overall Percentage				61.1

a. The cut value is .500

Logistic Regression Capabilities of Educators - Technology Level of Progress Interaction Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	891.485	-.893
	2	890.788	-.959
	3	890.788	-.960

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 890.788

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Capabilities-Technology Level of Progress: Early Stages	Predicted: Capabilities-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Capabilities-Technology Level of Progress	Early Stages	546	0	100.0
		Advanced Stages	209	0	.0
	Overall Percentage				72.3

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.960	.081	139.377	1	.000	.383

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	8.826	1	.003
		d2	3.348	1	.067
		d3	4.978	1	.026
		d4	5.465	1	.019
		d5	.857	1	.355
		d6	.042	1	.837
		d7	.005	1	.942
		d8	.348	1	.555
		d9	3.034	1	.082
		d10	6.410	1	.011
		d11	1.759	1	.185
		d12	.038	1	.846
		d13	2.436	1	.119
		d14	.480	1	.488
		d15	1.509	1	.219
		d16	3.421	1	.064
		d17	.711	1	.399
		d18	.074	1	.786
		d19	6.128	1	.013
	Overall Statistics		33.536	19	.021

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	35.075	19	.014
	Block	35.075	19	.014
	Model	35.075	19	.014

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	855.713[a]	.045	.066

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	8	1.000

Contingency Table for Hosmer and Lemeshow Test

		Capabilities-Technology Level of Progress = Early Stages		Capabilities-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	43	43.000	4	4.000	47
	2	77	77.000	19	19.000	96
	3	75	75.000	21	21.000	96
	4	67	67.000	20	20.000	87
	5	59	59.000	19	19.000	78
	6	61	61.000	23	23.000	84
	7	28	28.000	16	16.000	44
	8	41	41.000	24	24.000	65
	9	28	28.000	17	17.000	45
	10	67	67.000	46	46.000	113

Classification Table [a]

			Predicted		
			Capabilities-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Capabilities-Technology Level of Progress	Early Stages	542	4	99.3
		Advanced Stages	204	5	2.4
	Overall Percentage				72.5

a. The cut value is .500

Logistic Regression Capabilities of Educators - Technology Level of Progress Main Effects Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	891.485	-.893
	2	890.788	-.959
	3	890.788	-.960

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 890.788

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Capabilities-Technology Level of Progress: Early Stages	Predicted: Capabilities-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Capabilities-Technology Level of Progress	Early Stages	546	0	100.0
		Advanced Stages	209	0	.0
	Overall Percentage				72.3

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.960	.081	139.377	1	.000	.383

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	8.826	1	.003
		d2	3.348	1	.067
		d3	4.978	1	.026
		d4	5.465	1	.019
		d5	.857	1	.355
		d6	.042	1	.837
		d7	.005	1	.942
	Overall Statistics		19.966	7	.006

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	20.152	7	.005
	Block	20.152	7	.005
	Model	20.152	7	.005

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	870.637[a]	.026	.038

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.189	8	.922

Contingency Table for Hosmer and Lemeshow Test

		Capabilities-Technology Level of Progress = Early Stages		Capabilities-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	58	57.281	11	11.719	69
	2	43	43.799	11	10.201	54
	3	59	61.000	19	17.000	78
	4	77	74.223	19	21.777	96
	5	64	63.364	18	18.636	82
	6	38	40.962	22	19.038	60
	7	63	60.307	28	30.693	91
	8	37	34.396	15	17.604	52
	9	55	58.665	35	31.335	90
	10	52	52.002	31	30.998	83

Classification Table [a]

			Predicted		
			Capabilities-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Capabilities-Technology Level of Progress	Early Stages	546	0	100.0
		Advanced Stages	209	0	.0
	Overall Percentage				72.3

a. The cut value is .500

Logistic Regression Leadership and Capabilities of Administrators - Technology Level of Progress Interaction Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	1046.068	.056
	2	1046.068	.056

