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ABSTRACT

PERCEPTIONS OF TECHNOLOGY USE IN RURAL AND
URBAN PENNSYLVANIA HIGH SCHOOLS

by

Brenda M. Freeman

Chair: James A. Tucker

ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

School of Education

Title: PERCEPTIONS OF TECHNOLOGY USE IN RURAL AND URBAN
PENNSYLVANIA HIGH SCHOOLS

Name of researcher: Brenda M. Freeman

Name and degree of faculty chair: James A. Tucker, Ph.D.

Date of completion: April 2008

Purpose

Policy makers are implementing standards and developing guidelines for integrating technology into K-12 schools. With this in mind, the integration of technology into curriculum is an ever-growing point of discussion among high-school education professionals. Technology uses in teaching and learning present significant issues in educational reform literature. Rather than trying to describe the impact of all technologies as if they were the same, this study focuses on the differences in the ways technologies are being used in the classroom as well as the role technology played in instruction. There is also a need to investigate whether or not student outcomes can vary significantly depending on the location of each identified school district. Rural areas tend to be sparsely settled. But does that remoteness mean less availability of educational

resources? This qualitative case study attempted to answer the following research questions: (a) What are the differences that exist in the way technology is acquired and used in rural and urban Pennsylvania high schools? (b) What are the benefits of understanding the impact technology has on rural vs. urban high schools in Pennsylvania? and (c) Why do teachers use technology?

Method

This study analyzed the differences that exist in the way technology is being used and funded in rural and urban Pennsylvania high schools. The participants consist of eight core-subject high-school teachers, two administrators, two technology coordinators, and one curriculum coordinator from a rural and an urban Pennsylvania high school.

Classifications were determined by county population in order to select one rural and one urban high school. Purposive sampling was conducted to determine which teachers were chosen for the case study.

Three different instruments were used to measure attributes of technology integration. Survey questionnaires, face-to-face interviews, and observation were used to collect data during site visitations conducted by the researcher. Exploration of Jerome Bruner's Discovery Learning Theory and M. J. Carroll's Minimalist Theory provided the theoretical framework for the study.

Results

The cross-case analysis of this study projected three distinct conclusions: (a) There is a belief that exists, in both the rural Pennsylvania high school and the urban Pennsylvania high school, that technology is a necessary and critical component for

educating students in today's world, (b) technology use differs in the rural Pennsylvania high school from the urban Pennsylvania high school, and (c) demographics play a role in funding sources needed to acquire and sustain technology in the educational classroom.

The analysis clearly confirmed the belief that technology is a necessary and critical component for educating students in today's world. Teacher interviews revealed an overall belief where technology prepares students for the future by meeting goals better and improving student interest.

Data also indicated that technology was used very differently in the urban high school than its counterpart rural high school. Automative techniques were used for technology integration in the rural high school, whereas the urban high school displayed innovative techniques for technology use in the classroom.

In addition, analysis of the data indicated that demographics play a role in funding. Population helps increase the local tax base. The greater the county population, the more tax revenue is generated for education. The urban high school reflected a larger population than the rural high school, yielding greater funding sources. Technology resources were abundant in the urban high school. In contrast, the lack of funding sources in the rural high school hindered technology resources available for teacher and student use in the rural high school.

Conclusions

One benefit of this case study is the idea that the integration of educational technologies affords teachers the capability to effect change at a curricular or programmatic level. Through the use of sharing content and learning activities, teachers created classroom environments where they were able to facilitate the development of

more effective learning experiences across the curriculum. In addition, the use of thematic team teaching allowed students to shape their own learning outcomes.

A study of how technology is acquired and used in rural and urban high schools in the state of Pennsylvania is important for several reasons. The outcomes of this research are useful to different groups in education: (a) those in leadership positions such as administrators and school board members who make informed decisions on technology use in schools and seek funding sources that are available for technology acquisition, (b) individual classroom teachers who are interested in integrating technology in the classroom setting, (c) individuals who are interested in conducting research on educational technology, (d) curriculum coordinators and technology directors who collaborate on ways to integrate technology into curriculum and provide technological professional development opportunities, and (e) students who are interested in the ways technology benefits their educational experiences.

Andrews University

School of Education

PERCEPTIONS OF TECHNOLOGY USE IN RURAL AND
URBAN PENNSYLVANIA HIGH SCHOOLS

A Dissertation

Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

by

Brenda M. Freeman

April 2008

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A dissertation
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Brenda M. Freeman

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DEDICATION

I dedicate this dissertation to my family. It is you who have given me the inspiration to stay the course and dream the dream. To my mother who inspired me to be a life-long learner. To my mother-in-law who sparked within me the voice that assures me that my thoughts are valued.

To my husband, Tom, who has supported me with the time, encouragement, and love that allowed me to reach my goals. To my children, TJ and Nicole, who provided me inspiration to push forward.

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TABLE OF CONTENTS

LIST OF TABLES	vii
ACKNOWLEDGMENTS	viii
Chapter	
I. INTRODUCTION	1
Background to the Problem	1
Background of the Problem	2
Statement of the Problem	2
Purpose of the Study	2
Significance of the Study	3
Research Questions	4
General Methodology	4
Theoretical Framework	5
Definition of Terms	6
Limitations	7
Delimitations	8
Summary	8
Organization of the Study	8
II. LITERATURE REVIEW	9
Introduction	9
Budget	9
The Digital Divide	10
The Role of Technology in the Classroom	16
Use of Technology in the Classroom	22
Factors Affecting Teachers' Use of Technology	26
Teacher Beliefs	27
Summary	29
III. METHODOLOGY	31
Introduction	31
Participants	32
Instrumentation	33
Data Collection	34

Data Analysis	36
Role of the Researcher	37
Background of the Researcher	38
IV. RESULTS	39
Description of Participants	40
School R, Rural High School	41
Administrative Focus Group—School R	41
Administrative Focus Group Interview Question 1	41
Administrative Focus Group Interview Question 2	42
Administrative Focus Group Interview Question 3	42
Administrative Focus Group Interview Question 4	43
Administrative Focus Group Interview Question 5	43
Observations of the Rural School District Teachers	49
Survey Questions—School R	52
Rural School District Teacher Responses to Interview Questions	55
Interview Question 1	55
Interview Question 2	56
Interview Question 3	57
Interview Question 4	57
Interview Question 5	59
Emergent Themes	59
School U, Urban High School	61
Administrative Focus Group—School U	61
Administrative Focus Group Interview Question 1	61
Administrative Focus Group Interview Question 2	62
Administrative Focus Group Interview Question 3	62
Administrative Focus Group Interview Question 4	63
Administrative Focus Group Interview Question 5	63
Observations of Urban School District Teachers	69
Urban School District Teacher Responses to Interview Questions	74
Interview Question 1	74
Interview Question 2	74
Interview Question 3	75
Interview Question 4	76
Interview Question 5	77
Emergent Themes	78
Summary	79
V. CROSS-CASE ANALYSIS	80
Theme 1	80
Theme 2	82
Theme 3	84
Participant Background Knowledge	86

Teacher Knowledge	87
Discussion of Findings	90
Research Question 1	90
Research Question 2	94
Research Question 3	98
Summary	101
VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	102
Summary of Procedure and Findings	104
Conclusions	111
Programmatic Recommendations	111
Recommendations for Future Research	112
Appendix	
A. PROTOCOLS	117
B. SURVEY	120
C. LETTER TO PRINCIPAL	126
D. LETTER TO PARTICIPANTS	128
REFERENCE LIST	131
VITA	141

LIST OF TABLES

1. Years of Teaching in School R—Rural High School	46
2. Computer Use in School R—Rural High School	46
3. Computer for Instruction in School R—Rural High School	46
4. Computer Training Received in School R—Rural High School	47
5. Location of Training Received in School R—Rural High School	48
6. Age of Participants in School R—Rural High School	49
7. Participant Responses to Survey Questions in School R—Rural Pennsylvania High School	53
8. Years of Teaching in School U—Urban High School	65
9. Computer Experience in School U—Urban High School	65
10. Computer for Instruction in School U—Urban High School	66
11. Computer Training Received in School U—Urban High School.	67
12. Location of Training Received in School U—Urban High School.	67
13. Age of Participants in School U—Urban High School	68
14. Urban School District Teacher Responses to Survey Questions	72

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Truly, I have been fortunate to work with such an outstanding group of leaders.

CHAPTER ONE

INTRODUCTION

Background to the Problem

The shift towards a computer-based paradigm of teaching is obvious in our nation (Mann & Shafer, 1997) as well as in our high schools across the state of Pennsylvania. Because of this shift, technology uses in teaching and learning present significant issues in educational reform literature (Austin, 2004). Policy makers are implementing standards and developing guidelines for integrating technology into K-12 schools (ISTE, 2002; ITEA, 2000). Significant progress has been made toward building wide-area networks across the state of Pennsylvania in the educational world (The General Assembly of Pennsylvania, 2004). With the adoption of the No Child Left Behind Act of 2001, even the White House has made educational technology a priority issue. Rather than trying to describe the impact of all technologies as if they were the same, researchers need to think about what differences exist in the uses of technology in the classroom and what funding sources are available to school districts to support them (North Central Regional Educational Laboratory, 1999). However, we also need to investigate whether or not student technology-related outcomes can vary significantly depending on the location, rural or urban, of each identified Pennsylvania school district. Rural areas tend to be characterized by a more firm community-oriented population (Miller, 1995). Rural also means sparsely settled (*Dictionary.com*), but does that remoteness also mean there is

less availability of educational resources? Often rural school districts compete with urban school districts in purchasing technology. School districts, whether rural or urban, need to begin to examine the value of what technology offers them by examining the ways teachers and students are using technology. Proposed to look at in this study are differences in the ways technology is being used in rural and urban Pennsylvania high schools, what value of knowledge technology delivers, and the sources of funding that are available to purchase them.

