EXPLORING THE FACETS OF THE DIGITAL DIVIDE IN TEXAS PUBLIC SCHOOLS GRADES K-12

AMMY JONES

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Faculty Approval:

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Dr. Patricia M. Shields

____
Dr. Howard Balanoff

____
Mr. Paul Williams

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ABSTRACT

The purpose of this research is to explore differences in levels of technology integration in Texas school districts grades K-12. Despite intervention at the state and federal level, there is a perception that a digital divide exists in school district technology integration by geographic location, socioeconomic status and ethnicity.

This research uses survey data completed by 5,007 Texas school principals during the 2002-2003 school year. The principals ranked each campus' level of technology integration based on four key indicators, teaching and learning, educator preparation and development, administration and support services and infrastructure for technology. ANOVA and Independent t test were used to determine whether there were statistical significance with regard to the level of technology integration based on geographical location, socioeconomic status and ethnicity. The research uses three working hypotheses with four sub-hypothesis for each.

The data revealed that rural school districts have significantly higher scores in the area of teaching and learning than midsize and suburban districts and rural school districts are doing significantly better than midsize school districts in the areas of educator preparation and development. Rural school districts were also doing significantly better than urban, suburban and midsize school districts in the area of infrastructure for technology. Additionally, affluent school districts were doing significantly better than economically disadvantaged school districts in the areas of teaching and learning and educator preparation and development. Further, non-minority school districts are doing significantly better than minority school districts in teaching and learning, educator preparation and development, administrative support services and infrastructure for technology.

CHAPTER I
INTRODUCTION

Digital Survival

To survive in the Information Age, thrive in a global economy and avoid getting left behind, individuals must become more technologically competent than ever before. Americans are now living in the Information Age. The "Information Age[1]" can be defined as a new era of human development in which information will be increasingly viewed as a commodity, and one that is directly linked to economic and social mobility. The term digital divide has been used to describe the social implications of unequal access to information and communications technologies (ICT) and to the acquisition of the skills necessary for full inclusion (NOIE p.1 2003). The digital divide is now one of America's leading economic and civil rights issues. Education is perceived as one of the most viable and productive routes toward economic prosperity and a key element to maintaining democracy in America. Some believe that public education is one of the most promising ways of bridging the digital divide.

[2] Dusiclk (1998) argues that it is the responsibility of educators to enable all students' access to and training in technology. Without this effort, she suggests, we will create the next generation of "haves" and "have not." Minorities (African Americans and Hispanics), low-income persons, the less educated, and children of single-parent households, particularly when they reside in rural areas or central cities, are among the groups that lack access to information resources (U.S. Department of Commerce, 1999). According to Carver (1994 p. 532) during the

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[1] See Carver (1994)

[2] Dusiclk suggest that to be successful in society today, it is the responsibility of educators to help students gain self-efficacy (Bandura, 1989) in using computers. Self-efficacy in regards to using computers is defined as having a high expectation to succeed in using computers.

Information Age, economic and societal woes will prevent many from being productively involved in the usage of information technologies. Over twenty years ago Toffer (1971) warned of the emergence of an "information–rich," "information-poor" dichotomy in the United States. Toffler (1971) correctly predicted that African Americans and other minorities would constitute a large segment of the information poor category because of a general lack of availability of economical, educational and other societal opportunities. Consequently, minority populations would be at risk of failure in the Information Age. Americans are now living in the year of 2004 of the Information Age and encountering the evolution of e-government and the existence of a digital divide for minorities and the poor.[3] The education system is one of few routes for many Americans with hopes of bridging the digital divide. Classrooms around the nation are integrating technology into classroom curriculum. However, technology funding, access, educator training and use of technology in the classroom are not equally available to all students (Bolt and Crawford 2000 p. 25). Technology integration in Texas public schools is the focus of this research.

RESEARCH PURPOSE

The research purpose is to (1) explore differences in the level of technology integration in urban, suburban and midsize Texas school districts compared to rural school districts; (2) explore economically disadvantaged school districts compared to affluent school districts and (3) explore schools districts with a high minority population compared to those with a low minority population. The key concepts are geographic region, economic status and ethnicity. The

[3] See U. S. Department of Commerce Reports, 1999; October 2000, February 2002

components of technology integration include teaching and learning, educator preparation and development, administration and support services and infrastructure for technology.

This research is important because it provides valuable information regarding how well Texas schools are equipping students of different geographical, socioeconomic and ethnic backgrounds with the knowledge and skills they need to thrive in today's information technology economy. Most studies of the digital divide focus on broad base indicators like Internet access or computer technology in the home. An obvious place to address the digital divide is the school systems. Furthermore, this is an area where government intervention is clearly merited. Policy makers can and should address the digital divide. There are few studies that examine the use and level of technology in schools. This study fills a gap. The state of Texas sent each school a questionnaire addressing the issue of technology integration. Their data are used to examine the digital divide.

CHAPTER OVERIEW

Chapter two contains a review of the literature including an overview of information technology and the digital divide. It discusses alternatives that the public has if affected by the digital divide.

Chapter three discusses the setting for the research project The fourth chapter examines the many facets of the digital divide in public schools as identified in the literature review. The conceptual framework and research hypotheses are located within this chapter.

Chapter five operationalizes the hypothesis and describes the methodology developed to address the research questions. The research method selected is secondary analysis of existing quantitative data. The process used to identify and test the areas explored is also explained in this section.

In chapter six the results of the statistical procedures are explained and summarized in a table. Additionally, the results are interpreted in the text. The seventh chapter summarizes the conclusions extracted from the result chapter and suggests future research. This research provides information about the level of technology integration in Texas public school districts regarding students from diverse geographic, socioeconomic and ethnic backgrounds.

CHAPTER TWO

LITERATURE REVIEW

This chapter examines scholarly literature regarding information technology, the digital divide and technology integration in public schools. This information is significant in understanding the importance and complexity of technology integration in public schools and serves as a foundation for the working hypothesis that are developed through the chapter.

Information Systems: Why So Important?

Laudon and Laudon (2002), define information systems as a set of interrelated components that collect or retrieve, process, store and distribute information to support decision-making coordination and control in organizations. Information systems are essential to business organization survival and prosperity. Toffler (1971, p. 25) suggest that technology is the engine and mighty accelerator that lies behind economic growth and if technology is the engine, knowledge must be the regarded as the fuel.

Access to information in today's society can make the difference between prosperity and poverty. Davenport and Prusak describe information as data that makes a difference (1998 p. 3). Dizzard (1982) (as cited by Carver 1994 p. 253), and Toffer (1990) describe the "Information Age" or "Third Wave" of societal development as a new era of human development in which information will be viewed as a commodity, and one that is directly linked to economic and social mobility. McLuhan (1989) purports that this phenomenon is global and that as it spreads, separate and discrete societies will be transformed and restructured into "global villages. Information systems and Internet technology is used world wide in a public, private and personnel context.

A growing percent of the American economy depends on imports and exports (Laudon and Laudon 2002). America, Europe, Japan, Asia and Germany now operate in a global economy. The future and success of firms in these countries depends on their ability to operate globally. Information systems provide the communication and analytical power that firm's need for conducting trade and managing businesses on a global level (2002 p. 4- 5). The United States now uses information technology to simplify and improve transactions between governments and other stakeholders. This method is called electronic-government (E-Government).

E-Government

E-government includes the use of all information communication technologies, from fax machines, to wireless palm pilots, to facilitate the daily administration of government. E-government "improves citizen access to government information, service and expertise to ensure citizen participation in and satisfaction with the government process… it is a permanent commitment by government to improving the relationship between the private citizen and the public sector through enhanced, cost-effective and efficient delivery of services, information and knowledge (Moon 2002, p. 425).

As a form of e-government, the Internet allows citizens with access to vote electronically, obtain government information, send information to their legislators, and search for jobs, pay taxes; renew driver's licenses etc. on line. There are many advantages and conveniences for citizens with access to the Internet, nevertheless, it poses an overwhelming disadvantage to those without access.

Some of those disadvantages according to Kakabdase et al is that information-age direct democracy poses new social segregation challenges for those who are information rich and those who are information poor on an individual and societal basis. Kakabdase, et al (2003, p. 47-51), further suggest that the way information technology is currently implemented does not equitably facilitate citizen access to direct democracy; it facilitates such opportunities only to a small minority group (young affluent). Moreover, they suggest, "Information-poor individuals will not be able to influence political agendas."

In a 1999, Los Angeles Times article, Gary Chapman, indicates racial tension in America have nearly always had technological dimensions, as African Americans have commonly found their economic prospects altered usually for the worse by technological developments. Slaves were freed just as new agricultural technologies devalued human labor. African Americans who migrated to cities for factory employment weren't there very long before automation decimated those jobs. He adds for low-income African Americans the boom in the "new economy threatens to pass them by" (Chapman, 1999).

On a similar note, an article in *The Journal of Blacks in Higher Education* titled "African Americans as the Have-Nots of the Information Age" it is expressed that historically, African Americans have been cut off from the flow of information. Information access has always been a major weapon of racial subordination and control. Jim Crow's racial restrictions on access to information were piled on top of a 250-year slave system in which it was illegal to teach a slave to read or write. The article further notes that "power is necessarily unequal when one group knows what's going on and the other group does not. And the powerless, lacking information as they do, almost necessarily function at the bottom of the economic and political sector of any society."

Carver (1994 p. 543) notes " In an Information Age, those who know what information is available and how to use it will reap tremendous benefits. Technologically competent and computer literate individuals stand to become the productive citizens of the future." Is there a population in society that maybe left behind because of the digital divide?

Digital Divide

The term digital divide has been used to describe the social implications of unequal access to information and communications technologies and to the acquisition of the skills necessary for full inclusion (NOIE p.1 2003). The "digital divide[4]"-- the divide between those with access to new technologies and those without -- is now one of America's leading economic and civil rights issues. The U.S. Department of Commerce, 1999 report *Falling Through the Net: Defining the Digital Divide* clarifies which Americans are falling further behind. The report indicates minorities, low-income persons, the less educated, and children of single-parent households, particularly when they reside in rural areas or central cities, are among the groups that lack access to information resources.