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 1046.068

c. Estimation terminated at iteration number 2 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Leadership-Technology Level of Progress: Early Stages	Predicted: Leadership-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Leadership-Technology Level of Progress	Early Stages	0	367	.0
		Advanced Stages	0	388	100.0
	Overall Percentage				51.4

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.056	.073	.584	1	.445	1.057

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	2.875	1	.090
		d2	1.436	1	.231
		d3	.126	1	.722
		d4	9.817	1	.002
		d5	1.107	1	.293
		d6	.476	1	.490
		d7	.002	1	.964
		d8	.171	1	.679
		d9	.454	1	.500
		d10	.710	1	.400
		d11	.551	1	.458
		d12	.888	1	.346
		d13	.001	1	.969
		d14	.249	1	.618
		d15	1.293	1	.255
		d16	.021	1	.884
		d17	2.654	1	.103
		d18	3.763	1	.052
		d19	2.861	1	.091
	Overall Statistics		23.368	19	.222

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	24.263	19	.186
	Block	24.263	19	.186
	Model	24.263	19	.186

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1021.805[a]	.032	.042

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	8	1.000

Contingency Table for Hosmer and Lemeshow Test

		Leadership-Technology Level of Progress = Early Stages		Leadership-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	52	52.000	24	24.000	76
	2	29	29.000	19	19.000	48
	3	40	40.000	38	38.000	78
	4	29	29.000	30	30.000	59
	5	46	46.000	50	50.000	96
	6	21	21.000	25	25.000	46
	7	29	29.000	36	36.000	65
	8	40	40.000	50	50.000	90
	9	19	19.000	25	25.000	44
	10	62	62.000	91	91.000	153

Classification Table [a]

			Predicted		
			Leadership-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Leadership-Technology Level of Progress	Early Stages	121	246	33.0
		Advanced Stages	81	307	79.1
	Overall Percentage				56.7

a. The cut value is .500

Logistic Regression Leadership and Capabilities of Administrators - Technology Level of Progress Main Effects Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients
			Constant
Step 0	1	1046.068	.056
	2	1046.068	.056

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 1046.068

c. Estimation terminated at iteration number 2 because parameter estimates changed by less than .001.

Classification Table [a,b]

			Predicted		
			Leadership-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 0	Leadership-Technology Level of Progress	Early Stages	0	367	.0
		Advanced Stages	0	388	100.0
	Overall Percentage				51.4

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.056	.073	.584	1	.445	1.057

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	2.875	1	.090
		d2	1.436	1	.231
		d3	.126	1	.722
		d4	9.817	1	.002
		d5	1.107	1	.293
		d6	.476	1	.490
		d7	.002	1	.964
	Overall Statistics		15.990	7	.025

Block 1: Method = Enter

Iteration History [a,b,c,d]

Iteration		-2 Log likelihood	Coefficients							
			Constant	d1	d2	d3	d4	d5	d6	d7
Step 1	1	1029.932	-.173	.742	.740	.597	-.038	-.396	-.290	-.349
	2	1029.924	-.172	.756	.753	.610	-.041	-.410	-.302	-.362
	3	1029.924	-.172	.756	.753	.610	-.041	-.411	-.302	-.362

a. Method: Enter

b. Constant is included in the model.

c. Initial -2 Log Likelihood: 1046.068

d. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	16.144	7	.024
	Block	16.144	7	.024
	Model	16.144	7	.024

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1029.924[a]	.021	.028

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.153	8	.997

Contingency Table for Hosmer and Lemeshow Test

		Leadership-Technology Level of Progress = Early Stages		Leadership-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	52	52.310	29	28.690	81
	2	31	30.690	19	19.310	50
	3	40	38.467	38	39.533	78
	4	46	46.181	50	49.819	96
	5	35	38.214	47	43.786	82
	6	40	41.140	50	48.860	90
	7	22	20.045	23	24.955	45
	8	40	40.029	50	49.971	90
	9	22	22.392	30	29.608	52
	10	39	37.531	52	53.469	91

Classification Table [a]