Background of the Problem

In this study, I looked at differences in the ways technology is being used in rural and urban Pennsylvania high schools, what value of knowledge technology delivers, and the sources of funding that are available to them.

Statement of the Problem

Research studies tend to concentrate on whether technology plays a role in student learning outcomes (Lewis, 1999). I believe that these studies lack evidence in the differences that may exist in the ways technology is acquired and used in rural and urban Pennsylvania high schools, and what students can accomplish with it.

Purpose of the Study

The purpose of this study was to determine what differences exist in the way technology is acquired and used in rural and urban Pennsylvania high schools. This case study examined if technology plays a different role when used by rural-area teachers versus urban-area teachers. The intent of this case study is to assist educators and students by examining whether technology differences exist in rural and urban high-

school classroom settings. It is also the intent of this study to show how and why technology is used in each respective area.

Significance of the Study

A study of how technology was being used in rural and urban high schools in the state of Pennsylvania is important for several reasons. The outcomes of this research will be useful to different groups in education: (a) those in leadership positions such as administrators and school board members who make informed decisions on technology use in schools and seek funding sources that are available for technology acquisition, (b) individual classroom teachers who are interested in integrating technology in the classroom setting, (c) individuals who are interested in conducting research on educational technology, (d) curriculum coordinators and technology directors who collaborate on ways to integrate technology into curriculum and provide technological professional development opportunities, and (e) students who are interested in the ways technology benefits their educational experiences. An understanding of what technology resources were available for teacher and student use was a key factor to understanding how and why technology is used in the classroom. Federal and state funding along with competitive grants are often awarded to school districts based on a variety of objectives. Understanding how school districts obtain funding sources is another key element in the integration of technology into curriculum. If we understand how teachers integrate technology in the classroom, this knowledge may be of benefit to students.

Research Questions

The following research questions guided this study:

1. What are the differences that exist in the way technology is acquired and used in rural and urban Pennsylvania high schools?
2. What are the benefits of understanding the impact technology has on rural vs. urban high schools in Pennsylvania?
3. Why do teachers use technology?

General Methodology

I used a qualitative case-study approach in this study. The participants consist of high-school teachers, principals, technology coordinators, and curriculum coordinators from rural and urban Pennsylvania high schools. Classifications were determined by county population in order to select one rural and one urban high school. Purposive sampling was conducted to determine which teachers were chosen for the case study. This case study also made use of a focus-group research model to facilitate an organized discussion with a group of individuals selected because they are believed to represent the criteria for each rural and urban high school in the study. Instrumentation for this case study was a combination of open-ended questions, questionnaires, and observations created and conducted by myself. Data were collected at a 1-day site visit at each school. Permission forms were sent to all participants before the study began. Once all data were collected I used triangulation to verify the validity of the data.

Theoretical Framework

Exploration of Jerome Bruner's Discovery Learning Theory and M. J. Carroll's Minimalist Theory aided in the understanding of technology integration in the educational classroom setting. Therefore, these theories were used as the theoretical framework for my study.

Bruner believed that students learn best by discovery and that the learner is a problem solver who interacts with the environment testing hypotheses and developing generalizations. Bruner felt that the goal of education should be intellectual development, and that the science curriculum should foster the development of problem-solving skills through inquiry and discovery (Hassard, 2000).

Bruner said that knowing is a process rather than the accumulated wisdom of science as presented in textbooks. To learn science concepts and to solve problems, students should be presented with perplexing (discrepant) situations. Guided by intrinsic motivation the learner in this situation will want to figure the solution out. This simple notion provides the framework for creating discovery learning activities (Hassard, 2000, p. 1).

Carroll's Minimalist Theory advises that course designers must minimize instructional materials that obstruct learning and focus the design on activities that support learner-directed activity. Instruction can be made more efficient when the amount of reading is minimized and learners are allowed to fill in the gaps themselves (Carroll, 1990).

Definition of Terms

The following terms are defined as they are used in this study:

1:1 laptops: Initiative to provide one computer for every student and teacher.

Classrooms of the Future Grant: Pennsylvania Governor Rendell's 3-year investment to provide laptop computers, high-speed Internet access, and state-of-the-art software to high-school classrooms across the state.

E-Fund Grant: The Education Technology Fund (E-Fund) established under Act 183 (The General Assembly of Pennsylvania, 2004) as part of the requirements for amended network modernization plans submitted by telephone companies. Legislation required the Pennsylvania Department of Education to establish a program to disburse the funds attained through E-Fund.

E-Rate: Created as part of Public Law 104-104 Section 254 (Telecommunications Act, 1996). This program was established to provide discounts on the cost of telecommunications services and equipment to all public and private schools and libraries.

Integration: The process of incorporating parts, components, or elements into a larger defined unit, set, whole.

Intermediate Unit: Regional educational service agencies serving the public and non-public schools and other education needs of the Commonwealth.

No Child Left Behind: An Act (Public Law 107-110) by the 107th United States Congress to close the achievement gap with accountability, flexibility, and choice so that no child is left behind.

Technology: Using multimedia technologies or audiovisual aids as a tool to enhance the teaching and learning process. Technology shall include, but not be limited to, computers, computer hardware, scanners, multimedia material, facsimiles, e-mail, computer software, CD-ROM material or other magnetic media, computer simulations, video, the World Wide Web (WWW) or Internet, Listservs, multi-user domains, and other technology used in distance learning or distance education.

Rural: A county population of less than 50,000 according to the United States Census Bureau.

Urban: A county population of more than 200,000 according to the United States Census Bureau.

WAN: Wide area network. A computer network that covers a broad area. This network uses routers and public communications links.

Limitations

The participants of this case study were selected from rural and urban Pennsylvania county populations. Each population is limited to the characteristics of their region—culture, religious influences, socio-economic aspects. These elements have an impact on the responses of each participant. Individual perceptions about procedures such as interview questions and survey questions may not have been perceived by all participants in the same manner. Conclusions drawn may imply with great meaning to rural and urban Pennsylvania schools, but not apply to other populations.

Delimitations

This study was focused on Pennsylvania high-school teachers in Grades 9 through 12. The results may not be generalizable to faculty members from all grade levels.

Summary

This introductory chapter is intended to show the background of technology's role in the educational paradigm. I have introduced the problem of the lack of knowledge on how technology is used and funded in rural and urban high schools throughout Pennsylvania.

Organization of the Study

Chapter 2 contains a review of the literature as it pertains to this study. Chapter 3 describes the methods used in this qualitative case study. Chapter 4 contains an analysis of the data in this case study. Chapter 5 examines the cross-case analysis between responses from rural and urban Pennsylvania high school participants. Chapter 6 is a summary of the whole study and brings suggestions and recommendations for future studies.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter focuses on the literature regarding aspects of funding for education technology. The review also examines topics such as the digital divide, the role of technology in the classroom, uses of technology in the classroom, factors affecting the teacher's use of technology, and teacher beliefs.

Budget

On December 21, 2005, the United States Senate approved a new educational budget for 2006 (United States Department of Education, 2007). This budget reflected a decrease of \$224 million in funding for the Enhancing Education Through Technology (EETT) grant program (Murray, 2007). The EETT is the primary source of federal funding for educational technology (United States Department of Education, 2006). Again in January 2006, President Bush asked Congress to cut more than \$3 billion from education in the proposed 2007 budget (Murray, 2007). Murray (2007) writes that the EETT grant has been targeted for elimination in the past two budget cycles.

In 2001, under the direction of the No Child Left Behind Act of 2001, funding was established to create the Enhancing Education Through Technology (EETT) grant program. EETT was designed with a primary goal to assist every child in crossing the

digital divide (see below) by ensuring that every student is technologically literate by the time the student finishes eighth grade (James, 2007). The grant program specifically called for teachers to receive professional development and districts to maintain an effective, educational technology infrastructure (James, 2007). According to the United States Department of Education's National Technology Plan (2004) —*Toward a Golden Age in Education* —over the past 20 years, the nation has invested hundreds of billions of dollars in education. A major portion of that funding was allocated to the purchase of infrastructure and hardware. In 1996, the Universal Service Fund for Schools and Libraries (E-Rate) was created as part of Public Law 104-104 Section 254 (Telecommunications Act, 1996). This program was established to provide discounts on the cost of telecommunications services and equipment to all public and private schools and libraries. What now sparks the decrease in federal funding toward technology progression in education? Could it be that acquiring technology for technology's sake is not enough anymore? We will continue to examine research to answer this question.

The Digital Divide

In the 1990s the "digital divide" was a catch phrase commonly used to describe the gap in technology and education (Hess & Leal, 2001). Has education today finally bridged the technology gap? If the gap truly has been closed, then why does there seem to be so much research on the influences of technology, or lack of it, in schools today (Cradler, McNabb, Freeman, & Burchett, 2002). How is technology integrated into curriculum; and with funding decreases in technology, where is the money coming from to keep the fissures filled along the way?