Computer Ownership and the Digital Divide

The U.S. Department of Commerce's October 2000, Report *Falling Through the Net: Toward Digital Inclusion* (pg. 19) reports that the August 2000 divide between African American households and the national average rate was still at 18.4 percentage points compared

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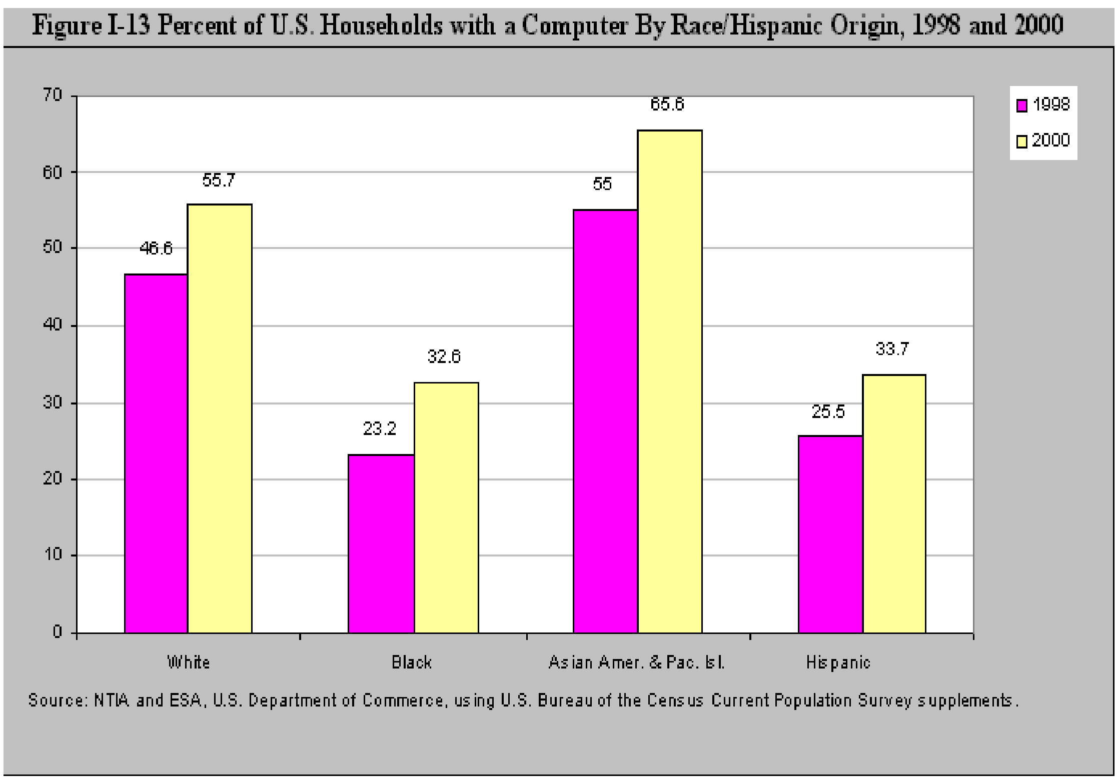
[4] Larry Irving former Assistant Secretary for Communications and Information Administrator, National Telecommunications and Information Administration (NTIA) with the U.S. Department of Commerce states in the report *Falling Through the Net: Defining the Digital Divide*.

to the December 1999, digital divide (a 32.6% penetration rate for African American households, compared to 51.0% for 1998 households nationally). That gap is statistically no different from the gap that existed December 1998. Similarly, the 17.3 percentage point difference between the share of Hispanic households with a computer (33.7%) and the national average (51. %) did not register a statistically significant change from the December 1998 computer divide as indicated in Figure 2-1.

Figure 2-1



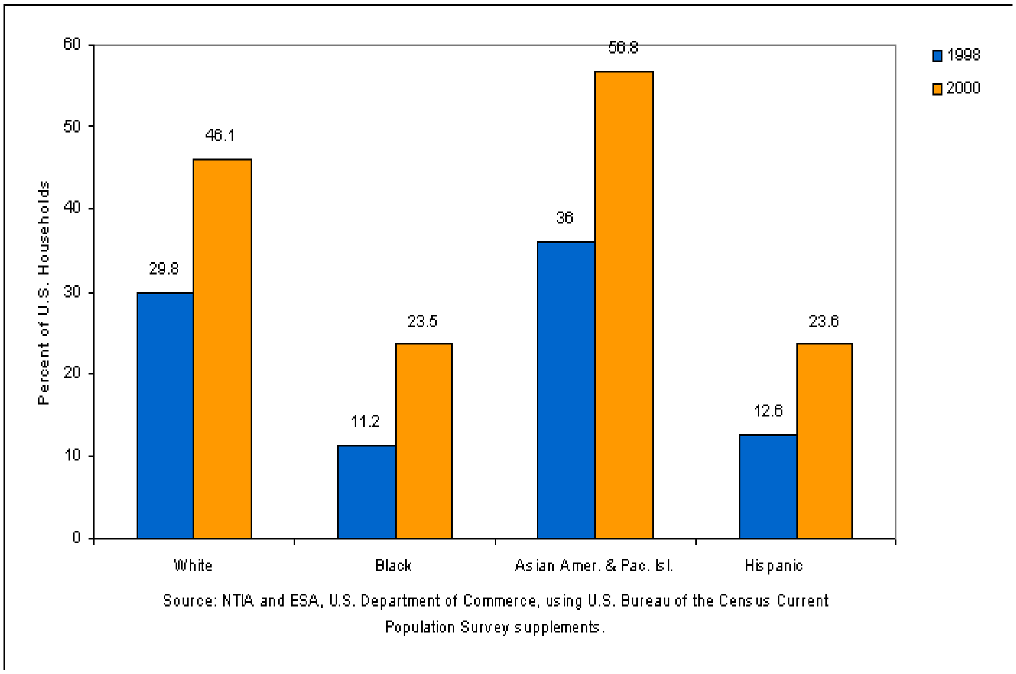
The report further indicates that a digital divide continues to exist regarding Internet use geographically and for minorities.

Home Internet Access and the Digital Divide

Between December 1998 and August 2000, urban households with incomes of $75,000 and higher are more than *twenty times* more likely to have access to the Internet than rural households at the lowest income levels, and more than *nine times* as likely to have a computer at home. Regardless of income level, Americans living in rural areas are lagging behind in Internet access. At the lowest income levels, those in urban areas are more than twice as likely to have Internet access than those earning the same income in rural areas. There was a surge upward of Internet and computer access among households of different ethnic and racial origins. Asian Americans and Pacific Islanders have maintained the highest level of home Internet access at 56.8%. African Americans and Hispanics, at the other end of the spectrum, continue to experience the lowest household Internet access rates at 23.5% and 23.6%. African American and Hispanic households continued to experience the lowest Internet penetration rates (at 23.5% and 23.6%, respectively). Between December 1998 and August 2000, access among African American households doubled from 11.2% in 1998 to 23.5% in 2000, a gain of 12.3 percentage points. Hispanic households' access increased 11 percentage points from 12.6% in 1998 to 23.6% in 2000 (U.S. Department Commerce, 2000, p. 20):

Figure 2.2

Figure I-10 Percent of U.S. Households with Internet Access By Race/Hispanic Origin, 1998 and 2000

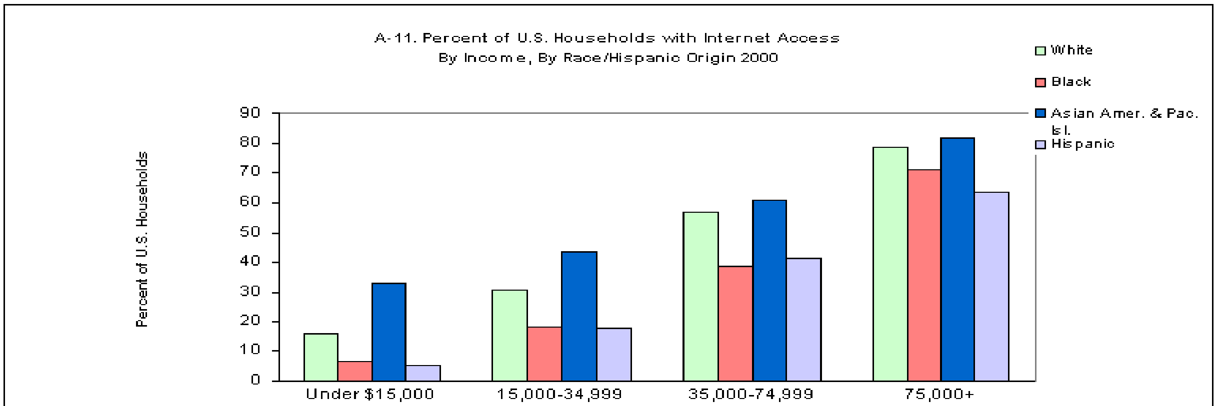


The August 2000 data shows schools, libraries, and other public access points continue to serve those groups that do not have Internet access at home. The 1998, U.S. Department of Commerce data also revealed significant digital divide disparities, regarding geographical location and economic status. Nationally, just over half (51%) of households owned computers, up from 42.1% in Decembe1998. Urban areas have the highest ownership rate at 51.5. Rural areas household ownership is 49.6% compared to Central cities at 46.3%.

Income and Internet Access

Income is definitely a contributing factor to the digital divide. The income divide applies to all goods and services however, the digital income divide merits policy attention because being able to access the Internet is important to gaining a more advantageous position whether at work, school, in business or as a citizen. The Internet opens up new ways for people to communicate, participate in democracy and education, find employment, access to public services and buy or sell merchandise. The chart[5] below indicates the percent of American households with Internet access by income in the year 2000:

FIGURE 2.3



	Under $15,000	15,000-34,999	35,000-74,999	75,000+
White	16.0	31.0	56.7	78.6
Black	6.4	17.9	38.7	70.9
Asian Amer. & Pac. Isl.	33.2	43.8	60.7	81.6
Hispanic	5.2	17.7	41.5	63.7

Source: NTIA and ESA, U.S. Department of Commerce, using August 2000 U.S. Bureau of the Census Current Population Survey supplement.

According to the U.S. Department of Commerce (February 2002, p.1) between December 1998 and September 2001, Internet use by individuals in the lowest-income households (those earning less than $15,000 per year) increased at a 25 percent annual growth rate. Internet use

5 See U. S. Department of Commerce

among individuals in the highest-income households (those earning $75,000 per year or more) increased from a higher base but at a much slower 11 percent annual growth rate.

The use of information technology is rapidly growing across all demographic groups and geographic regions. Children and teenagers use computers and the Internet more than any other age group. Ninety percent of children between the ages of 5 and 17 (or 48 million) now use computers. Seventy-five percent of 14-17 year olds and 65 percent of 10-13 year olds use the Internet. Computers at schools substantially narrow the gap in computer usage rates for children from high and low-income families (U.S. Department of Commerce's, February 2002, p.1).

Internet use is increasing for people regardless of income, education, age, races, ethnicity, or gender. The Internet is being used by a greater number of Americans. For those without computers at home, public libraries, community centers and schools are the only source of access.