			Predicted		
			Leadership-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Leadership-Technology Level of Progress	Early Stages	83	284	22.6
		Advanced Stages	48	340	87.6
	Overall Percentage				56.0

a. The cut value is .500

Logistic Regression Models of Professional Development - Technology Level of Progress Interaction Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	953.243	-.697
	2	953.089	-.727
	3	953.089	-.727

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 953.089

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Models-Technology Level of Progress: Early Stages	Predicted: Models-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Models-Technology Level of Progress	Early Stages	509	0	100.0
		Advanced Stages	246	0	.0
	Overall Percentage				67.4

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.727	.078	87.683	1	.000	.483

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	5.846	1	.016
		d2	.409	1	.522
		d3	.658	1	.417
		d4	1.778	1	.182
		d5	.726	1	.394
		d6	.706	1	.401
		d7	.640	1	.424
		d8	1.676	1	.195
		d9	1.338	1	.247
		d10	7.365	1	.007
		d11	.304	1	.581
		d12	3.321	1	.068
		d13	.012	1	.912
		d14	.435	1	.510
		d15	.324	1	.569
		d16	.028	1	.867
		d17	1.557	1	.212
		d18	.515	1	.473
		d19	.130	1	.719
	Overall Statistics		34.351	19	.017

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	34.107	19	.018
	Block	34.107	19	.018
	Model	34.107	19	.018

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	918.982[a]	.044	.062

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	7	1.000

Contingency Table for Hosmer and Lemeshow Test

		Models-Technology Level of Progress = Early Stages		Models-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	73	73.000	18	18.000	91
	2	76	76.000	22	22.000	98
	3	54	54.000	19	19.000	73
	4	5	5.000	2	2.000	7
	5	94	94.000	47	47.000	141
	6	53	53.000	29	29.000	82
	7	68	68.000	38	38.000	106
	8	40	40.000	24	24.000	64
	9	46	46.000	47	47.000	93

Classification Table [a]

			Predicted		
			Models-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Models-Technology Level of Progress	Early Stages	494	15	97.1
		Advanced Stages	221	25	10.2
	Overall Percentage				68.7

a. The cut value is .500

Logistic Regression Models of Professional Development - Technology Level of Progress Main Effects Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	953.243	-.697
	2	953.089	-.727
	3	953.089	-.727

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 953.089

c. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Models-Technology Level of Progress: Early Stages	Predicted: Models-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Models-Technology Level of Progress	Early Stages	509	0	100.0
		Advanced Stages	246	0	.0
	Overall Percentage				67.4

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.727	.078	87.683	1	.000	.483

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	5.846	1	.016
		d2	.409	1	.522
		d3	.658	1	.417
		d4	1.778	1	.182
		d5	.726	1	.394
		d6	.706	1	.401
		d7	.640	1	.424
	Overall Statistics		16.518	7	.021

Block 1: Method = Enter

Iteration History [a,b,c,d]

Iteration		-2 Log likelihood	Coefficients							
			Constant	d1	d2	d3	d4	d5	d6	d7
Step 1	1	937.405	.676	-1.025	-.837	-.674	-.555	-.561	-.682	-.675
	2	936.920	.726	-1.116	-.884	-.697	-.571	-.601	-.741	-.732
	3	936.920	.727	-1.118	-.885	-.697	-.571	-.602	-.742	-.733
	4	936.920	.727	-1.118	-.885	-.697	-.571	-.602	-.742	-.733

a. Method: Enter

b. Constant is included in the model.

c. Initial -2 Log Likelihood: 953.089

d. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	16.169	7	.024
	Block	16.169	7	.024
	Model	16.169	7	.024

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	936.920[a]	.021	.030

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.806	7	.802

Contingency Table for Hosmer and Lemeshow Test

		Models-Technology Level of Progress = Early Stages		Models-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	48	49.161	17	15.839	65
	2	72	67.928	18	22.072	90
	3	76	70.523	22	27.477	98
	4	58	61.881	31	27.119	89
	5	53	55.000	29	27.000	82
	6	64	64.211	32	31.789	96
	7	30	30.779	18	17.221	48
	8	50	49.849	28	28.151	78
	9	58	59.668	51	49.332	109