One source of funding for school districts still remains in the E-Rate program

(U. S. Department of Education, 2007). However, in 2004, school districts saw major changes in the process for filing and qualifying for discounts of services. While E-Rate was created to help reduce the digital divide for economic needs in rural locations, Puma, Chaplin, and Pape (2000) suggest that there remains a digital divide in access to computers and the Internet for the poor and minorities. However, this gap is beginning to narrow with the implementation of the Minority Serving Institution Digital and Wireless Technology Opportunity Act of 2007 (2007). This House amendment was established to assist eligible educational institutions in acquiring, and augmenting use of, digital and wireless networking technologies to improve the quality and delivery of educational services at such institutions. This amendment also defines as eligible institutions (a) historically Black colleges or universities, (b) a Hispanic-, Alaskan Native-, or Native Hawaiian-serving institution; (c) a tribally controlled college or university; or (d) an institution with a sufficient enrollment of needy students as defined under the Higher Education Act of 1965 (Minority Serving Institution Digital and Wireless Technology Opportunity Act of 2007, 2007).

The Goals 2000: Educate America Act (1994) gave educational technology a privileged position. Federal dollars again were disbursed via state-administered grants. In Pennsylvania this was through Governor Rendell's Project Link-to-Learn. In this federally funded program, grants were used to: improve the quality and quantity of educational technology in accordance with minimum standards and specifications developed by the department and the Office of Administration; equip schools and other entities with the appropriate networking and Internet technologies to build the Pennsylvania Education Network; provide for the training of teachers and staff in ways to

effectively integrate the technology with the curriculum; begin implementing the regional action plans that were developed as part of the shared vision and action plan project activities; and improve the quality of technology services at the State Library of Pennsylvania (Pennsylvania School Code, 2000).

According to U. S. Department of Education's (2005) *Fiscal Year 2006 Budget Summary*, many funding grants are no longer available to schools. Funding sources are dwindling while government agencies and educators still continue to place great emphasis on the need to educate students for a technology-driven workplace (Hansen, 1995; Marx, 2002). So are these funding shortages that cause the slow adoption of technology by teachers of grave concern? Many researchers have studied the phenomenon using different approaches, from case studies (Cuban, 2001; Schofield, 1995; Zhao, Pugh, Sheldon, & Byers, 2002), to historical analysis (Cuban, 1986), to large surveys (Becker, 2000a, 2000b). These studies offer different accounts for why teachers do not frequently use technology to its full potential and in relevant ways that can truly lead to qualitatively different aspects of teaching and learning (Zhao & Frank, 2003).

Cuban (2001) examines why teachers do not frequently use technology to its full potential. Cuban states several reasons for why computers are underused in the classroom. Such reasons consist of:

1. There is a disconnect of technology from the classroom. Computers tend to be isolated in computer labs.
2. There tends to be an undefined definition of computer literacy.
3. There are few required computer courses.

4. Teachers tend to use computers to do what they have always done:

communicate with parents and administrators, prepare syllabi and lectures, record grades, and assign research papers (p. 179). Due to these reasons computers tend not to be well used and seldom link to any deep change.

Schofield (1995) examined computers and classroom culture. Her conclusions are that many teachers fail to make significant instructional use of computers. While students tended to welcome use of computers, teachers displayed strong resistance due to inertia, anxiety about technology, and/or little or no perceived connection between computers and traditional curriculum goals. Another explanation for little computer use in the classroom by teachers was fear of looking uninformed, stupid, incompetent, or foolish.

Zhao et al. (2002) completed a study on what conditions influence teacher technology use. The study asked teachers why they did not integrate computers in their teaching in more meaningful ways. The authors examined a grant program in K-12 Michigan schools. Michigan teachers were awarded funds to innovate technology in their classrooms. The conclusion was that classrooms that succeeded had a teacher who was an innovator of technology use. Not only did these teachers use technology, but they understood the logistics of its uses. Knowing how to use it and knowing how it works are essential to success. Successful teachers also understood and made connections between the technology use and curriculum content being studied. Social awareness was another key to successful technology uses in the classroom. These teachers knew the social environment of the building and when the computer lab was open for use.

Battey, Kafai, and Franke (2005) suggest that "teachers' beliefs and knowledge influence all aspects of their teaching practice including the choice of appropriate

instructional problems, activities, and technologies” (as cited in Vrasidas & Glass, 2005, p. 242). However, some teachers do not use technology despite the availability (Vrasidas & Glass, 2005). The authors to *Preparing Teachers to Teach With Technology* (Vrasidas & Glass, 2005) give reasons for why teachers don’t use technology:

1. Resistance to change
2. Lack of teacher technology and pedagogical skills
3. Lack of technologies specifically designed to serve the needs of teachers and students
4. Lack of teacher support
5. Curriculum constraints
6. Education policy
7. Problems in the assessment area.

The authors go on to state that teachers who do use technology are more likely to integrate it into the classroom if they have access to adequate equipment and infrastructure. Cuban (2001) portrays the idea that technology in education will make schools more productive, improve teaching and learning, provide authentic and engaging learning experiences, and better prepare students for the workforce. Vrasidas and Glass (2005) support the ideas of Cuban, but believe that technology integration will not come to fruition until all teachers and students have their own computer, much in the same way they now have textbooks and notebooks.

One of the goals as stated in Section 2404 of the No Child Left Behind Act of 2001 (NCLB) Title II Part D Law is to assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes

the eighth grade (No Child Left Behind Act, 2001). State Educational Technology Directors Association (SETDA, 2007) addressed results of their report from all 50 states and the District of Columbia regarding NCLB's Title II Part D Enhancing Education Through Technology Program. The report indicates the following six findings:

1. States are increasingly sophisticated in their use of a range of effective professional development models designed to advance the NCLB II D program goals.
2. The type of evidence documenting the impact of NCLB II D programs in advancing the stated goals and purposes varies widely across states. Most states are conducting descriptive evaluations, and despite the lack of NCLB II D funds for this purpose, some states are conducting research studies to document the impact of NCLB II D on student learning.
3. States are setting priorities for the NCLB II D competitive grants that are evidence-based and tightly aligned to the NCLB goals.
4. States report more targeted priorities for competitive programs resulting in substantive NCLB II D programs in the academics, especially in the priority areas of literacy and mathematics. This impact is limited somewhat by federal decreases to funding in FY05.
5. NCLB II D formula grants are used for technology and infrastructure improvements at significantly higher rates than in the NCLB II D competitive grants.
6. While nationally the NCLB II D program continues to be a primary source of dedicated funding for educational technology, states share that responsibility through both dedicated and optional state-funding sources for LEA educational technology.

The SETDA *National Trends Report* (2007) finds that 4 years after the adoption of NCLB these six findings strongly indicate that technology funding from the NCLB II D program directly supports NCLB goals in four distinct ways:

1. Closing the achievement gap by providing access to software, online resources, and virtual learning aligned to academic standards for instruction and learning
2. Closing the digital divide by providing increased levels of access and robust connectivity for students in low socioeconomic status (SES) schools
3. Supporting the development of highly qualified teachers by providing online courses, communities of practice, and virtual communication that ensure flexibility and access
4. Enhancing data systems to ensure that educators can utilize real-time data to inform sound instructional decisions and ensure that states meet AYP

The results have been somewhat limited by the reduction in federal funding in Round 4 (FY05) for NCLB II D (State Educational Technology Directors Association, 2007). It is interesting to note that just as significant gains are being made in closing the digital gap, funding is cut to support such adoption.

The Role of Technology in the Classroom

Dr. Marshall's report for *Cable in Classrooms* (2002) establishes that technology can and does support learning in the classroom. Dr. Marshall explains well the history associated with technology and instructional practices. During the overview of the history of technology Marshall explains that technology-based training first came to light during World War II. Faced with the challenge of educating soldiers in a quick and efficient

manner, the Division of Visual Aid for War Training for the United States Office of Education produced sound-motion and silent-motion pictures depicting combat training exercises (Olsen & Bass, 1982). Intrigued with the success of technology training in the military, in the 1950s the Ford Foundation funded educational television (Marshall, 2002). The Federal Communications Commission established 242 channels for educational use. Today these channels still exist under the auspices of Public Broadcast Systems (Hezel, 1980). During the 1950s and 1960s Ford spent an estimated \$170 million on educational television (Gordon, 1970). However, according to Reiser (1987) these broadcasts did little more than replicate lecture-based learning. By the mid-1960s, interest in educational television decreased (Reiser, 1987). Teacher attitudes played a role in the resistance to television in the classroom (Gordon, 1970; Tyler, 1975). Gordon (1970) also identifies expense of television sets and the inability of television to meet the various conditions for student learning reasons for its failure.

Although the computer first came on the scene in 1944 with the MARK 1 at Harvard and in 1946 with the ENIAC at the University of Pennsylvania, early use of computer technology in education was mainly used in mathematics and science and engineering (Lee & Winkler, 1996). In the midst of a cold war, the National Defense Education Act of 1958 brought money and technology into American schools (Matthew, Brucoli, & Layman, 1994). In 1959, PLATO became the first large-scale project of computer use in education at the University of Illinois. The transformation of computers from research to academic occurred in 1963 at Dartmouth. John Kemeny and Thomas Kurtz developed a new computer language called BASIC which enabled students to directly interact with the computer. Until this time students stood in long lines with punch

cards for batch processing. During this same year at Stanford, Patrick Suppes and Richard Atkinson placed their mark in computer history by establishing a program of research and development on computer-assisted instruction in mathematics and reading. Their program allowed students to obtain mastery through drill-and-practice techniques. The National Science Foundation, during the late 1960s, aided in the development of 30 regional computing networks (Molnar, 1997). The Vocational Education Act of 1963 brought new money for technology in schools. President Kennedy's plea for science to develop a way to put man on the moon also strengthened the interest in computer technology. Then in 1965 the Elementary and Secondary Education Act once again provided new money for technology in schools. As a result, mainframes and minicomputers were placed in some schools for administrative purposes (Murdock, 2007). Seymour Papert began his journey to develop a new and different approach to computers in education in the early 1970s at MIT. His LOGO/LEGO software designs supported the constructivist learning theory approach. Papert believed that constructing a meaningful product enabled learning to be more effective (Molnar, 1997).