Access At Public Libraries, Community Centers and Schools

Many Americans who obtain Internet access outside the home rely on such places as public libraries (8.2%) and community centers (0.6%). Public libraries, in particular, are used by certain groups with some regularity. Unemployed persons who access the Internet outside their homes are nearly *three* times more likely to use public libraries as the national average (21.9% versus 8.2%). Those Americans who are "not in the labor force," such as retirees or homemakers, are twice as likely to use the public libraries for access (16.1%). Both groups are even more likely to use public libraries in urban, as opposed to central city or rural, areas (22.8% and 17.9%, respectively) (U.S. Department of Commerce's, February 2002 p.1).

Other groups that also use public libraries more frequently include those earning less than $25,000, those with less than a high-school education, those in female-headed households, and American Indians/Eskimos/Aleuts, African Americans, and Hispanics. Of these groups, American Indians/Eskimos/Aleuts are especially likely to use libraries in urban areas (17.3%), while African Americans are more likely to use libraries in rural areas (16.3%).

Those in female-headed households are also more likely to gain Internet access in libraries in central cities (16.4%). Those who are less likely have Internet access at home or work (*e.g.*, those earning less than $20,000, certain minorities, and those without a college degree) are relying on the resources of public facilities (U.S. Department of Commerce's, February 2002, p.1.).

Internet Access At K-12 Schools

The second most frequently used access point is the Kindergarten through 12th grade (K-12) school, particularly in rural areas (30.0%). Nevertheless, certain groups who access the Internet outside the home are particularly likely to go online at K-12 schools. American Indians/Eskimos/Aleuts and Hispanics are particularly high users (36.5% and 35.1%, respectively), compared to Asians/Pacific Islanders (19.4%), Whites (20.0%), and African Americans (26.6%) (U.S. Department of Commerce's, February 2002).

Hispanics and American Indians/Eskimos/Aleuts are especially likely to use schools for access if they live in rural areas (*e.g.*, 46.6% for Hispanics). Single-parent households are also far more likely to use K-12 schools (43.6% for female-headed households, 38.5% for male-headed households), than are dual parent households (33.7%), families without children (5.8%), or non-family households (4.3%) (U.S. Department of Commerce's, February 2002).

Although schools are the second most accessed place for Internet use, there are manifestations of the digital divide in public schools regarding information technology integration. The Texas Education Agency is responsible for ensuring the integration of technology in the Texas education system.

CHAPTER THREE
SETTING FOR RESEARCH

The purpose of this chapter is to provide information regarding the agency responsible for implementing measures to insure information technology is integrated in the Texas education system. The Texas Education Agency (TEA) is the setting of this research project and is the administrative unit for primary and secondary public education in Texas.

TEXAS EDUCATION AGENCY

TEA manages the textbook adoption process; oversees development of the statewide curriculum; administers a data collection system on public school students, staff, and finances. TEA also rates school districts under the statewide accountability system; operates research and information programs; monitors for compliance with federal and state guidelines and serves as a fiscal agent for the distribution of state and federal funds (Snapshot 2002, p1).

In January 2002, President Bush signed the No Child Left Behind Act of 2001 (NCLB). NCLB expands the federal government’s role in elementary and secondary education. The NCLB reinforces the Elementary and Secondary Education Act of 1965 (ESEA) the main federal law regarding K-12 education. Through the ESEA, the federal government's role in K-12 education was primarily one of providing aid to disadvantaged students and investing in educational research and development. The NCLB emphasizes accountability by making federal aid for schools conditional on those schools meeting academic standards and abiding by policies set by the federal government. This new law sets strict requirements and deadlines for states to expand the scope and frequency of student testing, revamp their accountability system and guarantee that every classroom has a teacher qualified to teach in his or her subject area. The NCLB requires states to improve the quality of their schools from year to year. The NCLB pushes state governments and educational systems to help low-achieving students in high-poverty schools meet the same academic performance standards that apply to all students.

The Enhancing Education through Technology Act of 2001, which is Title II Part D of the NCLB Act, provides grants for states that meet specific requirements to integrate technology into the curriculum. One of the requirements is grant applications must indicate how the State education agency is going to ensure ongoing integration of technology into school curricula and instructional strategies in all schools in the State so that technology will be fully integrated into the curricula and instruction of the school by December 31, 2006 (Title II, Part D. §2413).

In an effort to comply with the NCLB, the Texas Education Agency Educational Technology Advisory Committee (ETAC) developed the Texas School Technology and Readiness (STaR) Chart. The Texas STaR is an online resource to use for self- assessment of campus' and district efforts to integrate technology across curriculum. The STaR Chart serves as a key component in meeting the goals of the State of Texas Master Plan for Educational Technology.

The Texas STaR Chart is patterned after the CEO Forum's STaR Chart and has been developed around four key areas of the Long- Range Plan for Technology: Teaching and Learning, Educator Preparation and Development, Administration and Support Services and

Infrastructure for Technology. Principals coordinate the completion of the online survey, which is forwarded to TEA (Anita Givens, February 2004). Campus and districts can use the data to perform needs assessments, judge progress, set benchmarks, determine funding priorities ect. The Texas STaR Chart is the instrument that is used to test working hypothesis for this research purpose. The 4 key areas are discussed in greater detail in the following chapter.

CHAPTER FOUR
THE DIGITAL DIVIDE IN PUBLIC SCHOOLS

This chapter contributes to the research purpose by examining the nature of the digital divide within the schools. Texas has done an extensive survey of schools and technology integration. This study identified 4 key areas that schools should work on to ensure that Texas students were being prepared for their technological future. These key areas are (1) teaching and learning (2) educator preparation and development (3) administration and support services and (4) infrastructure for technology. The components of each key area are described in detail using information from the Texas STaR Chart. Also included is literature both explaining the significance of the key areas and discussing relevant studies. The conceptual framework and research hypothesis are also located in this chapter.

KEY AREA I
Teaching and Learning

Key Area I, teaching and learning in the Digital Age is significantly different than the traditional approach to teaching and learning. Traditionally the teacher is the source of knowledge and the student is the learner. In the Digital Age, students must be empowered in the information gathering and communications arena. Teaching and learning is a complex concept that incorporates six additional components:

- Teacher Role and Collaborative Learning
- Patterns of Teacher Use
- Frequency of Design of Instructional Setting
- Curriculum Areas
- Technology Applications TEKS/Assessment
- Patterns of Student Use

This section explains the meaning of each component.

Teacher Role and Collaborative Learning

The teacher's role in 21st Century digital learning is to engage the student in the learning process to the point that students are active participants in the learning process. The continuum of teacher role and collaborative learning would begin with passive learning. The teacher gives the lecture while the student uses technology to work on individual projects. In more advanced levels, students use technology to create communities of inquiry within their own community. And finally, the teacher is the facilitator, mentor and co-learner while the student is centered on learning in communities of inquiry with business, industry and higher education.

Johnson & Maddux (2003 p. 85) cited Carroll's (2000) presentation at the Preparing Tomorrow's Teachers to Use Technology Conference as stating that technology enhanced units could be more student centered and collaborative and that learning should be more active and more problem based. Additionally, Carey (1993) reports in an article in *Computers Today* that the role of the teacher with computers in the classroom is changing today. The teacher is moving from the role of director to facilitator as technology created interactive learning environments Johnson & Maddux (2003, p. 85).

Kozma (2003 p.2) reports that research studies have began to document a more integrated curricular role for information communications technology (ICT) in classrooms, citing Means et al.[6] ICT is increasingly incorporated into various subjects in the curriculum and across subjects.

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[6] See Kozma 2003.

Kozma's study addresses similarities and differences regarding how teachers around the world[7] use technology to support instructional change. Results indicate that teachers in many countries around the world are beginning to use ICT to help change classroom teaching and learning and are integrating technology into the curriculum. Students are working together in teams and using computer tools and resources to search for information, publish results, and create products. Teachers are using ICT to change their role from that of a primary source of information to one, who provides students with structure and advice, monitors their progress and assesses their accomplishments. The next component of teaching and learning is the patterns of technology use by the teacher.

Patterns of Teacher Use

How teachers use technology in the classroom can progress from use of technology as a supplement or to streamlining administrative functions such as grade books, attendance records, word processing, and e-mail ect. Progress includes using technology for research, lesson planning, multimedia, or correspondence with peers, parents or experts. The ultimate goal is to achieve greater interest, inquiry, analysis, collaboration, creativity and content production.

Researchers Fecker, Sterling, (1987), Hueftle, Rakow, and Welch, (1983) all note inequality in student access to and usage of computers in U.S. schools by race and geographic area. Similarly, Green (2000) who's field experience includes schools in Texas reports computers are predominately used as "electronic workbooks for basic skill remediation rather than being used to stimulate student creativity, to solve problems, to record and manipulate data or to create multimedia presentations that summarize what students have learned."

[7] Countries include Australia, Canada, Chile, China, Hong Kong, Chinese Taipei, Czeh, Republic, Denmark,

According to the U.S. Department of Education, Office of Educational Research and Improvement (2000 p. 1), thirty-nine percent of public school teachers use the computer or Internet to create instructional materials, and 34 percent reported using computer for administrative record keeping. Less than 10% reported using computers or the Internet to access model lesson plans or to access research and best practices.

Additionally, teachers in schools with a poverty level of less than 11 percent were more likely to use computers or the Internet for creating instructional materials than schools with a poverty level of 71 percent or more. The same patterns existed for teachers who used computers for administrative record keeping (2000 p. 1). Where and how teachers use computers is the next component of teaching and learning.

Frequency/Design of Instructional Setting Using Digital Content

The third component of teaching and learning is the frequency and design of the instructional setting when using digital content. Where and how often computers are used is the focus of frequency and design of the instructional setting. Technology can be used in various settings like libraries, labs, or the classroom. Frequency of use and setting can range from occasional, to regular weekly computer use, supplementing classroom instruction primarily in lab and library settings or a combination of settings and regular weekly technology use. On demand access to all technologies that allows students to complete technology activities that

England, Finland, France, Germany, Israel, Italy, Japan, and South Korea.

have been integrated into curriculum is the most ideal use of technology. Integrating technology into curriculum is challenging and is discussed next.

Curriculum Areas

The fourth component of teaching and learning is the curriculum areas. The curriculum area involves the use of technology in all subject areas to include the Texas essential knowledge skills (TEKS). Limiting technology use to technology skill classes only is the beginning of the continuum toward integrating technology into TEKS and foundation subject areas and ultimately in all subject areas.

One major advantage of integrating computer technology into classroom curriculum is it provides more ways of reaching students. For example multimedia can help students who do not pay much attention to print media but are more attracted to sound, motion or real world activities. For instance, a lesson on Martin Luther King Jr.'s role in the civil rights movement is much more exciting on CD-ROM than out of a textbook. Multimedia allows students to see King and hear him speak (Holt, 1998, p 96).