Classification Table [a]

			Predicted		
			Models-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Models-Technology Level of Progress	Early Stages	490	19	96.3
		Advanced Stages	237	9	3.7
	Overall Percentage				66.1

a. The cut value is .500

Logistic Regression Levels of Understanding and Patterns of Use - Technology Level of Progress Interaction Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients
			Constant
Step 0	1	729.956	-1.258
	2	724.110	-1.466
	3	724.089	-1.480
	4	724.089	-1.480

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 724.089

c. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted		
			Use-Technology Level of Progress		Percentage Correct
			Early Stages	Advanced Stages	
Step 0	Use-Technology Level of Progress	Early Stages	615	0	100.0
		Advanced Stages	140	0	.0
	Overall Percentage				81.5

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.480	.094	249.786	1	.000	.228

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	3.591	1	.058
		d2	.547	1	.459
		d3	1.865	1	.172
		d4	.620	1	.431
		d5	.044	1	.834
		d6	.050	1	.823
		d7	.261	1	.609
		d8	.034	1	.854
		d9	.968	1	.325
		d10	.916	1	.339
		d11	2.357	1	.125
		d12	.369	1	.544
		d13	.067	1	.795
		d14	.203	1	.653
		d15	.004	1	.951
		d16	2.659	1	.103
		d17	.439	1	.508
		d18	.993	1	.319
		d19	.160	1	.689
	Overall Statistics		13.193	19	.829

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	13.358	19	.820
	Block	13.358	19	.820
	Model	13.358	19	.820

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	710.730[a]	.018	.028

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	7	1.000

Contingency Table for Hosmer and Lemeshow Test

		Use-Technology Level of Progress = Early Stages		Use-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	32	32.000	3	3.000	35
	2	91	91.000	13	13.000	104
	3	85	85.000	15	15.000	100
	4	75	75.000	15	15.000	90
	5	67	67.000	15	15.000	82
	6	73	73.000	18	18.000	91
	7	92	92.000	26	26.000	118
	8	59	59.000	18	18.000	77
	9	41	41.000	17	17.000	58

Classification Table [a]

			Predicted		
			Use-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Use-Technology Level of Progress	Early Stages	615	0	100.0
		Advanced Stages	140	0	.0
	Overall Percentage				81.5

a. The cut value is .500

Logistic Regression Levels of Understanding and Patterns of Use - Technology Level of Progress Main Effects Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients
			Constant
Step 0	1	729.956	-1.258
	2	724.110	-1.466
	3	724.089	-1.480
	4	724.089	-1.480

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 724.089

c. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted		
			Use-Technology Level of Progress		Percentage Correct
			Early Stages	Advanced Stages	
Step 0	Use-Technology Level of Progress	Early Stages	615	0	100.0
		Advanced Stages	140	0	.0
	Overall Percentage				81.5

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.480	.094	249.786	1	.000	.228

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	3.591	1	.058
		d2	.547	1	.459
		d3	1.865	1	.172
		d4	.620	1	.431
		d5	.044	1	.834
		d6	.050	1	.823
		d7	.261	1	.609
	Overall Statistics		7.631	7	.366

Block 1: Method = Enter

Iteration History [a,b,c,d]

			Coefficients							
Iteration		-2 Log likelihood	Constant	d1	d2	d3	d4	d5	d6	d7
Step 1	1	723.942	-1.244	.452	.372	.181	.146	-.255	-.327	-.342
	2	716.562	-1.550	.750	.636	.334	.277	-.351	-.464	-.488
	3	716.496	-1.615	.823	.706	.385	.323	-.359	-.479	-.505
	4	716.496	-1.617	.826	.708	.387	.325	-.359	-.479	-.505
	5	716.496	-1.617	.826	.708	.387	.325	-.359	-.479	-.505

a. Method: Enter

b. Constant is included in the model.

c. Initial -2 Log Likelihood: 724.089

d. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	7.592	7	.370
	Block	7.592	7	.370
	Model	7.592	7	.370