With the development of the personal computer in the early 1970s technology once again played a significant role in classroom instruction (Reiser, 1987). During the 1970s and 1980s computer software programs were developed to incorporate drill and practice lessons in the classroom (Marshall, 2002). Marshall goes on to explain that teacher resistance was met once again by the lack of teacher training for operating the computers and fear of computers taking their place in the classroom. Apple 1 PCs were donated to schools in 1975. By 1980, the TI 99, which used a television screen as a monitor, became the world's most popular PC. In 1984 the Apple Macintosh computer

was developed, and computer-based tutorials and learning games were developed for sale by commercial companies. By 1986, PC computers were used in 25% of high schools for college and career guidance, whereas Apple II and Macintosh computers were used primarily in K-8 school buildings (Marshall, 2002).

In an attempt to understand the relationship between technology and education, Apple sponsored a research project called Apple Classrooms of Tomorrow (ACOT). The purpose of the research was to examine the relationship between technology and education. Begun in the mid-1980s, two computers were given to teachers and students, one for use at school and one for use at home. Results at the end of the first year suggested that students felt better about themselves and their learning. With the use of computers in the classroom, students became more involved in collaboration. Tests scores increased as well as social skills. Teachers reported that they felt more comfortable using technology and enjoyed their work more. Technology itself had become a catalyst for change (Apple, 1995).

In 1988, laptops were developed, and 60% of all workers in the United States were using computers. Schools began using multimedia PCs in 1990 (Murdock, 2007). It was not until the 1990s that the rise of the Internet forced a clear focus on the necessity of technology in the classroom. For the first time, says Marshall (2002), teachers needed to take an active role in organizing technology-based learning over the more passive role of sitting back and letting the software entertain students.

Schools began to rewire for Internet access and install web servers in 1996. As the Internet continues to grow it has become "the world's largest database of information, graphics, and streaming video making it an invaluable resource for educators (Murdock,

2007, p. 4). According to Molnar (1997), "The world of education has changed from an orderly world of disciplines and courses to an infosphere in which communication technologies are increasingly important. This information explosion has greatly increased our understanding of the world about us" (p. 10).

So how do teachers view technology in the classroom today? Foster's (1997) research talks about how the relationship to the teacher's view of technology and their practice of integrating it into their classrooms go hand-in-hand. Foster classified the technology definitions in three categories: (a) content—technology is a subject matter in its own right, (b) method—technology is a means to add value to the subject matter at hand, and (c) process—technology is how children make sense of the world. According to the teacher's understanding of technology's role in the classroom, technology is integrated in the classroom curriculum. Teachers will make use of educational technology when they themselves believe that technology results in learning (Marshall, 2002). There simply is not a universal understanding of the concept because many teachers themselves did not grow up as a technology user (Brooks-Young, 2005).

While conducting workshops for technology planning teams Brooks-Young (2005) asked for examples of technology-supported instruction in the participants' classrooms. Examples were focused on students using technology to do things that they normally could have done without technology. For instance, students were using the computer to make posters for a science fair project, search online for a library book, take an online quiz after reading a book, or play educational games. Brooks-Young explained to her audience that doing the same old thing a little faster or a little more efficient isn't going to change academic outcomes.

For many teachers, technology has been integrated when a lesson has been created using technology in a teacher-directed manner. What about the student-directed lessons? Jonassen, Peck, and Wilson (1999) write that meaningful technology integration is defined generally as curricula, utilizing authentic tasks, which intentionally and actively promote students to process information to construct meaning. Jonassen et al. go on to say that factors indicating meaningful technology uses in schools include: technology influences upon teachers, instructional methodology, school culture, and staff development. However, research suggests that most professional development programs related to technology do not achieve long-term effects (Chen & Chang, 2006) without continued staff development, technical assistance, and common planning times (Cradler & Bridgforth, 1996).

Most technology initiatives tend to focus on hardware or software issues (United States Congress, 1995). So what is the role of the educator to which digital content is integrated? Is the classroom, teacher-directed, student-directed, or both? In order to answer these questions, we must first examine what the understanding and use of digital content is to the educator.

According to Levin, Arafah, Lenhart, and Rainie (2002), despite the availability of computers with Internet access in schools, the use of digital tools by students is more home-based than school-based. The report *The Digital Disconnect* (Levin et al., 2002) also states that many schools and teachers have not recognized the ways in which students communicate and access information over the Internet. Teens in the PEW Internet and American Life Project survey (Lenhart, Rainie, & Lewis, 2001) relay that

the Internet has replaced the library as their primary tool for research. In the study only 11% of teens say that the school provides them with their primary source of Internet.

While at home, teens are logged onto the Web and multi-tasking. It was not uncommon for the teens in this study to be simultaneously e-mailing, instant messaging, surfing the Web, talking on the telephone, and doing homework (Lenhart, Rainie, & Lewis, 2001). If students are coming to school with different expectations, skills, and knowledge than offered through traditional curriculum, what will bridge the digital divide for them (Levin et al., 2002)? Perhaps a technological understanding of how technology is integrated into the classroom will facilitate an avenue for teachers to begin closing the gap.

Uses of Technology in the Classroom

Through the years as education has evolved, the methods of teaching children have evolved along with it (Carvin, 2000). As technology continues to be focused in education, governmental agencies as well as the general public begin to examine closely the methods of instruction used in public schools. A paperless classroom is one method that is growing in all areas of classroom instruction including lectures, homework, quizzes, and examinations (Jadali, 1999). Some teachers have gone as far as to trade in textbooks for online materials. Yet others use technology in the more traditional teacher-centered ways (Unites States Congress, 1995). However used, the method of presentation is what seems to be the focus of education today. It seems as if attention is being placed on emphasizing the need for active learning over passive learning (McManus, 2001). McManus (2001) describes two paradigms of education. The first is teaching-centered and the second is learning-centered. In the teaching-centered paradigm

passive learning is taking place. The teacher tends to be at the center of instruction, transferring information to students. The learner accumulates knowledge and is tested frequently on knowledge of content. This type of learning is thought to be impersonal. There is little interaction between instructor and students or among students. The classroom environment is competitive and individualistic. Teaching is a routine activity where students are expected to be self-motivated and need only to complete the requirements for the course.

The learning-centered paradigm displays an active learning process. The instructor and student are partners. Learning is a dynamic process of teamwork. The student develops skills in constructing and using knowledge with the instructor's guidance. The classroom environment is collaborative, cooperative, and supportive of learner risk-taking. Students are assessed on what they can do with the knowledge. Learning is personal, allowing the instructor to use student interests, backgrounds, and needs to select content and establish a learning environment. Students learn how to set goals, establish plans to achieve goals, and record progress. Students develop skills for lifelong learning. Teaching is complex and requires training (McManus, 2001, pp. 3, 4).

As stated earlier, millions of dollars have been given to school districts via the Universal Service Fund allowing teachers and students to experience technology first hand. In fact, the E-Rate program has provided America's schools with more than \$3 billion to help bring technology into the educational system (Riley, 2000). The International Society for Technology in Education as well as the International Technology Education Association has provided a guideline of standards for technology use in schools (International Society for Technology in Education [ISTE], 2000;

International Technology Education Association [ITEA], 2000). ISTE's philosophy states that technology is essential to school transformation and future opportunities for 21st-century learners around the globe. Learning is no longer constrained by or confined to a classroom (ISTE, 2006-2007). Their latest report on National Educational Technology Standards focuses on skills and expertise and less on tools. The new standards for students address creativity and innovation, communication and collaboration, research and information fluency, critical thinking, problem solving and decision-making, digital citizenship, and technology operations and concepts (ISTE, 2006-2007).

ITEA, International Technology Education Association, is the professional organization for technology, innovation, design, and engineering educators. ITEA's mission is to promote technological literacy for all by supporting the teaching of technology and promoting the professionalism of those engaged in this pursuit. ITEA strengthens the profession through leadership, professional development, membership services, publications, and classroom activities (ITEA, 1999).

One example of how powerful technology can be is the use of wired or wireless handheld devices in classrooms for instantaneous feedback from students (Advancing K-12 Technology Leadership, 2007). This form of technology not only enhances the material to be learned, but improves student learning and teacher effectiveness (Lowery, 2005). Lowery (2005) suggests that response systems also allow for a visual and engaged approach to learning. Each response system works with a spreadsheet and/or PowerPoint presentation depicting graphs, charts, graded-question responses, and polling questionnaires. Another benefit is that less class time is used for students to copy notes,

as a PowerPoint presentation can be printed in outline format for all students (Jadali, 1999). This information delivery system also allows for immediate evaluation of students by the teacher (Lowery, 2005).