Technology Applications TEKS Assessment

Technology applications Texas essential knowledge skills (TEKS) assessment is the fifth component of teaching and learning. Technology applications TEKS assessment involves technology application courses offered and taught within grade clusters such as grades K-8. Most high school campuses offer at least two technology application courses and some but not all grade clusters meet technology application TEKS. As campuses begin to develop at least four technology application courses are offered and two taught. The continuum is toward offering all technology application courses with a minimum of four taught or included, and new courses are developed as a local elective or included as an independent study course. The next component discussed is patterns of student use.

Patterns of Student Use

The sixth and last component of "teaching and learning" is the patterns associated with student use of software and hardware applications. Occasional use of software applications and or use of tutorial software for drill practice reflects early technology use while regular use on an individual basis to access electronic information, communication and presentation projects depicts developing tech. When student's work with peers and experts to evaluate information analyze data and content in order to solve a problem and select appropriate technology tools to convey knowledge and skills learned, they are exhibiting advanced tech skills. As students collaborate in communities of inquiry to propose, access and implement solutions for real world problems and communicate effectively with a variety of audiences they are at the most desired level of progress.

McAdoo, (1994) found that 98% of all U.S. schools have computers including urban inner-city schools in which most of the nations African American students are enrolled. The nature of computer interactions experienced by African American students was still vastly different from that of their white peers in urban and suburban schools. Additionally, computer usage and instruction for African Americans is either isolated skill development remedial work or for drill and practice programs aimed at enhancing basic skills. The literature review indicates a consensus[8] of opinion that computer technology can be employed to reach students at risk of educational and occupational failure and aid them in becoming productive and contributing members of information based societies.

Martinez and Mead (1993 as cited in Carver) conducted a study examining the concept of computer competency among America's school age children. They found that computer competency is significantly related to student's use of and access to computers and to the types and amounts of in-school computer instruction. Their data also revealed differences in computer competency based on race and school location, (urban, suburban, or rural). The findings suggest that due to limited access to computers and to types and amounts of in-school computer instruction, African American students are generally less computer competent than White and that suburban school students were more computer competent than those residing in urban and rural settings (Carver 1994 p.533).

Additionally, the U.S. Department of Education Office of Research and Improvement (OERI) reports that teachers in the lowest poverty schools were more likely to assign students work involving computer applications, research, using CD-ROM, and research using the Internet to a moderate or larger extent than teachers in the highest poverty schools.[9] Swain and Pearson indicate that other research findings (Coley et al., 1998; Shields & Behrman, 2000; Wenglinsky, 1998) also support the fact that minority, poor, and urban students were more likely to use computers for lower-order thinking skills than White, non-poor, and suburban students. Based on these finding the following is expected:

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[8] See for example Bailo and Sivin 1989a, 1989b; Merrell, 1991, Pogrow, 1990; Ross, Morrison, Smith, & Clevland, 1990; Wepner 1991, Carver 1994, p. 533)

[9] See U.S. Department of Education Office of Research and Improvement 2000.

Working Hypothesis (WH1a): Urban, suburban, and midsize school districts will score higher levels in the **Teaching and Learning** component of technology integration than rural school districts

Working Hypothesis (WH2a): Affluent school districts will score higher levels in the **Teaching and Learning** component of technology integration than economically disadvantaged school districts.

Working Hypothesis (WH3a): High Minority (African American and Hispanic) school districts will demonstrate lower levels in the **Teaching and Learning** component of technology integration than low minority (white) school districts.

KEY AREA II
Educator Preparation and Development

Educator preparation and development is Key Area II of the Texas STaR Chart. Preparing teachers to educate students for 21st century learning in information technology is a constantly changing endeavor. There must be funds available for training, relevant training material, training regarding technology skills and capabilities, and accountability for utilizing the training. Educator preparation and development incorporates six additional components. The additional components are as follows**:**

- Content of Training
- Capabilities of Educators
- Leadership and Capabilities of Administrators
- Models of Professional Development
- Levels of Understanding and Patterns of Use
- Technology Budget for Technology Professional Development

Each component will be discussed in detail below beginning with content of training.

Content of Training

Content of training is the first component of educator preparation and development. Most training content begins with an emphasis on technology literacy skills including multimedia and the Internet. As educators are more developed, training content includes technology use in administrative task, classroom management and the use of TLC resources, while advancing to training on the integration of technology into teaching and learning, and regular use of TLC resources to enrich instruction. At the highest end of the continuum is regular creation and communication of new technology supported learner-centered projects; and vertical alignment of technology application TEKS with anytime, anywhere use of TLC by the entire school community.

Green (2000) found that even when teachers have the required hardware and software they do not use technology at all or they use it poorly because of a lack of time, training and technical support. She contends this is a general trend for all teachers in high and low poverty schools and in regular and special programs.

Barnett (1999, p. 40), suggest that rural school staff maybe at some disadvantages in that rural school staff may not attend as many workshops because of distance, and staff developers may not get down as often from regional office. Human resources are also stretched thinner because of fewer staff to cover all areas of the instructional programs. Capabilities of educators will be discussed next.

Capabilities of Educators

The second component of educator preparation and development is the capabilities of the educator. Capabilities of the educator refer to the educator's ability to meet the SBEC proficiencies and implement them in the classroom. Capabilities are generally scored using percentages of proficiencies met. The leadership and capabilities of administrators will be discussed next.

Leadership and Capabilities of Administrators

The third component of educator preparation and development is the leadership and capabilities of administrators. The progression of leadership and capabilities of administrators begins with educators recognizing the benefits of technology in instruction although minimal personal use is indicated. As the administrators develop, teachers use technology for administration and classroom management task and some aspect of daily work. In more advanced instances educators recognize and identify exemplary use of technology in instruction and model use of technology in everyday work. And finally, at the highest level, administrators ensure integration of appropriate technologies to maximize learning and teaching while involving and educating the school community around issues of technology. Models of professional development is discussed next.

Models of Professional Development

Models of professional development the fourth component of educator preparation and development, is characterized by involving whole groups in professional development with or without follow-up to facilitate implementation of professional development while advancing to long-term ongoing professional development and involvement in a development and improvement process. The highest level involves the creation of communities of inquiry and knowledge building anytime, anywhere, with learning availability through a variety of delivery systems or individually guided activities.

Magnuson (2002 p.2), reports that 82% of teachers told the National Center for Education Statistics (NCES) that they were not given enough time outside their regular teaching duties to learn, practice or plan how to use computers in the classroom. The next component discussed is the levels of understanding and patterns of use.

Levels of Understanding and Patterns of Use

The level of understanding and patterns of use of technology is the fifth component of educator preparation and development. It involves the adoption of technology use, adapting to technology, and appropriation followed by invention.

Sexton, King, Aldridge, and Good-Killoran conducted a study investigating computer attitudes among teachers. They cited Corston and Colman (1996) suggesting that one-third to one quarter of all individuals maybe, to some extent afraid of using computers and tend to avoid contact with keyboards based technologies. Researchers have documented relationships between teacher's attitudes toward computers and their use of microcomputer technology. Zammit (1992 as cited by Sexton et al) found that the major stumbling block for teachers not using computers was perceived lack of confidence and skill with computers. Similarly, Knupfer (1998) reported that the attitudes and opinions of teachers about the value of educational computing varied widely with about 22% (81) of her respondents seriously questioning the value of using computers in their classrooms.

Mills and Flincher (2003 p.383) indicate that teachers with technology fluency are characterized by modeling technology use in the classroom, applying technology across curriculum, applying technology to problem solving and decision making in real learning environments and applying technology to facilitate collaboration and cooperation among learners.

Swain and Pearson (2003 p. 330) report that many teachers do not feel comfortable using computes or do not understand how to use technology. This is a significant problem at all economic levels but especially at schools with lower economic status. Discussed next is the technology budget allocated for technology professional development.

Technology Budget Allocated for Technology Professional Development

The last component of educator preparation and development is the technology budget allocated for technology professional development. The Texas STaR Chart technology budget allocation scores range from a low of 5% to a high of 30%.

Quoting Stephen Gerky, a former teacher and administrator Holts asserts that teacher training is the most important investment of all. Many school districts do not budget a small fraction of what they spend on hardware and software for teacher training, though many studies, have shown that it takes three years to five years to go from novice to power-user level Gerky says (Holt 1998, p. 96). Supporting this assertion, in a study examining how exemplary computer using teachers differed from other teachers, Becker (1994, p. 305) found that exemplary teachers worked in school districts that invested heavily in staff development and on-site staff development.

Haugland and Wright (1997) point out that it is unrealistic to think early care and education teachers can utilize computers comfortably and successfully without training. A nation wide study found that only 8% of the total technology budgets of schools were used for staff development (Siegel, 1995). Knupfer (1998) reported a shared perspective by many teachers that microcomputer technology training opportunities were nonexistent or inadequate. (Hohmann, 1994) asserts that "accelerated investments in computer hardware and software have not always been matched with the support and professional development opportunities needed by the personnel expected to improve the care and educational experiences provided young children and their families by incorporating various aspects of microcomputer technology" (Sexton et al p. 278. Based on the above findings the following is expected:

Working Hypothesis (WH1b): Urban, suburban, and midsize school districts will score higher levels of technology integration in the **educator preparation and development** component than rural school districts.

Working Hypothesis (WH2b): Affluent school districts will score higher levels of technology integration in the **educator preparation and development** component than economically disadvantaged school districts.

Working Hypothesis (WH3b): Minority school districts will demonstrate lower levels of technology integration in the **educator preparation and development** component than non-minority school districts.

This concludes the discussion of educator preparation and development. The next section will discuss Key Area III, administrative and support services in technology integration.

Key Area III
Administrative and Support Services

Key Area III, administrative and support services involves the commitment of administrative leadership with a vision for integrating technology in schools and skilled technical and administrative support. Administrative and support services incorporates five additional components:

- Vision and Planning
- Technical Support
- Instructional and Administrative Staffing
- Budget
- Funding

Each component is discussed in detail below beginning with vision and planning.

Vision and Planning

Vision and planning, the first component of administrative and support involves the use of a technology plan. Most early technology schools or districts lack technology plans. Technology is used mainly for administrative tasks such as word processing, budgeting, attendance and grade books. More developed districts have a plan and it is aligned with the Texas Long Range Plan for Technology (LRPT). The plan is integrated into the district and is used for budgeting and applying for external funding and discounts. Teachers and administrators have a vision for technology use for direct instruction and some student use. In more advanced plans, the above are incorporate and the superintendent and board approve the plan. The plan is collaboratively developed and the guiding policy and practice are regularly updated. The campus plans address Technology Applications TEKS and higher order teaching and learning. Additionally, administrators use technology tools for planning. And finally, in addition to all of the above, the most advanced districts update plans at least yearly and the plan is focused on student success based on needs, research, and proven teaching and learning principles. Administrators use technology tools for planning and decision-making.