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	716.496[a]	.010	.016

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.692	7	.975

Contingency Table for Hosmer and Lemeshow Test

		Use-Technology Level of Progress = Early Stages		Use-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	70	71.274	12	10.726	82
	2	84	81.606	12	14.394	96
	3	67	69.425	15	12.575	82
	4	36	35.235	6	6.765	42
	5	65	64.778	13	13.222	78
	6	80	77.810	17	19.190	97
	7	70	70.674	20	19.326	90
	8	56	56.240	16	15.760	72
	9	87	87.957	29	28.043	116

Classification Table [a]

			Predicted		
			Use-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Use-Technology Level of Progress	Early Stages	615	0	100.0
		Advanced Stages	140	0	.0
	Overall Percentage				81.5

a. The cut value is .500

Logistic Regression Technology Budget Allocated to Technology Professional Development - Technology Level of Progress Interaction Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	661.763	-1.380
	2	651.242	-1.667
	3	651.155	-1.696
	4	651.155	-1.696

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 651.155

c. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Budget-Technology Level of Progress: Early Stages	Predicted: Budget-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Budget-Technology Level of Progress	Early Stages	638	0	100.0
		Advanced Stages	117	0	.0
	Overall Percentage				84.5

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.696	.101	284.443	1	.000	.183

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	1.404	1	.236
		d2	.417	1	.518
		d3	.037	1	.848
		d4	.321	1	.571
		d5	.028	1	.868
		d6	1.119	1	.290
		d7	1.742	1	.187
		d8	.225	1	.635
		d9	1.101	1	.294
		d10	6.084	1	.014
		d11	3.222	1	.073
		d12	.177	1	.674
		d13	.000	1	.991
		d14	1.824	1	.177
		d15	.009	1	.925
		d16	.889	1	.346
		d17	.082	1	.774
		d18	.004	1	.950
		d19	3.158	1	.076
	Overall Statistics		27.507	19	.093

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	27.667	19	.090
	Block	27.667	19	.090
	Model	27.667	19	.090

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	623.488[a]	.036	.062

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	8	1.000

Contingency Table for Hosmer and Lemeshow Test

		Budget-Technology Level of Progress = Early Stages		Budget-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	32	32.000	1	1.000	33
	2	84	84.000	6	6.000	90
	3	70	70.000	8	8.000	78
	4	47	47.000	7	7.000	54
	5	62	62.000	10	10.000	72
	6	38	38.000	7	7.000	45
	7	69	69.000	13	13.000	82
	8	34	34.000	7	7.000	41
	9	78	78.000	18	18.000	96
	10	124	124.000	40	40.000	164

Classification Table [a]

			Predicted		
			Budget-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Budget-Technology Level of Progress	Early Stages	634	4	99.4
		Advanced Stages	113	4	3.4
	Overall Percentage				84.5

a. The cut value is .500

Logistic Regression Technology Budget Allocated to Technology Professional Development - Technology Level of Progress Main Effects Model

Case Processing Summary

Unweighted Cases [a]		N	Percent
Selected Cases	Included in Analysis	755	100.0
	Missing Cases	0	.0
	Total	755	100.0
Unselected Cases		0	.0
Total		755	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Early Stages	0
Advanced Stages	1

Block 0: Beginning Block

Iteration History [a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	661.763	-1.380
	2	651.242	-1.667
	3	651.155	-1.696
	4	651.155	-1.696

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 651.155

c. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table [a,b]

	Observed		Predicted: Budget-Technology Level of Progress: Early Stages	Predicted: Budget-Technology Level of Progress: Advanced Stages	Predicted: Percentage Correct
Step 0	Budget-Technology Level of Progress	Early Stages	638	0	100.0
		Advanced Stages	117	0	.0
	Overall Percentage				84.5

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.696	.101	284.443	1	.000	.183

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	d1	1.404	1	.236
		d2	.417	1	.518
		d3	.037	1	.848
		d4	.321	1	.571
		d5	.028	1	.868
		d6	1.119	1	.290
		d7	1.742	1	.187
	Overall Statistics		10.567	7	.159