Still another benefit is that the use of technology enhances the studies of brain-based learning (Ziegenfuss, Drake, Brown, & Warnke, 2005). Brain-based learning addresses the theory that students learn in accordance to their brain. A left-brain learner prefers to learn in a step-by-step sequential format, beginning with details leading to a conceptual understanding of a skill. A right-brain learner prefers to learn beginning with the general concept and then going on to specifics (Freedman, 2000). It has been thought that classrooms of old tend to teach mainly to the left-brained student (Mitchell, 2006). Allowing for the use of technology versus a more traditional drill-and-skill environment benefits both the left- and right-brained learners. Technology seems to be a way of doing so because it allows students to interact with learning (Freed & Parsons, 1997).

Cooper and Journell (1999) write about using technology labs as dynamic learning centers. They talk about how teachers and students make great use of the idea that has been made available to them. The article also addresses the idea that when a classroom is set up with module computer learning labs, students are allowed to be actively involved in learning.

Classroom organization helps to promote learning as well (Cotton, 1988). Being involved in learning tends to develop social skills, bolster self-esteem, acquire new problem-solving strategies, and allow for students to be accountable for their own work (Haertel, et al., 1998). They also suggest that a child's learning is influenced most by his or her psychological characteristics and the features of his or her home and classroom.

This idea supports the statement that students' uses of digital tools are more often home-based than school-based. It shows the necessity to close the gap between the two environments. Technology can empower students to take charge of their emotional and educational needs (Haertel et al., 1998).

Once again ACOT findings shed some light on technology use in the classroom.

Early on, we found that with powerful, multipurpose tools and a learning environment that balances the appropriate use of direct instruction with a collaborative, inquiry-driven, knowledge-construction approach, students can achieve far beyond today's expectations. We also discovered that teachers are the key to creating such learning environments. And we found that they need broad administrative support both to create these environments and to sustain them. (Apple, 1995, p. 14)

Factors Affecting Teachers' Use of Technology

Technology has been a driving force in both government and private sectors of business. Ndahi and Gupta (2000) believe that employers in today's workplace seek computer literacy in almost everyone they hire. They also believe that if an applicant does not have computer skills, they are seriously disadvantaged at either obtaining a job or qualifying for a promotion. Education enables students to be successful, productive citizens. There is a belief that technology in school enhances student success (Dede, 2000; Haertel & Means, 2003; Kozma, 2003). So where does all this leave us today? Are teachers using technology in the classroom to enhance student learning? One researcher examines both questions. Creighton (2000) believes that the computer can be the ideal educational tool. On the other hand, she also believes that while teachers are using computers to research and prepare their own lessons, create handouts and examinations, and record grades, they are not integrating technology into the classroom instruction. One reason stated in Creighton's (2000) study is that teachers themselves

lack the prior experience in using computers for more than word processing. They are digital immigrants while students are digital natives (Prensky, 2001). Foster (1997) points out that when teachers lack experience themselves, they tend to be overwhelmed with the time needed to get themselves to a comfort level. This in return leads teachers to ignore the possibilities of using technology as a form of instruction. Other concerns of teachers were that they had limited access to equipment such as software and hardware, limited administrative support, limited time to use technology in the curriculum, lack of knowledge as how to effectively integrate the use of technology in the classroom, and limited training in using technology (Creighton, 2000).

According to Golden (2004), "the challenge is about helping all stakeholders use technology to transform the culture of education to enhance student performance" (p. 1). In his article "Technology's Potential, Promise for Enhancing Student Learning," Golden (2004) states that in order to accomplish this challenge "leaders must become comfortable and familiar with the technology and the benefits it provides" (p. 1).

Teacher Beliefs

In another study, Chin and Hortin (1993) surveyed elementary teachers on their use of technology. The study showed that 50% of teachers used technology less than 30 minutes in a school day. Furthermore, the study showed that for the teachers who used computers in the classroom, the average use was 2.6 hours per month. Chin and Hortin's belief from this study is that teachers teach as they were taught. According to the United States Department of Education only 20% of full-time teachers report feeling prepared to integrate educational technology into their classroom curriculum (Lewis et al., 1999). Digital immigrants (teachers) perceive technology as a tool to connect students to the

world. Digital natives (students) view technology as their world. If this is true, then how is technology integrated into curriculum in education today? Current research on learning suggests that the real power of technology in the classroom is embedded in its potential to facilitate basic change in the way teaching and learning occurs in the classroom (Mills, 2004).

To prepare technology-proficient teachers for today's classrooms, teacher preparation programs must provide faculty with the technology skills and equipment to effectively model the use of technology (Whittier & Lara, 2003). This study was intended to examine ways in which technology is being integrated in curriculum, and the funding sources that promote that process.

In addition to examining technology's role in education, this case study also explored the idea of several contemporary theories of learning: Bruner's discovery learning, Vygotsky's constructivist theory, Carroll's minimalist theory, and their relevancy to this study.

Bruner's, Vygotsky's, and Carroll's theories build upon each other in the respect that each displays in some form social learning theory. The Minimalist theory of J.M. Carroll (1990) is a framework for the design of instruction, especially training materials for computer users. The theory suggests that (a) all learning tasks should be meaningful and self-contained activities, (b) learners should be given realistic projects as quickly as possible, (c) instruction should permit self-directed reasoning and improvising by increasing the number of active learning activities, (d) training materials and activities should provide for error recognition and recovery and, (e) there should be a close linkage between the training and actual system (Carroll, 1990).

Jonassen et al. (1999) believe that constructivism is a fairly new concept when applied to educational technology. In their book *Learning With Technology* (1999), the authors examine how computers are used to engage learners in socially co-constructed meaning-making. They take the concept one step further to say that technology is not just a tool to learn from. Instead, it is a tool to learn with. According to Bruner's discovery learning theory, students should be presented with perplexing situations. Bruner also believes that when guided by intrinsic motivation, the learner in this situation will want to figure out the solution (Bruner, 1967). Bruner's constructivist theory suggests that learning is an active process in which learners construct new ideas based upon their current knowledge. One key element is that the learners can build upon prior knowledge to discover key principles by themselves. Carroll's Minimalist theory (1990) focuses on the advice that course designers must minimize instructional materials that obstruct learning and focus the design on activities that support learner-directed activity. With this minimized approach the learner is allowed to fill in the gaps themselves.

A debate seems to exist in the educational realm as to just how much a teacher should help a student and how much a student should help himself (Snelbecker, 1974). Through the use of technology students are afforded opportunities for self-help at a multitude of levels.

Summary

This chapter provided research related to technology integration into education, including overview of teachers and technology, and barriers to technology integration. Topics examined through literature review included educational technology funding, digital divide on technology use, the role technology plays in the classroom, instructional

uses of technology in the classroom setting, factors that affect teacher use of technology for instruction, and the impact teacher beliefs have on the integration of technology in curriculum.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter provides an overview of the qualitative case-study approach used in this study. Patton (2002) defines the purpose of a case study as describing one or more cases in-depth and addressing the research questions and issues. In qualitative research, the researcher interacts with those he or she studies and tries to minimize the distance between him- or herself and those being researched (Creswell, 1994, 1998). Qualitative research manifests an interest in understanding how people make sense of their world and the experiences they have in the world. It strives for a depth of understanding as an end in itself, not as an attempt to predict what may happen in the future (Patton, 1985). The qualitative case-study approach was most appropriate for this study as it aligns itself with the philosophy of several learning theories as defined earlier. By concentrating on just two research questions I believe I was able to focus on the interaction between teacher and technology uses and available funding sources.

The first part of the chapter describes the participants for this qualitative case study, how participants were selected, and the manner in which data were collected. Instrumentation of measure and data collection is also explained in this chapter. The last part of this chapter explains data analysis.

Participants

Purposive sampling was the methodology used for selecting participants in this study, as Patton (1990) suggests that it seeks information-rich cases which can be studied in depth. The subjects in this case study consisted of high-school teachers in Grades 9 through 12, principals, curriculum coordinators, and, when possible, technology directors of each participating Pennsylvania high school. Based upon county populations, reflected in the U. S. Census Bureau (2000), one high school was classified as rural and one high school was classified as urban. Populations were determined by using the Pennsylvania Bureau of Census county population chart (U.S. Census Bureau, 2000). The rural high school was classified as having a county population of less than 50,000, while the urban high school was classified as having a county population of more than 200,000. This case study took place at each of the purposively selected high schools. Purposive sampling was also used to determine which high-school English, social studies, science, and math teachers were chosen for this case study. Teacher participants consisted of three male and one female from each urban and rural high school. Teachers' experience ranged from second-year teachers to veteran teachers with more than 30 years of experience. Every teacher had access to a computer in their classroom, but experience varied considerably. Professionally, computer use ranged from meaningful integration into classroom curriculum, to a system that sat quietly in the classroom corner. Computer ability was decisive by a direct line between urban and rural high-school teachers. It was clearly evident that urban teachers were advanced at integration of technology in the classroom. This case study made use of a focus-group research model to facilitate an

organized discussion with a group of individuals selected because they were believed to represent the criteria for each rural and urban high school.

Instrumentation

Qualitative research is an inquiry process in a natural setting where the researcher is an instrument of data collection that explores a social or human problem (Creswell, 1998). Stake (1995) and Yin (1994) identified six sources of evidence in case study. These sources include (a) documents, (b) archival records, (c) interviews, (d) direct observations, (e) participant-observation, and (f) physical artifacts.