Barnett (1999 p.40) suggests that the best use of technology in rural education comes down to leadership. "The board and superintendent must have a vision for technology beyond e-mail. The principal must agree with the vision and encourage teachers. He adds that all those pieces must be in place to promote a powerful learning environment." The next component discussed is technical support.

Technical Support

Technical support, the second component of administrative and support services involves access to trained technology specialist who can assist educators with technology hardware and software issues. The lack of technical support on site with a call response time greater than 24 hours is characteristic of early tech districts. As districts develop, at least one technical staff to 750 computers is available with a call in response time less than 24 hours. More advanced districts have at least on technical staff per 500 computers, remote management software tools, and a response time of less than 8 hours. The ideal environment is least one technical staff to 350 computers, remote management software tools and response time of 4 hours.

According to Swain and Pearson (2003) teachers and administrators must be given ongoing relevant professional development and immediate support. Professional development must center on how to use technology with the student. A qualified technology specialist must be available constantly for questions and support. Emailing tech specialist when problems arise and waiting a week for a response or assistance discourages teachers from using technology in their instructions. Teachers need patience and support if they are to make necessary adjustments in their teaching methods to accommodate the employment of technology (Dawson Rakes, p 29, 2003).

Instructional and Administrative Staffing

Instructional and administrative staffing consist of technology coordinators, assistant superintendents, instructional technology staff, trainers, webmasters, network administrators per campus district or staff per student ratio. The least technologically developed districts**,** lack full time district level technology coordinators. The campus coordinator is serving as local technical support. Developing tech districts have a full time district level technology coordinator/assistant superintendent for technology. Centrally located instructional technology staff is available for one of every 5, 000 students. Additional staff is provided as needed such as trainer, Webmaster, and network administrator. As districts become more advanced they have all of the above and one dedicated campus based instructional technology support staff, plus one for every 1,000 students.

Budgeting

Budgets should include allocation for hardware, software purchases and professional development, minimal staffing support and some ongoing cost. Advanced tech districts budget for all of the above and adequate staffing support. The ultimate budget includes all of the above, an incentive for professional development facilities and an appropriate budget to support the district technology plan. According to the Web-Based Education Commission, 2000, it is recommended that schools devote at least 40% of their technology budgets to teacher training. (Mouza, 2002-2003, p. 275). Technology funding is discussed next.

Funding

Technology funding is the last component of administration and support services. Funding includes allotments, minimum grants/minimum local funding, TIF, other competitive grants, E-Rate discounts, federal programs, bond funds business partnerships, donations, foundations and the other local funds designated for technology. Districts technology integration levels vary based on a use of allotments alone to a combination of all of the above.

Boozer, Krueger, Wolkon, Haltiwanger and Loury (1992 p. 271) measured the extent of computer use, teacher to student ratio, based on resources available to schools because public policy directly influences school resources. The school quality is measured by the available resources such as the number of students for each teacher. They contend that much evidence has been established linking schools resources and students' subsequent performance in the labor market citing Haunshek (1986) and Krueger (1992b). Based on these finding the following is expected:

Working Hypothesis (WH1c): Urban, suburban, and midsize school districts will score higher levels of technology integration in the **administration and support services** component than rural school districts.

Working Hypothesis (WH2c): Affluent school districts will score higher levels of technology integration in the **administration and support services** component than poor school districts.

Working Hypothesis (WH3c): Minority school districts will demonstrate higher levels of technology integration in the **administration and support services** component than non-minority school districts.

This concludes the discussion of administration and support services. The next section discusses Key Area IV, infrastructure for technology.

Infrastructure for Technology

The foundation or infrastructure of technology allows student and teachers to use technology tools that are necessary for education. Infrastructure involves the number of computers available for students, Internet access, LAN/WAN and other technologies. Problems associated with the digital divide and infrastructures are often related to the inequalities in districts, campuses and classrooms. The Texas STaR chart focus areas for infrastructure for technology are indicated below:

- Students per computer
- Internet Access/ Connectivity Speed
- Distance Learning
- LAN/WAN
- Other Technology

Each component is discussed in detail below beginning with students per computer.

Students per Computer

Student per computer addresses the number of students per Internet connected multiple computer and the replacement cycle of the computer. Magnuson (2002 p.1) reports that poor children, minority children, girls, low achieving students, rural students, students with disabilities, and children learning to speak English as a second language are all at a disadvantage when it comes to accessing and effectively using technology. Poor students suffer from lack of access and knowledge on how to use technology within public schools. To illustrate this point, Magnuson reported a recent study by Market Data Retrieval which indicated that schools with fewer than 11% of students qualifying for federally subsidized lunches, 74% or more of students qualify, only 39 percent of classrooms are connected to the Internet. In addition, schools in high

–poverty communities have one computer for every 5.3 students, which is higher than the national average (Magnuson (2002 p.1).

Bolt and Crawford (2000 p.25) assert that the increased use of technology in the classrooms has created a different kind of educational experience for some students but not for all. Access to technology is not equally available, is not handle well by all educators, and is not equally useful to everyone in education as it is currently structured. They suggest that this is the educational essence of the digital divide. The "wiring" of our schools is altering education in our nation. Technology integration in the classroom alters the way students are taught. There is an increasing disparity between schools and students with or without significant access to technology. Much of the student's educational experience depends on student's socioeconomic background, whether or not the student has access to technology, access to the information made available by that technology and access to educators trained in integrating technology and information into the educational experience (Bolt and Crawford 2000 p. 26). Internet access and connectivity is discussed next.

Internet Access/Connectivity

The second component of infrastructure of technology is Internet access and connectivity or dial up connectivity to the Internet. The early tech schools or districts only have dial up connectivity to the Internet on a few computers. While developing tech districts provide direct connectivity to the Internet in 50% of the rooms including the library with adequate bandwidth to the campus to avoid delays. More advanced schools have direct connectivity to the Internet available in 75% of the rooms and the library. Additionally, adequate bandwidth is wired to classrooms and over the local area network. Direct connectivity to the Internet in **all** rooms on all campuses including adequate bandwidth to each classroom and easy access of students and teachers, with some wireless connectivity is the most advanced level.

Green (May 2000) comments that the infrastructure the hardware, software wiring should be easy to remedy. She suggests that there are still some inequities in terms of infrastructure for schools. School with a higher the percentage of poor and minority students tend to have lower their access to technology. Ninety percent of high poverty schools have Internet access but only thirty-nine percent of classrooms in these schools have access compared seventy-four percent in low poverty schools.

The U.S. Department of Education's report *Internet Access in U.S. Public Schools and Classrooms:* 1994-2002 reports that by fall of 2002, 99% of schools had no internet access. Two percent of rural schools still have no access, while 100% of suburban schools do have access.

Additionally, the National Center for Education and Statistics shows that wealthy schools were more than 2 times more likely to have access to the Internet in classrooms than poor schools. Similarly, schools with high minority enrollment were almost three times less likely to have Internet access in classrooms than predominantly white schools. U.S. Department of Education (2000 p1.) The percentage of minority students in a school also has a direct effect on Internet access according to Swain and Pearson (2003, p. 328). They indicate that research (Krueger, 2000) reports that 20.52% of white students have Internet access in school, compared to 14.8% of African American students and 11.76% of Hispanic students. Moreover, Becker (2000) found that technology available in schools with a majority of students from low-income families is usually behind by one or two years compared with schools from middle-income families and three to four years behind schools in higher income brackets.

Magnuson (2002 p.1) reports that rural schools often lack high-speed Internet access because telecommunications companies won't install necessary equipment to reach remote areas. Adding that schools can do little to entice telecommunications companies to reach rural schools. Only 33% of high minority schools have local area network access (LAN) as compared to 41% of low minority schools (Green 2000). Distance learning is discussed next.

Distance Learning

Distance learning, the third component of infrastructure for technology involves Web based online, satellite or interactive video distance learning. Early tech districts will exhibit no Web based online learning; no satellite based learning or two-way interactive video distance learning capabilities on campus. As districts develop, they will have Web based and satellite but no two-way interactive video active distance learning capabilities on campus but available in the district. Advanced districts have Web and satellite based learning available on campus and two-way interactive video distance learning in at least one classroom.

LAN/WAN

The fourth component of infrastructure for technology involves connection to the land area network (LAN) and wide area network (WAN). At the beginning of the continuum, districts have limited print /file sharing networks and some shared resources are available on campus. As districts develop, most rooms are connected to the LAN/WAN with student access, minimum

10/100 Cat 5 hubbed network and high-end servers, such as Novell or NT serves serving some applications. With advancement, all rooms are connected to the LAN/WAN with student access. Minumum 10/100 Cat 5 switched network and high-end servers (Novell or NT) serving, multiple applications. At the highest level, all rooms are connected to the WAN sharing multiple district-wide resources. The campus is connected to WAN with 100 MB/GB and or fiber switched network that allows of resources such as video streaming and desktop teleconferencing. Easy access to network resource for students and teacher include some wireless connectivity

Inequity in the kind of Internet access schools have is another problem cited by Green (2002). Only 50% of high poverty schools have dedicated lines as compared to 72 % of low poverty schools. This affects the speed of the transmissions received. This presents a problem when waiting with a group of other students for a web page to download causing lengthy delays in an otherwise well managed lesson. The next section discusses the use of other technologies in the classroom.

Other Technologies

The last component of infrastructure for technology involves other technology but is not limited to TVs, VCRs, digital cameras, scanners, and classroom sets of programmable calculators. Shared use of these resources and or one educator per computer is characteristic of less advanced districts. The more advanced, there is one educator per computer, and dedicated and assigned use of technology, with shared use of specialized technology like digital cameras, scanners and projectors and finally, one educator per computer and fully equipped classrooms with all technology that is available. Based on the above findings the following is expected:

Working Hypothesis (WH1d): Urban, suburban, and midsize school districts will score higher levels of technology integration in the **infrastructure for technology** component than rural school districts.

Working Hypothesis (WH2d): Affluent school districts will score higher levels of technology integration in the **infrastructure for technology** component than poor school districts.

Working Hypothesis (WH3d): Minority school districts will demonstrate higher levels of technology integration in the **infrastructure for technology** component than non-minority school districts.

The research finding suggests that a digital divide does exist in America for African Americans and Hispanics, the economically disadvantaged, and people living in rural communities. It also revealed that the digital divide can be manifested in public schools in the areas of teaching and learning, educator preparation and development, administrative support and infrastructure for technology. The next section will summarize and develop the research finding in a conceptual framework.