Block 1: Method = Enter

Iteration History [a,b,c,d]

			Coefficients							
Iteration		-2 Log likelihood	Constant	d1	d2	d3	d4	d5	d6	d7
Step 1	1	654.526	-.613	-.745	-.587	-.662	-.729	-.113	-.032	-.210
	2	641.929	-.557	-1.082	-.805	-.931	-1.053	-.193	-.056	-.367
	3	641.751	-.533	-1.138	-.828	-.966	-1.104	-.211	-.062	-.410
	4	641.751	-.533	-1.139	-.829	-.966	-1.105	-.212	-.062	-.411
	5	641.751	-.533	-1.139	-.829	-.966	-1.105	-.212	-.062	-.411

a. Method: Enter

b. Constant is included in the model.

c. Initial -2 Log Likelihood: 651.155

d. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	9.405	7	.225
	Block	9.405	7	.225
	Model	9.405	7	.225

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	641.751[a]	.012	.021

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8.997	7	.253

Contingency Table for Hosmer and Lemeshow Test

		Budget-Technology Level of Progress = Early Stages		Budget-Technology Level of Progress = Advanced Stages		
		Observed	Expected	Observed	Expected	Total
Step 1	1	84	80.034	6	9.966	90
	2	105	108.423	19	15.577	124
	3	74	75.358	13	11.642	87
	4	38	38.465	7	6.535	45
	5	52	55.249	13	9.751	65
	6	70	66.063	8	11.937	78
	7	66	71.000	19	14.000	85
	8	69	67.777	13	14.223	82
	9	80	75.631	19	23.369	99

Classification Table [a]

			Predicted		
			Budget-Technology Level of Progress		
	Observed		Early Stages	Advanced Stages	Percentage Correct
Step 1	Budget-Technology Level of Progress	Early Stages	638	0	100.0
		Advanced Stages	117	0	.0
	Overall Percentage				84.5

a. The cut value is .500

VITA

Trina J. Davis
1501 Woodland Drive
Bryan, TX 77802

EDUCATION

TEXAS A&M UNIVERSITY- College Station, TX. Ph.D., Educational Curriculum and Instruction, Emphasis: Educational Technology, 2005.

PRAIRIE VIEW A&M UNIVERSITY- Prairie View, TX. M.S., Mathematics, 1999.

VIRGINIA COMMONWEALTH UNIVERSITY- Richmond, VA. B.S., Mathematics, 1990.

EXPERIENCE

Director, eEducation, Texas A&M University, College of Education and Human Development, Department of Teaching, Learning And Culture, 2000-Present.

Director and Principal Investigator, Contract with NASA Johnson Space Center, Middle School Aerospace Scholars, 2002-2005.

Director, Ocean Drilling Distance Learning Program, Texas A&M University, Colleges of Education and Geosciences, 1999-2001.

Program Coordinator, South Central Regional Technology in Education Consortium (SCR*TEC-TX), Texas A&M University, College of Education, Office of the Dean, 1997-2000.

Technology Coordinator, Waller Independent School District, 1993-1997.

Mathematics Teacher and Gifted and Talented Teacher, Waller Independent School District, 1992-1996.

PROFESSIONAL SERVICE

Davis, T. (2003-2005). International Society for Technology in Education (ISTE), Executive Board of Directors, Treasurer 2004-2005.

Davis, T. (2000-2003). Appointment to the Texas Education Agency, Educational Technology Advisory Committee, Co-Chair 2001-2003.

SELECTED PUBLICATIONS

Denton, J., Davis, T., Strader, A., & Durbin, B. (Winter 2003). 2002 Texas public school technology survey. *INSIGHT*, *17*(3), 13-28.

Denton, J., Davis, T., & Strader, A. (2001, Summer). 2000 Texas public school technology survey. *INSIGHT*, *15*(2), 13-23.

Denton, J., Davis, T., Strader, A., Jessup, G., & Jolly, D. (1999, Summer). The changing technology infrastructure in Texas public schools. *INSIGHT, 13*(2), 34-38.