Instrumentation for this case study consisted of a variety of techniques that includes focus-group interview questions, direct observations, and open-ended survey questionnaires (Appendices A & B). By incorporating a variety of data collection methods, triangulation was utilized to ensure the credibility of the information accumulated (Cohen & Manion, 1994). In order to obtain data I developed a primary source questionnaire based on how-and-why questions (Yin, 1994), adapted from Christensen (1998). According to Yin (1994), interviews are one of the most important sources of case-study information. Before I could begin data collection, however, I submitted all written forms of communication with participants to the Internal Review Board at Andrews University. The role of the Internal Review Board (IRB) is to review and approve all research protocols, including surveys and all other data-collecting instruments. This process is designed to protect the rights and welfare of human participants by selecting them equitably, obtaining informed consent, minimizing risks, and ensuring privacy and confidentiality. The IRB examined my introduction letter to administrators and participants as well as my interview questions and open-ended survey

questionnaires with the intent to make sure I had accomplished all elements of human privacy and confidentiality, equitability, consent, and to ensure minimal risk for each participant.

During the open-ended interviews, key respondents were asked to comment about certain events. I was particularly careful to ask the same questions to all participants in order to corroborate validity (Yin, 1994). Direct observations took place on 1-day site visits per school. During direct observations I collected data on casual activities and formal protocols. Open-ended survey questions were given to purposively selected teachers to gain baseline data on the subjects. Participants were asked (a) how they use technology, (b) how they define technology integration, (c) what motivates them to incorporate technology in the curriculum, and (d) what funding sources were available to purchase or sustain technology in the district.

Data Collection

By incorporating a variety of data collection methods (Appendices A & B), triangulation assisted in ensuring the complete understanding of the collected data as well as ensured validity. Yin (1994) believes that each case-study investigator should require the following basic skills:

1. Ask good questions and interpret answers.
2. Be a good "listener" – avoid preconceptions.
3. Be adaptive and flexible.
4. Have a firm grasp of the issues being studied.
5. Be unbiased by preconceived notions.

He also emphasized that a case-study investigator must be able to operate as a senior investigator during the course of the data collection (Yin, 1994). In order to achieve this goal I created a protocol prior to data collection. The protocol allowed me to keep consistent with every participant in this study.

Permission to conduct this case study was obtained prior to the visits. An introduction letter and return-addressed stamped envelope was sent to the principal of each targeted high-school, along with a consent form to be signed and returned before the site visits were conducted. Before each 1-day site visit occurred, I met with each high-school principal to purposely select four high-school teachers—one from each discipline area—math, science, social studies, and English. Each purposively selected participant received an introduction letter with a return addressed stamped envelope. Each letter described the purpose of this case study, participant involvement, why participants were selected, and a consent form. Participants were also given the opportunity to decline participation in this study. An open-ended survey was also included with the introduction letter. The open-ended survey was intended to give myself a knowledge base of each teacher's technological background. Anonymity and confidentiality were also discussed with each participant prior to the start of this study. No teachers were unwilling to participate in this study. However, one teacher did not meet the criteria for years of teaching experience. The pre-established criteria stated that each high-school teacher would have at least 3 years of teaching experience. On January 17, 2007, I conducted the site visit at the rural Pennsylvania high school. On February 26, 2007, I conducted the site visit at the urban Pennsylvania high school. During each 1-day site visit I first conducted direct-observations in each participant's classroom. After observations were

complete I then conducted face-to-face interviews (Creswell, 1994) with the participants. I gave them additional contact information so that they could contact me if they thought of any other relevant information to the study. Each participant also gave contact information so that I could contact them in the future if I needed additional information for clarification.

In addition to interviews with the participants, interviews were also conducted with the administrators of each high school. These face-to-face interviews were conducted in the respective offices. Data collected were used to determine the overall climate and philosophy of how administration viewed meaningful technology integration.

All data collected were analyzed at a later date. Participants are anonymous and have the opportunity to share in the results of this case study. In order to keep participants anonymous, I coded each participant's information. All rural high-school teachers were coded with an R followed by an A, B, C, or D. All urban high-school teachers were coded with a U followed by an A, B, C, or D. No names were associated with data. Signed consent forms were placed in a secure location away from other forms of data.

Data Analysis

The data analysis approach used for this study was question-by-question analysis that shed light on the case study (Patton, 2002). Focus-group interviews, direct-observations, and open-ended surveys with faculty, curriculum coordinators, principals, and, when available, technology directors were the source of data for this case study. "The infusion of technology in teacher education is a rapidly evolving field. Technologies are changing continually within a 16 to 24 month life cycle" (Herman,

2002, p. 37). These changes make it difficult to isolate events and examine independent and dependent variables. With this in mind, an analytical approach to this case study may be inappropriate. Scholars and researchers (Creswell, 1998) support the qualitative research approach for this type of study.

A qualitative approach allowed me to actually see first-hand how technology was being used in each classroom setting. Methodology triangulation was used for gathering data to explore the issue of technology perception in rural and urban Pennsylvania high schools. For this case study, triangulation refers to the use of more than one approach to the investigation of the research questions. Triangulation not only helps ensure validity, but also ensures a complete understanding of participants' responses. Triangulation also allowed for comparing and cross-checking the consistency of information gathered at different times, by different approaches, and from different people.

An in-depth discussion of contents, themes, issues, and implications yielded a rich description of the case. Data were organized in table form. From these tables information was easily sorted and reviewed. Information obtained from data collection was coded to protect participants' identities. Analysis of each table yielded general themes. Themes were coded as they emerged.

Because the researcher is the instrument of a qualitative study, the report must include information about the researcher (Patton, 1990).

Role of Researcher

This case study involved the investigation of how technology is used in rural and urban Pennsylvania high schools. It also examined how technology funding is acquired. As observer-researcher, I observed, recorded, and interpreted the efforts, attitudes, and

oral and written comments of participants as they defined and adapted strategies in response to technology integration in the classroom. Interviews with participants offered me valuable insight into the perceptions of technology uses and funding sources available to each district.

Unlike a quantitative study where statistical sampling procedures occur to make generalization about the nature of the study, qualitative case studies do not lend themselves to such procedures. Therefore generalization is often difficult to represent in case-study findings (Silverman, 2000). I do not intend to generalize the findings in this case study to other populations.

Background of the Researcher

As researcher, I brought an unconscious bias to the study. As the Technology Director for a rural Pennsylvania school district, I am aware of current trends and attitudes in technology integration in the classroom. I am equally aware of funding sources available to public high schools. With this in mind I made a conscious effort not to directly influence any participant. The use of triangulation—multiple data collection—aided in the compensation for any potential researcher bias (Herman, 2002).

CHAPTER FOUR

RESULTS

This case study was conducted to develop an understanding of the types of technologies used in both rural and urban high-school classrooms and the purpose each represents. The study also addressed the aspect of funding for such technology uses. Results of this study indicate that technology use, as well as funding sources, differed between the rural and the urban school districts studied. Data were collected during the 2006-2007 school year from site visits at two public high schools in the state of Pennsylvania. Observations gave me a general picture of how technology was being used in each classroom in a natural setting. Survey questions gave the participants an opportunity to respond to prescribed, uniform questions. Open-ended interview questions allowed the participants to speak freely on the topic of technology uses and funding.

The chapter begins with demographics of the study participants, including an overview of how each teacher was selected for this study. The participants of the study were chosen by both population (rural county population less than 50,000, urban county population greater than 200,000) and purposive sampling (based on number of years integrating technology into the content areas). Next, collected data from observations, survey questions, and interview questions are presented. Subsequently, answers to the two research questions for this study are examined. Data from School R, the rural high

school, are presented first, followed by data from School U, the urban high school. The chapter concludes with a summary of the results of this study.

Description of Participants

Data collected from focus group sessions, interviews, surveys, and questionnaires were used to generate descriptive statistics about the sample. The data described participants' gender, age, and experience, and provided information on which teachers have a computer at home. Of the eight teachers who participated in the focus groups from both high schools, 75% were male and 25% were female.

I contacted the Pennsylvania Department of Education, Office of Information and Educational Technology, about school districts that may meet the criteria for this study. He gave me a contact name for what became School U, the urban high school. Information from the Pennsylvania Census Bureau (2004) was obtained to gain knowledge on population. School R, the rural high school, was recorded as having a county population of 41,157. School U, the urban high school, was recorded as having a county population of 1,448,394. Both high schools are classified as public high schools.

Once the schools were selected, I contacted each representing school administrator via an e-mail and letter of introduction. Each administrator granted permission for research to be conducted at his or her high school. Several e-mails followed as dates and times were set up to conduct site visitations. The administrator from each school was asked to purposively select teacher participants from each core subject area—math, science, social studies, and English—based on the number of years integrating technology into the curriculum. However, due to the nature of School U, the urban high school, one teacher was selected to participate in the study who did not meet

the 3-year teaching requirement. School U, the urban high school, had only one English teacher in the building. This English teacher was in his second year of teaching. However, his ability to integrate technology into the classroom portrayed him more as a veteran teacher than a new teacher.

School R, Rural High School

Administrative Focus Group—School R

After completing the classroom observations, I met with members of the administrative focus group. These individuals consisted of the administrator, Superintendent, and technology coordinator. Due to the rural nature of this school, the senior administrator in the building was the Superintendent of the district. Therefore, he participated as the administrator of the high school. The technology coordinator was also the assistant principal and the curriculum coordinator.

Administrative Focus Group Interview Question 1

When asked what drives his decision to implement technology use in the district, the Superintendent replied, "I know it is the wave of the future. Students must learn technology to survive in the world today."