CONCEPTUAL FRAMEWORK

This section defines and develops the research project's conceptual framework. The conceptual framework used is a working hypothesis. Working hypotheses serves as guides to early-stage investigations (Shields, 1998, p. 57). The literature review supports the conceptual framework selected for the research.

This study develops three working hypotheses, each with four sub-hypotheses. Tables 4.1, 4.2, and 4.3 present the working hypotheses and a list of literature sources used to develop each hypothesis.

WORKING HYPOTHESIS 1

The first purpose of this research project is to explore differences in the level of technology integration in urban and suburban school and midsize school districts compared to rural school districts. Table 4.1 shows the connection between the working hypotheses and the literature source.

TABLE 4.1
GEOGRAPHIC LOCATION AND TECHNOLOGY INTEGRATION

Research Purpose 1: Explore Texas STaR Chart Assessment results to determine if there is a difference in the level of technology integration in urban, suburban and midsize school districts compared to rural school districts.

Working Hypothesis	Source
WH1: Urban, suburban and midsize school districts will demonstrate higher levels of technology integration than rural school districts in four key areas.	
WH1a: Urban, suburban and midsize school districts will score higher levels of technology integration in the teaching and learning component than rural school districts.	• McAdoo, 1994 • Martinez and Mead, 1993 • U.S. Department of Education (2002) • U.S. Department of Commerce, (1999) & (2000), (2002) • Fecker, Sterling (1987), • Hueftle, Rakow, and Welch (1983)
WH1b: Urban, suburban and midsize school districts will score higher levels of technology integration in the educator preparation and development component than rural school districts.	• U.S. Department of Commerce, (1999) & (2000), (2002) • Barnett (1999)
WH1c: Urban, suburban and midsize school districts will score higher levels of technology integration in the administrative and support services component than rural school districts.	• U.S. Department of Commerce, (1999) & (2000), (2002) • Barnett (1999)
WH1d: Urban, suburban and midsize school districts will score higher levels of technology integration in the infrastructure for technology component than rural school districts.	• Magnason (2002) • U.S. Department of Commerce, 1999 & 2000, 2002 • U.S. Department of Education (2003)

The conceptual framework for working hypothesis 2 is discussed next. Wealth and technology integration is explored.

WORKING HYPOTHESIS 2

TABLE 4.2
WEALTH AND TECHNOLOGY INTEGRATION

Research Purpose 2: Explore Texas STaR Chart Assessment results to determine if there is a difference in the level of technology integration in affluent school districts compared to economically disadvantaged school districts.

Working Hypothesis	Source
WH2: Affluent school districts will demonstrate higher levels of technology integration than economically disadvantaged school districts in four key areas:	
WH2a: Affluent school districts will score higher levels of technology integration in the teaching and learning component than economically disadvantaged school districts	• U.S. Department of Commerce, (1999 & 2000, 2002) • Green, (2000) • U.S. Department of Education (2002) • Swain and Pearson (2003)
WH2b: Affluent school districts will score higher levels of technology integration Educator Preparation and Development than economically disadvantaged school districts.	• Green, (2000) • U.S. Department of Education (2002) • Swain and Pearson (2003
WH2c: Affluent school districts will score higher levels of technology integration in the administrative and support services component than economically disadvantaged school districts. .	• Swain and Pearson (2003) • U.S. Department of Education (2002
WH2d: Affluent school districts will demonstrate higher levels of technology integration in the infrastructure for technology components than economically disadvantaged school districts.	• Green, (2000) • U.S. Department of Education (2002) • Magnason (2002) • Swain and Pearson (2003)

The conceptual framework for working hypothesis 3 is discussed next. Minority status and technology integration is explored.

WORKING HYPOTHESIS 3

TABLE 4.3
MINORITY STATUS AND TECHNOLOGY INTEGRATION

Research Purpose 3: Explore Texas STaR Chart Assessment results to determine if there is a difference in the level of technology integration in school districts with high minority population compared to school districts low minority populations.

Working Hypothesis	Source
WH3: Low minority school districts will demonstrate higher levels of technology integration than high minority districts in four key areas.	• U.S. Department of Commerce, 1999 & 2000
WH3a: Low minority school districts will demonstrate higher levels of technology integration in the teaching and learning component than. than high minority districts	• Green, (2000) • Carver (1994) • U. S. Department of Education • Swain and Pearson (2003)
WH3b: Low minority school districts will demonstrate higher levels of technology integration in the educator preparation and development component than high minority districts.	• Swain and Pearson (2003)
WH3c: Low minority school districts will demonstrate higher levels of technology than high minority districts in key area 3 Administrative and Support services.	• Swain and Pearson (2003)
WH3d: Low minority school districts will demonstrate higher levels of technology integration in the infrastructure for technology component than high minority districts.	• Magnason (2002) • Bolt and Crawford (2000) • Green (2000) • U. S. Department of Education (2000) • Swain and Pearson (2003)

The next chapter explains the process used to test the hypothesis and operationalizes the working hypothesis. It also provides information regarding the source of data used for analysis.

CHAPTER FIVE
METHODOLOGY

INTRODUCTION

This chapter explains the process used to test the working hypothesis. It discusses the source of the data used and descriptions of the statistical procedures used to test the working hypothesis.

Working hypothesis WH1, WH2, WH3 are operationalized. Each has four sub-hypotheses, with an independent and dependent variable (see tables 5.2, 5.3 and 5.4).

The relationship between technological integration in school districts and socioeconomic, geographical and racial characteristics is studied using data collected by the Texas Education Agency. Thus, this study uses secondary analysis or analysis of existing data. Babbie (2001, p.269) defines secondary analysis as a form of research in which the data collected and processed by one researcher are reanalyzed – often for a different purpose –by another. Babbie (2001, p.270) adds that secondary research is advantageous because it is cheaper and faster than doing original surveys which involves questionnaire construction, sample selection, and data collection through either interviewing or self-administered questionnaires. Additionally, Babbie, p. 270) suggest that depending on who did the original survey one might benefit from the work of "topflight" professionals.

Secondary analysis will allow collection of a large amount of data in a short period, which specifically addresses the exploratory issues and measures the variables analyzed, thus, satisfying the research purposes. Although secondary analysis is advantageous, there are key problems associated with its validity. Babbie (2001, p. 270) explains that when one researcher collects data for one particular purpose, there is no assurance that those data will be appropriate for others research interest. The weakness does not impact this research purpose. The questions that are asked are valid measures of the variables that will be analyzed. However, some bias is possible. Principals or their designee completed survey regarding their expert opinion about the state of technology integration at their school. They may be poorly informed or want to put their school at it's best light. The survey does not measure student or teacher competency. We are unsure about the relationship between technology integration and student knowledge, skills or actual access.

The unit of analysis and population for the study is Texas school districts. The ANOVA statistical procedure is performed to test WH1 and sub-hypothesis. Independent T-test is performed to test WH2 and WH3 and sub-working hypothesis. Existing data is obtained from the Texas Education Agency's Texas STaR Chart Assessment survey results. The survey was administered online to principals at all 7,621 school campuses in Texas grades K-12 during the 2002-2003 school year and 5,007 surveys were returned. The survey results were aggregated to the district level. Charter schools were excluded from the data. This research explores differences in the level of technology integration in Texas school districts based on geographic location, socioeconomic status and ethnicity.

Geographic Location

TEA classifies schools districts based on a scale ranging from major urban to rural. Factors such as size, growth rates, student economic status, and proximity to urban areas are used to determine the appropriate group (Snapshot 2002, p 32-33). Specific district types have been selected and grouped into categories for the research purpose. Categories include urban, suburban, rural and midsize school districts. Rural school districts will be compared to urban, suburban and midsize school districts.

Rural school districts either have a growth rate less than 20 percent and the number of students in membership is between 300 and the state median, or the number of students in membership is less than 300. Rural school districts do not meet the criteria for placement into any of the other categories (Snapshot 2002, p 32-33).

Urbanicity

Urban school districts included major urban and other central city districts. Major urban school districts are the largest in the state that serve the six metropolitan areas of Houston, Dallas, San Antonio, Fort Worth, Austin, and El Paso. Major urban districts are the districts with the greatest membership in counties with populations of 650,000 or more. Other central cities are major school districts in other large, but not major, Texas cities. Other central city districts are the largest districts in counties with populations between 100,000 and 650,000 and are not contiguous to any major urban districts (Snapshot 2002, p 32-33).

Suburban districts will include major suburban and other central city suburban schools. Major suburban school districts are in and around the major urban areas. They are contiguous to major urban districts. Other central city suburban school districts are in and around the other large, but not major, Texas cities (Snapshot 2002, p 32-33).

Midsize districts will encompass independent towns, non-metro stable and non-metro fast growing. Independent towns are the largest school districts in counties with a population of

25,000 to 100,000. Non-metro fast growing school districts exhibit a five-year growth rate of at least 20 percent with at least 300 students in membership. Non-metro stable school districts have a number of students that exceeds the state median (Snapshot 2002, p 32-33). Table 5.1 below provides the number of school districts per geographic location:

Table 5.1

Geographic Category	No. School Districts
Rural	307
Urban	43
Suburban	169
Midsize	291

The next section discusses the methodology for economically disadvantaged and affluent school districts.

Economically Disadvantaged vs. Affluent School Districts

School districts with a 50% or higher economically disadvantaged student population (421) will be compared to (81) affluent schools districts. School districts that fall between the criteria were excluded. TEA defines the percent of economically disadvantaged as the sum of the students coded as eligible for free lunch or reduced-price lunch or eligible for other public assistance, divided by the total number of students (TEA (2001-2002 AEIS Glossary). For purposes of this research project affluent schools districts are defined as districts identified by TEA as subject to Chapter 41 of the wealth equalization program. The wealth equalization program is a program established in 1993 when the Texas Legislature passed Senate Bill 7, which provided all districts with substantially equal access to revenue for equal tax effort.

Chapter 41 is the key equity chapter in the Texas Education Code (TEC) and is subsequently referred to as "Chapter 41. Chapter 41 focuses on wealth equalization through the mechanism of recapture, the recovery of financial resources from districts defined by the state as high property wealth. Resources are recovered for the purpose of sharing them with low wealth districts. High wealth districts are defined as a district with a tax base that exceeds the equalized wealth level of $305, 000 in property value per student in weighed average daily attendance. In 2002-2003, the equalized wealth level was $305,000. A low wealth district is one that has a wealth per weight student below the equalized level (TEA, 2003-2004 p 2.) .[10]

Ethnicity

And finally, school districts with a high minority population (50% African American and or Hispanic students) (267) will be compared to school districts (313) with a low minority population (White), (districts with less than 25 % African American and or Hispanic student population).