The technology coordinator's response was, "We look at several factors prior to implementing new technology. The primary factor taken into account is addressing identified needs. Other factors taken into account are ease of use, ease of implementation, interoperability with existing technology, and cost."

Administrative Focus Group Interview

Question 2

During the discussion on what determines the objectives for technology uses in your district, the Superintendent answered, "Money is the driving force." He then added, "Also teachers' knowledge and desire of what is available and how it can help students learn."

The response from the technology coordinator was,

The objectives are determined by the needs. For example, we have identified the need to improve communications within and between the school and community. Particularly, we want to communicate regularly, efficiently and effectively with parents about their child's progress. That need led to the implementation of Edline; a web hosting and portal solution, for facilitating that communication. The objectives were to have the technology in place and operating by the beginning of the school year, to train staff in its use, to train parents in its use, and have teachers update weekly.

Administrative Focus Group Interview

Question 3

Whether demographics play a role in technology use in the district was the next question asked of the pair. The Superintendent said that he did not think demographics play much of a role. He followed up by stating,

We would do the same thing; strive to use technology to the fullest, even if we weren't so rural. However, it does have a positive impact on reaching the outside world. It enlightens all of us – students, teachers, and community – as to the possibilities.

The technology coordinator's thought was that yes, they do play a role. Their rural location means that they sometimes do not have access to some technologies. An example would be cell phones, paging, and broadband internet. Other times technologies are not available due to the small numbers. For example, in larger schools it is common to have video production capabilities because there are numbers to support it. Their

small numbers prevent it; there just isn't enough demand. Living in a rural area also means they have to travel to learn about new technologies. It is rare for a salesperson to visit their location to show them new technology.

Administrative Focus Group Interview

Question 4

The Superintendent responded to the question, What purpose does technology integration have in your district methodology? with, "We encourage technology use to enhance student learning. We also analyze student results on tests such as, 4 Sight, PSSA and other particular areas of concern. We are looking at and learning how to do video conferencing and taking virtual field trips."

The technology coordinator responded with, "The purpose of technology integration is to make things simpler, quicker, or easier. It also improves student understanding. Technology allows you to do things that would be too costly or time consuming otherwise." He then added some examples by saying,

Using an electronic grade book makes it possible to give students weekly progress reports that would have been too time consuming otherwise. Using the Internet allows me to access information that I would have had to get previously by traveling many miles to find a well equipped library; and using simple tools like Word, Excel, Access, and PowerPoint, it is possible to analyze large volumes of information and present it in a simple form.

Administrative Focus Group Interview

Question 5

When talking about funding sources used to integrate technology, the Superintendent commented on the fact that they do receive some Federal Programs, as well as State initiatives, from time to time, to offset the cost of technology purchasing. They also apply for independent grants that allow the purchasing of technology products.

Information on funding opportunities is usually obtained through e-mails, or U.S. Postal Service. In addition, their local Intermediate Unit does a good job on getting technology-related information for them. The Superintendent also shared that today's classroom must use technology for efficiency of delivery and for showing the students what is available. His belief is that students are actually growing up with technology and will not accept the old ways of learning. Personally he uses the computer daily. His teachers are encouraged to use all technology: video conferencing, which is new this year; Edline software, to interact with parents and students, and to analyze PSSA scores and anchors not achieved by the students. Websites that help students learn are also promoted by the Administration. The Superintendent firmly believes that technology is a major push in his district.

The technology coordinator added that funding sources include numerous grants through PDE, E-Rate, and local support. This district currently receives grant funds through the E-Fund Grant obtained by their Intermediate Unit. This money has helped them upgrade their Intranet access to a 100 MGPS, and create a regional WAN. It has also given them access to Internet2 and provided equipment for video conferencing, as well as teacher training. They are able to leverage E-Fund money with E-Rate funds to provide 4MBPS Internet access for a cost to the school of less than \$500 per month. Unfortunately, the amount of funding available in grants has dropped considerably in the past few years. The school competed last year, unsuccessfully, for the Classrooms of the Future Grant. In addition, they budget significant levels of local support for purchasing new technology, as well as replacing outdated equipment.

Tables 1-6 depict demographic information given by each rural school teacher. Table 1 depicts the number of years each rural teacher has taught in a public high-school setting. Requirements for participation in this study were to have taught in a high-school setting for at least 3 years. When asked about the number of years they have been teaching, three participants had been teaching less than 10 years while only one teacher had taught more than 11 years.

Table 2 depicts how rural teachers are experiencing computer use in their classrooms. When asked to rate their experience with computers, only one teacher used their computer for e-mail and grades. The other three participants used their computers for additional uses.

Table 3 depicts the frequency of computer use by each rural teacher in this study for instruction in each classroom. When asked how often respondents use computers for instruction, half of the participants responded that they used their computer for daily or weekly instruction. The other half just occasionally used their computers for instruction.

When asked how many hours per week they used computers at the beginning of the school year, respondent A answered less than 3 hours. Respondent B answered 4 hours. Respondent C answered 10 hours, and respondent D answered 15 hours.

When asked how many hours per week they used computers at the beginning of the school year, only one participant responded to less than 3 hours, one participant responded to 4 hours, one participant responded to 10 hours, and one participant responded to working with computers 15 hours a week at the beginning of the school year.

Table 1

Years of Teaching in School R – Rural High School

Years of teaching	<i>f</i>	%
3-5 years	1	25.0
6-8 years	2	50.0
9-11 years	0	0.0
11+ years	1	25.0
Total	4	100.0

Table 2

Computer Use in School R – Rural High School

Computer experience	<i>f</i>	%
Computers for e-mail/grades	1	25.0
Applications MS Word	1	25.0
Computers for classroom instruction	0	0.0
Both e-mails/grades and applications	2	50.0
Total	4	100.0

Table 3

Computer for Instruction in School R – Rural High School

Computers for instruction	<i>f</i>	%
Daily	1	25.0
Weekly	1	25.0
Occasionally	2	50.0
Total	4	100.0

When asked how many hours per week they currently use computers now, respondent A answered 3 hours. Respondent B answered 5 hours. Respondent C answered 10 hours, and the last respondent, D, answered 15 hours.

When asked how many hours per week they currently use computers now, one participant responded to currently using the computer for 3 hours, one participant responded to currently using the computer for 5 hours, one participant responded to currently using the computer for 10 hours, and one participant responded to currently using the computer for 15 hours per week.

Table 4 depicts the types of training each rural teacher in this study has received prior to this study. When asked what type of technology training they received, participant responses varied between only one receiving training for basic computer literacy, two participants received training for basic computer literacy and computer applications, and only one participant received training for basic computer literacy and computer integration.

Table 4

Computer Training Received in School R – Rural High School

Computer training	<i>f</i>	%
Basic Computer Literacy	1	25.0
Computer Applications	0	0.0
Computer Integration	0	0.0
Basic Literacy and Applications	2	50.0
Basic Literacy and Integration	1	25.0
Applications and Integration	0	0.0
Basic Literacy, Applications, and Integration	0	0.0
Total	4	100.0

Table 5 illustrates the location of computer training received by each rural teacher in this study.

When asked where they received training, it is interesting to note that not one participant thought of themselves as self-taught only. One participant received training at a college or university, while the other two participants were both self-taught and received training at either the school district or a college or university.

Of participants in the sample of rural teachers, 100% said they have a computer at home. This percentage is above the national average, which states that 50% of all U. S. homes have a personal computer, according to a 1998 study by market research company Computer Intelligence.

When asked if they had a computer at home, all four participants responded yes, they do have a computer at home.

Table 5

Location of Training Received in School R – Rural High School

Location of training	<i>f</i>	%
Self-taught	0	0.0
School district	0	0.0
College or university	1	25.0
Other (1, 2, 3)	1	25.0
Self-taught and school district	1	25.0
Self-taught and college/university	1	25.0
School district and college/university	0	0.0
Total	4	100.0

The next background question asked participants to identify if they were male or female. Three participants were male and one participant was female.

Table 6 illustrates the age of each rural participant in this study. When asked about their age bracket, two participants responded 36-40 years, while the remaining two participants responded that they were over the age of 41 years.

Observations of the Rural School District Teachers

The first site visit was conducted at School R, rural high school. Upon arrival at the school, I met with the administrator to discuss the process of the visit. Teachers were identified as purposively selected participants, and a schedule was created to obtain data.

The first teacher observation took place in a computer lab. The course was an eighth-grade English class. The physical arrangement of the room was a traditional size classroom with a whiteboard mounted on the wall. Computers were placed against two side walls making an L-shape, with a double row of computers facing each other in the

Table 6

Age of Participants in School R – Rural High School

Age of participant	<i>f</i>	%
20-25 years	0	0.0
26-30 years	0	0.0
31-35 years	0	0.0
36-40 years	2	50.0
41-45 years	1	25.0
46+ years	1	25.0
Total	4	100.0

middle of the room. There were 19 computers in the room. Five computers could not log into the network, therefore for the students at those outlets the Internet was not available, nor were those students able to save their work in a network folder. Each computer's operating system was Windows 98. A pile of computers was stacked in the corner awaiting a technician's repair. One disconnected smartboard was placed against the back wall in the lab. Two television sets and one VCR also occupied the room.