The literature review findings and the 2002-2003 Texas STaR Chart Assessment tool are consistent regarding key areas that should be assessed to determine levels of technology integration in schools. Consequently, geographic, socioeconomic and ethnic comparisons are based on each school district's level of technology integration in four key areas (1) teaching and learning (2) educator preparation and development (3) administration and support services and (4) infrastructure for technology. Scales were constructed by TEA to measure the degree of technology integration. The levels of technology integration ranges from a low of 1 to a high of 4 as indicated in the scale below:

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

[10] See Texas Education Agency Manual for Districts Subject to Wealth Equalization 2003-2004 School Year.

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. Technology Applications TEKS/ Assessment	F. Patterns of Student Use	Total 6-24

Key Area II: Educator Preparation and Development

G. Content Of Training	H. Capabilities Of Educators	I. Leadership And Capabilities	J. Models of Professional Development	K. Levels of Understanding And Patterns Of Use	L. Technology Budget for Technology Professional Development	Total 6-24

Key Area III: Administration and Support Services

M. Vision and Planning	N. Technical Support	O. Instructional and Administrative Staffing	P. Budget	Q. Funding	Total 6-20

Key Area IV: Infrastructure for Technology

R. Students per Computer	S. Internet Access/ Connectivity/Speed	T. Distance Learning	U. LAN/WAN	V. Other Technology	Total 5-20

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)

*Source 2001 2002 Texas STaR Chart a Tool for Planning and Assessing School Technology and Readiness aligned with the Long Range Plan for Technology 1996-2010

TABLE 5.2
OPERATIONALIZATION OF THE CONCEPTUAL FRAMEWORK FOR RESEARCH PURPOSE 1

Research Purpose 1: Explore Texas STaR Chart Assessments results to determine if there is a differences in the level of technology integration in urban, suburban and midsize school districts compared to rural school districts.

Working Hypothesis 1: Urban and suburban and midsize school districts will score higher levels of technology integration than rural school districts.

Dependent Variable	**Hypothesis Direction**	**Variable Measurement**	**1= Early Tech** **2 = Developing Tech** **3= Advanced Tech** **4 = Target Tech**
WH1a **Teaching and Student Learning**	**Rural Score Less Than (-)**	**Scale 1 to 4 (6 Item Scale)** **Scale composed of the following 6 Components:** • Teacher Role and Collaborative learning • Patterns of Teacher Use • Frequency/Design of Instructional Setting • Curriculum Areas • Technology Applications TEKS/Assessment • Pattern of Student Use	
WH1b **Educator Preparation and Development**	**Rural Score Less Than (-)**	**Scale 1-4 (6 Item Scale)** **Scale composed of the following 6 Components:** • Content of Training • Capabilities of Educators • Leadership and Capabilities of Administrators • Models of Professional Development • Levels of Understanding and Patterns of Use • Technology Budget for Technology Professional Development	
WH1c **Administration and Support Services**	**Rural Score Less Than (-)**	**Scale 1-4 (5 Item Scale)** Scale composed of the following 5 Components: • Vision and Planning • Technical Support • Instructional and Administrative Staffing • Budget • Funding	
WH1d **Infrastructure for Technology**	**Rural Score Less Than (-)**	**Scale 1-4 (5 Item Scale)** Scale composed of the following 5 Components: • Students per computer • Internet Access/Connectivity • Distance Learning • LAN/WAN • Other technologies	
Independent Variable: Geographic Location	**Rural Score less than (-)**	**1 = Urban (MU, OCC)** **2 = Suburban (MS, OCCS)** **3 = Rural (R)** **4 = Midsize (IT, NMS, NMFG)**	

Key Area I: Teaching and Student Learning
Key Area II: Educator Preparation and Dev.
Key Area III: Administration and Support Services
Key Area IV: Infrastructure for Technology

Scales were standardized to 1 to 4

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

TABLE 5.3
OPERATIONALIZATION OF THE CONCEPTUAL FRAMEWORK FOR RESEARCH PURPOSE 2

Research Purpose 2: Explore Texas STaR Chart Assessments results to determine if there is a differences in the level of progress toward use of technology in affluent school districts compared to school districts with a high population of economically disadvantaged school districts.			
Working Hypothesis 2: Affluent districts will demonstrate higher levels of technology integration than economically disadvantaged school districts.			
Dependent Variable	**Hypothesis Direction**	**Variable Measurement**	**1= Early Tech 2=Developing Tech 3= Advanced Tech 4= Target Tech**
WH2a **Teaching and Student Learning**	+	**Scale 1 - 4 (6 Item Scale)** **Scale composed of the following 6 Components:** • Teacher Role and Collaborative learning • Patterns of Teacher Use • Frequency/Design of Instructional Setting • Curriculum Areas • Technology Applications TEKS/Assessment • Pattern of Student Use	
WH2b **Educator Preparation and Development**	+	**Scale 1-4 (6 Item Scale)** **Scale composed of the following 6 Components:** • Content of Training • Capabilities of Educators • Leadership and Capabilities of Administrators • Models of Professional Development • Levels of Understanding and Patterns of Use Technology Budget for Technology Professional Development	
WH2c **Administration and Support Services**	+	**Scale 1-4 (5 Item Scale)** Scale composed of the following 5 Components: • Vision and Planning • Technical Support • Instructional and Administrative Staffing • Budget • Funding	
WH2d **Infrastructure for Technology**	+	**Scale 1-4 (5 Item Scale)** Scale composed of the following 5 Components: • Students per computer • Internet Access/Connectivity • Distance Learning • LAN/WAN • Other technologies	
Independent Variable: Affluence	**Positive**	1 = Affluence (<25 % ED) 0 = Economically Disadvantaged (ED) (>75%)	

Key Area I: Teaching and Student Learning **Key Area III: Administration and Support Services**
Key Area II: Educator Preparation and Dev. **Key Area IV: Infrastructure for Technology**

Scales were standardized to 1 to 4

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

TABLE 5.4
OPERATIONALIZATION OF THE CONCEPTUAL FRAMEWORK FOR RESEARCH PURPOSE 3

Research Purpose 3: Explore Texas STaR Chart Assessments results to determine if there is a differences in the level of technology integration in school districts with a high population of minority students compared to school districts with a low population of minority students.

Working Hypothesis 3: School districts with a low minority population will score higher levels of technology integration than school districts with high minority populations.

Dependent Variable	Hypothesis Direction	Variable Measurement	1= Early Tech 3= Advanced Tech 2=Developing Tech 4= Target Tech
WH1a **Teaching and Student Learning**	—	**Scale 1 to 4 (6 Item Scale)** **Scale composed of the following 6 Components:** • Teacher Role and Collaborative learning • Patterns of Teacher Use • Frequency/Design of Instructional Setting • Curriculum Areas • Technology Applications TEKS/Assessment • Pattern of Student Use	
WH3b **Educator Preparation and Development**	—	**Scale 1-4 (6 Item Scale)** **Scale composed of the following 6 Components:** • Content of Training • Capabilities of Educators • Leadership and Capabilities of Administrators • Models of Professional Development • Levels of Understanding and Patterns of Use • Technology Budget for Technology Professional Development	
WH3c **Administration and Support Services**	—	**Scale 1-4 (5 Item Scale)** Scale composed of the following 5 Components: • Vision and Planning • Technical Support • Instructional and Administrative Staffing • Budget • Funding	
WH3d **Infrastructure for Technology**	—	**Scale 1-4 (5 Item Scale)** Scale composed of the following 5 Components: • Students per computer • Internet Access/Connectivity • Distance Learning • LAN/WAN • Other technologies	
Independent Variable: High Minority Population		**1 = High Minority Population (75%)** **0 = Low Minority Population (25%)**	

Key Area I: Teaching and Student Learning
Key Area II: Educator Preparation and Dev.
Key Area III: Administration and Support Services
Key Area IV: Infrastructure for Technology

Scales were standardized to 1 to 4

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

CHAPTER SIX
RESULTS

INTRODUCTION

This chapter provides the results of the statistical procedures performed for this study. The results of the test are presented in a tabular format. They are also summarized and interpreted in text. Data showed that rural school districts have significantly higher scores in the area of teaching and learning than midsize and suburban districts and rural school districts are doing significantly better than midsize school districts in the areas of educator preparation and development. Rural school districts were also doing significantly better than urban, suburban and midsize school districts in the area of infrastructure for technology. With regard to key area III administrative support services in rural areas, no significant differences were found.

Additionally, affluent school districts were doing significantly better than economically disadvantaged school districts in the areas of teaching and learning and educator preparation and development. Further, non-minority school districts are doing significantly better than minority school districts in teaching and learning, educator preparation and development, administrative support services and infrastructure for technology.

Table 6.1 shows the results of the data analysis for WH1. Results indicate that there were significant differences between geographic locations. None of the sub-hypotheses are supported. No significant findings were noted. Working hypotheses WH1d states that urban and suburban and midsize school districts will demonstrate higher levels of technology integration in infrastructure for technology than rural school districts is not supported. Significant differences were found indicating that rural school districts are doing significantly better than urban, suburban and midsize school districts in the area of infrastructure for technology. The information below provides further detail of regarding the findings.

WH1a
Teaching and Learning Results by Geographic Location

WH1a states that urban and suburban and midsize school districts will demonstrate higher levels of technology integration than rural school districts in key area (1) WH2a teaching and learning. Results do not support this working hypothesis. Results indicate that rural school districts are doing significantly better than suburban and midsize school districts in the key areas of teaching and learning. The teaching and student learning mean score for rural school districts of 2.16 is significantly higher than the mean score of suburban and midsize districts both at 2.05. No other significant differences were found among the four geographic locations in key area 1 teaching and learning.

WH1b
Educator Preparation and Development by Geographic Location

WH1b states that urban and suburban and midsize school districts will demonstrate higher levels of technology integration than rural school districts in key area (1) WH2a educator preparation and development. Results do not support this working hypothesis. They are either the same or rural is doing better. Results indicate that rural school districts are doing significantly better than midsize school districts in the key areas 2, educator preparation and development. The educator preparation and development mean score for rural school districts of 2.25 is significantly higher than the mean score of midsize districts at 2.15. No other significant differences were found among the four geographic locations in key area 2 educator preparation and development.

WH1c
Administration and Support by Geographic Location

Working hypothesis WH2c states urban and suburban and midsize school districts will demonstrate higher levels of technology integration than rural school districts in key area (3) administration and support services. The results do not support this working hypothesis. No significant differences were found.

WH1d
Infrastructure for Technology by Geographic Location

Working hypothesis WH1d states urban and suburban and midsize school districts will demonstrate higher levels of technology integration than rural school districts in key area (4) infrastructure for technology. The results do not support this working hypothesis. The findings indicated that rural school districts are doing significantly better than urban, suburban, and midsize school districts in the key (4) infrastructure for technology. The infrastructure for technology mean score for rural school districts of 2.76 is significantly higher than the mean score of urban at 2.32, suburban 2.5 and midsize districts at 2.54. The scales were standardized to enhance interpretation.

Table 6.1 ANOVA TEST RESULTS

WH1 a-d: Urban, Suburban and Midsize School Districts vs. Rural School Districts

Texas STaR Chart **Key Area by Geographic Region**	**MEAN** **Urban N=(43)** **Suburban N=(169)** **Midsize N=(291)** **Rural N= (307)**	**F-Statistic**
Key Area I: Teaching and Learning		
Urban	2	
Suburban	2.05	
Rural	**2.16**	6.59**
Midsize	2.05	
Key Area II: Educator Preparation and Development		
Urban	2.08	
Suburban	2.13	
Rural	**2.25**	4.352*
Midsize	2.15	
Key Area III: Administration and Support		
Urban	2.26	
Suburban	2.4	
Rural	2.46	2.26
Midsize	2.42	
Key Area IV: Infrastructure for Technology		
Urban	2.32	
Suburban	2.5	
Rural	**2.76**	24.06**
Midsize	2.54	

*** Significant at the .01 level** 1=Early Tech 2= Developing Tech 3= Advanced Tech 4= Target Tech
****Significant at the .001 level**

INDEPENDENT T-TEST RESULTS
WORKING HYPOTHESIS 2:WH2a-WH2b

Table 6.2 shows the results of the data analysis for WH2. Results indicate that there were significant differences between affluent school districts compared to economically disadvantaged school districts. Working hypotheses WH2a and Wh2b which states affluent school districts will demonstrate higher levels of technology integration than economically disadvantaged school districts in (1) WH1a teaching and learning and (2) WH2b educator preparation and development are supported. No significant differences were found for working WH2c and WH2d which states affluent school districts will demonstrate higher levels of technology integration than economically disadvantaged school districts in (3) WH2c Administration and Support and (4) WH2d Infrastructure for Technology.

The information below provides more detail regarding each working hypothesis.

WH2a
Teaching and Learning by Economic Status

Working hypothesis WH2a asserts that affluent school districts will demonstrate higher levels of technology integration than economically disadvantaged school districts in key areas (1) **WH2a** teaching and learning (see table 6.2). Research results reflect that affluent school districts are doing significantly better than economically disadvantaged school districts in the key areas of teaching and learning. The teaching and student learning mean score for affluent school districts of 2.22 Mean is significantly different from the mean score of economically disadvantaged school districts at mean of 2.07.

Wh2b
Educator Preparation and development by Economic Status

Working hypothesis WH2a asserts that affluent school districts will demonstrate higher levels of technology integration than economically disadvantaged school districts in key areas (2) WH2b preparation and development. The educator preparation and development mean score of 2.28 is significantly different from the mean score of economically disadvantaged school districts at 2.58. Both are around the developing tech range with room for significant improvement overall.

WH2c and WH2d
Administration and Support Infrastructure for Technology by Economic Status

Working hypothesis WH2c and WH2d asserts that affluent school districts will demonstrate higher levels of technology integration than economically disadvantaged school districts in key areas (2)WH2c administration and support and (3) WH2d infrastructure for technology. Working hypothesis WH2c and WH2d are not supported. No significant difference were found between affluent school districts levels of technology integration compared to economically disadvantaged school districts in the area of administration and support and infrastructure for technology. The table 6.3 below summarizes the research finding regarding WH3 and the sub-hypothesis.

Table 6.2 Independent T-test Results

WH2 -WH2a-d: Economically Disadvantaged vs. Affluent School Districts

Independent Variable	Mean Economically Disadvantage N=421	Mean Affluent N=81	T-Value
Key Area I: Teaching and Student Learning	2.07	2.22	-2.931*
Key Area II: Educator Preparation and Development	2.15	2.28	-2.676*
Key Area III: Administration and Support	2.4	2.48	-1.503
Key Area IV: Infrastructure for Technology	2.58	2.62	-.563

***Significant at .01**

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

INDEPENDENT T-TEST RESULTS
WORKING HYPOTHESIS 3:WH3a-WH3b

Table 6.3 shows the results of the data analysis for WH3. Results indicate that there were significant differences between districts with a low minority population compared to school districts with high minority populations in key areas (1) WH3a teaching and learning; (2) WH3b educator preparation and development; (3) WH3c administration and support and (4) WH3d infrastructure for technology. The working hypotheses that school districts with a low minority population will demonstrate higher levels of technology integration than school districts with high minority populations in key areas (1) WH3a teaching and learning;(2) WH3b educator preparation and development;(3) WH3c administration and support and (4) WH3d infrastructure for technology are supported.

WH3a
Teaching and Learning by Ethnicity

Working hypothesis WH3a states that school districts with a low minority population will demonstrate higher levels of technology integration than school districts with high minority populations in key areas (1) WH3a teaching and learning. Results indicate that low minority (White) districts were doing significantly better than high minority (African American and Hispanic) districts in the key areas of teaching and learning. The teaching and learning mean score for low minority school districts of 2.15. Mean is significantly different from the mean score of high minority school districts at 2.0.

WH3c
Educator Preparation and Development by Ethnicity

Working hypothesis WH3c states that school districts with a low minority population will demonstrate higher levels of technology integration than school districts with high minority populations in key areas educator preparation and development. The working hypothesis is supported. Research results reflect that low minority districts are doing significantly better than high minority districts in the key areas of educator preparation and development. The educator preparation and development mean score for low minority school districts of 2.21. Mean is significantly different from the mean score of high minority school districts at 2.11. Both would be considered developing tech and have room for improvement toward advanced tech and target tech.

WH3c
Administrative Support by Ethnicity

Working hypothesis WH3c states that school districts with a low minority population will demonstrate higher levels of technology integration than school districts with high minority populations in key areas administration and support. Research result supports the working hypothesis. Statistics indicate low minority districts are doing significantly better than high minority districts in the key area of administration and support. The administration and support mean score for low minority school districts of 2.46. Mean is significantly different from the mean score of high minority school districts at 2.36. Both would be considered developing tech and have room for improvement toward advanced tech and target tech.

WH3d
Infrastructure for Technology by Ethnicity

Working hypothesis WH3c states that school districts with a low minority population will demonstrate higher levels of technology integration than school districts with high minority populations in key area of infrastructure for technology. Results support the working hypothesis. Low minority districts were doing significantly better than high minority districts in the key areas of infrastructure for technology. The mean score for low minority school districts infrastructure for technology of 2.21 is significantly different from the mean score of high minority school districts at 2.36. However, both would be considered developing tech and have room for improvement toward advanced tech and target tech. Table 6.3 below provides a detailed summary of the research finding for WH3 a-d.

Table 6.3 Independent T-test Result

WH3 –WH3a-d: High Minority School Districts vs. Low Minority School Districts

Texas STaR Chart Key Area	**Mean High Minority N=267**	**Mean Low Minority N=313**	**T=Value**
Key Area I: Teaching and Learning	2	2.15	-4.299*
Key Area II: Educator Preparation and Development	2.11	2.21	-2.893*
Key Area III: Administration and Support	2.36	2.46	-2.169*
Key Area IV: Infrastructure for Technology	2.48	2.66	-4.417*

***Significant at .01**

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

CHAPTER 7

SUMMARY CONCLUSIONS AND RECOMMEDATION

In conclusion, the data revealed that rural school districts have significantly higher scores in the area of teaching and learning than midsize and suburban districts and rural school districts are doing significantly better than midsize school districts in the areas of educator preparation and development. Rural school districts were also doing significantly better than urban, suburban and midsize school districts in the area of infrastructure for technology. Additionally, affluent school districts were doing significantly better than economically disadvantaged school districts in the areas of teaching and learning and educator preparation and development. Moreover, non-minority school districts are doing significantly better than minority school districts in all key areas (teaching and learning, educator preparation and development, administrative and support services and infrastructure for technology). These findings are summarized in table 7.1 below:

Table 7.1 Working Hypothesis Conclusions

Working Hypothesis	Supported
WH1: Urban, suburban, and midsize school districts will score higher levels of technology integration than rural in the key area of:	
Teaching and Learning	No
Educator Preparation and Development	No
Administrative Support Service	No
Infrastructure for Technology	No
WH2 Affluent school districts will score higher levels of technology integration than economically disadvantaged school districts in the key areas of:	
Teaching and Learning	Yes
Educator Preparation and Development	Yes
Administrative Support Service	No
Infrastructure for Technology	No

Continued… **Working Hypothesis**	**Supported**
WH2: Low minority school districts will score higher levels of technology integration than high minority districts in key areas of: Teaching and Learning Educator Preparation and Development Administrative Support Service Infrastructure for Technology	 Yes Yes Yes Yes

Overall, low technology integration scores in teaching and learning and educator preparation and development is a common denominator for economically disadvantage school districts and high minority school districts. Moreover, data suggest that a digital divide does exist in Texas public schools for minorities in all key areas. The good news is that rural school districts are doing significantly better or the same as urban, suburban and midsize school districts in technology integration. So what can be done to help minority and economically disadvantaged students?

RECOMMENDATIONS

Interviews with experts on the digital divide and information technology suggest that bridging the digital is a ongoing endeavor which requires coordinated effort by the government, the public, and the community. Dr. Lodis Rhodes, Professor of Public Affair at the University of Texas at Austin, suggests that the public school may help to bridge the digital divide however, the public education system cannot accomplish this alone. The community is the best source for bridging the digital divide. Youth need access to computers so they can “tinker.” By tinkering with computers youth gain confidence and knowledge in an environment not limited by time or access.

Gary Chapman, Director of the 21st Century project at the LBJ School of Public Affairs University of Texas at Austin suggests that " tinkering" is a UT theme. Tinkering means learning by trial and error by doing on your own. He agrees that community resources such as libraries, community centers and schools are helpful however, youth need a place where they can tinker without time constraints. He adds that the price of computers is coming down which will help more low income families purchase computers for the home.

Dr. George Weinberger a specialist in government information systems and public administration research methodology at Texas State University in San Marcos also suggest that access to computers and the ability to practice on them is a solution. In his words, he asserts "How can a child become a great violinist if he does not have a violin." He adds that even with the greatest equipment, every violinist needs lessons. He recommends professional development for educators and in an effort to retain qualified teachers in low income school districts, perhaps a plan similar to the one President Johnson used which allowed teachers to repay student loans by working in low income schools for a specified time as repayment would be helpful.

In conclusion, failing to realize the importance of bridging the digital is a detriment to the future of Texas and America. Who will really get left behind if we fail to prepare students to function in a digital economy? If we really believe the children are "our future," then we are the ones who will be left behind. As other countries provide the best education for all of their students and provide professional development for their teachers, Americans will be left behind.

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