Students were working on rough drafts of a persuasive essay. They were using Writers Workshop to help them develop their topics. Once students' rough drafts were finished, a peer student read the article, handwrote feedback, and returned it to the author. All essays were typed in Microsoft Word. Several students shared the use of a computer, as there were not enough computers for individual student use. The teacher roamed the room assisting in editing, and was often needed to troubleshoot computers to keep them in working condition for the students. Several students had to change computers in the middle of their work, as their computer would not accomplish the task at hand.

The second teacher observation took place in the computer lab as well. The course was a ninth-grade social studies class. Again students were sharing computers, as there were not enough computers for every student. Even though there were only 15 students in the class, only 10 computers were now in working condition. The teacher used the Internet to obtain information from virtualclassroom.net. Students were assigned to examine photos of the Battle of Gettysburg, with the intent of gathering information about the battle. Internet sites were predetermined by the teacher. The objective was for students to write a report, create a poster, and then orally present their

research findings to the class. The teacher acted as a resource, walking around the room prodding students with such questions as:

1. What can you tell me about the battle from this photo?
2. Why do you think the horses' bellies are so swollen?
3. When do you think this photo was taken?

Each student handwrote the web address of certain photos and any notes they might need to depict their research. Students could not print information, as the only lab printer was also in need of repair. A homework assignment was given to the students to find three photos that exemplified what the Civil War was about and to write a response to each photo. The teacher then explained to the students that the next day they would again meet in the computer lab for class to examine an interactive map. The objective would be to compare and contrast a map of their county with a map of a county in Virginia.

The third teacher observation took place in a traditional math classroom with 12th-grade students. The physical room was arranged with desks in straight rows, all facing the front of the classroom, which had a whiteboard mounted on the wall. In the corner, to the right, was a teacher computer running Windows XP, and the only school-owned video projector. Instead of the traditional lesson, the teacher had students pull their chairs into a circle formation and talk openly to me on the uses of technology at school. Students explained that in math class they use graphing calculators, which were newly purchased last year. They also use United Streaming Video to go over math concepts from a more in-depth view. One student shared that the school has its own website created and maintained by students. The website was designed as a business-

class project. Another student shared that they have one paper per month to write during their senior year. Most students handwrite their papers. The last student explained that he rarely has the opportunity to work with computers at school. If he does get time to go to the computer lab, often there is not a computer available that works. He does not own a computer at home.

The last teacher observation took place in the traditional science lab. There were hundreds of science-oriented VHS videos lined up against the front wall. A television, VCR, and teacher computer were in the room. Student desks were lined up in straight rows in half of the room, while laboratory sinks and supplies occupied the other half of the room. Students were taking a test; therefore, I had the opportunity to talk to the teacher one-on-one. When asked what types of technology he uses in the classroom, his answers were as follows:

I use videos to show students things about science that I cannot explain in just words. This allows them to experience the topic for themselves. We also use a GIS, Geographical Information Systems, program that allows us to do stream investigations. This tool helps students investigate fresh stream ecology and how GIS is used in environmental science investigations. It also allows students to create maps, analyze spatial and temporal trends, and explore real-world questions at local, regional, and global scales.

Survey Questions--School R

To gain a descriptive understanding of what technologies are being used in the classroom, 15 survey questions were used. Table 7 illustrates participant responses to survey questions in School R, a rural Pennsylvania high school.

Background information is needed on the rural high-school classroom setting to better understand participant responses. The classroom setting is traditional in the respect

Table 7

Participant Responses to Survey Questions in School R—Rural Pennsylvania High School

Survey question	Never	5 or fewer	6 to 9	10 or more
1. How many time this school year have you used a chalkboard?	2	0	0	2
2. How many times this school year have you used a whiteboard?	0	1	0	3
3. How many times this school year have you used a smartboard?	0	0	0	4
4. How many times this school year have you used overhead transparencies?	1	2	1	0
5. How many times this school year have you used video projectors?	1	1	0	2
6. How many times this school year have you used videotape players?	1	0	2	1
7. How many times this school year have you used audio players/recorders?	3	1	0	0
8. How many times this school year have you used video cameras?	3	1	0	0
9. How many time this school year have you used e-mail communication with students for instruction?	2	0	1	1
10. How many times this school year have you used listserv or online discussion forums?	4	0	0	0
11. How many times this school year have you assigned tasks such as: hotlists, treasure hunts, or WebQuests requiring computer technology?	2	1	1	0
12. How many times this school year have you taught in the computer lab?	1	1	1	1

Table 7—*Continued.*

13. How many times this school year have you used PowerPoint presentations?	1	2	0	1
14. How many times this school year have you used a course website that you created using an authoring program such as Adobe Contribute 3, Front Page, or School Wires?	3	0	0	1
15. How many times this school year have you used a course website hosted by a service such as WebCT or Blackboard?	4	0	0	0

that chalkboards still exist in most classrooms. However, whiteboards are also installed in the classrooms. It is teacher preference that guides their uses. There is only one interactive smartboard in the entire high-school building. This interactive smartboard was purchased for a business teacher who has since retired. It is stored in the computer lab disconnected from any computer. Overhead projectors still remain a vital part of the classroom. Video projectors are scarce and must be signed out and set up in the classroom by the teacher. Video tape players and televisions are also an intricate part of the classroom. Therefore, they are used over the newer forms of online video streaming. Audio players and recorders are not available via classroom computers, therefore again the ease of use prohibits audio players from being used for instruction. Video cameras also exist in rare form. They are not available for everyday classroom use. Very few students have e-mail accounts so e-mail is not used often for instruction. The high school does not make use of any electronic discussion forums, listservs, or other forms of content management systems. Since student use of computers is dedicated to traditional

computer lab settings, teachers do not make use of WebQuests, hotlists, or treasure hunts. Teaching in the computer lab is disconnected and unreliable because there is not a dedicated technology support staff on the premises. Although teachers do own personal computers they do not make the transition from home use to school use for instruction. Lessons that incorporate PowerPoint are too unreliable due again to the lack of technology support in the building. The school district does have a district website. However, individual teachers do not create their own classroom webpages.

Rural School District Teacher Responses to Interview Questions

The following set of teacher interview questions was used to answer the research questions of this study. Questions 1 through 5 addressed two of the research questions: *What are the differences that exist in the way technology is acquired and used in rural and urban Pennsylvania high schools?* and *Do teachers use technology for reasons other than individual learning outcomes?* Question 5, however, was more specific to the differences that exist in the way technology is acquired or what funding sources are available to purchase technology in the district. With an understanding of how and why teachers use technology in the classroom, the other research question, *Is there value in understanding the impact technology has on rural vs. urban schools?* is answered.

Interview Question 1

Interview question 1 asked what drives the respondent's decision to implement technology in his or her high school. I assigned a letter corresponding with each rural teacher's response. Rural teachers are coded as RA, RB, RC, and RD. Teacher RA stated

that student preparation for the future drives the decision to implement technology into his lessons. He also stated that computer skills are a must for every student.

Teacher RB acknowledged that the decision for her was based on availability of technology. She added that she previously had a student computer in her classroom, but the computer was taken from her to use in another classroom. Presently, she has her students save their work on a lab or home computer and e-mail the documents to her at her school e-mail account. From her teacher computer, Discovery Education's digital video based resource, United Streaming Video, is incorporated into her curriculum because it is easy to demonstrate, and she can follow up the video with a lesson. United Streaming Video affords teachers digital video-on-demand and lesson plans to engage student learning.

Teacher RC said that technology is part of our society and will only increase in functions and uses.

Teacher RD replied that technology meets goals better and improves student interest.

Interview Question 2

Interview question 2 asked what determines the objectives for technology use in the respondent's high school. Teacher RA responded that the objectives for technology use are based on high interest of students. He also said that he realizes by using technology it is the best way to get his students involved.

Teacher RB stated that his objectives are aligned with State standards.

Teacher RC answered, the objectives for technology use are based on the high interest of students. "I realize that by using technology it is the best way to get my students involved."

Teacher RD responded that the objectives match his existing goals. His objectives are also driven by Pennsylvania State Standards Assessments (PSSA).

Interview Question 3

Interview question 3 asked respondents whether demographics play a role in technology uses in their high school. Teacher RA said that demographics somewhat play a role in technology use.

Teacher RB said, "Yes, demographics play a big role. Wireless is unavailable, and, due to our rural nature, Internet service providers are limited. We have students who cannot get Internet access at home."

Teacher RC stated,

Not in my classroom. However, it is my belief that urban schools are capable of offering a larger variety of technology to their students. Even though rural school districts are limited by personnel, equipment, and money, they still must compete with urban schools for technology funding. Once rural students go on to higher education, they are at a disadvantage and struggle to catch up. So yes, demographics do play a role in the use of technology in my high school.

Teacher RD simply stated, "No."

Interview Question 4

Interview question 4 asked respondents to help me understand what purpose technology integration has in their teaching methodology. Teacher RA talked about the fact that the world has become a data-driven society and computers are the means and access to these data. He believes it is imperative that teachers show students how to

navigate through the Web. He also felt that if students do not have the basic computer knowledge and skills that our foreign competition has, we stand to lose far more in the future. He then added, "Technology integration is vital in my instruction because I can bring more material into my lessons such as pictures, graphs, stories, diaries, etc. All these things enhance the experiences of my students."

Teacher RB believed that technology is the most important skill our students will need to guarantee success in their future. He added that the resources available through technology offer students limitless possibilities for learning throughout their lives. Using technology frees up time. Students do not need to learn and memorize formats or procedures, but they do need to know how to look them up. Teaching students how to look up information takes much less time than teaching them to memorize or remember information.

Teacher RC offered these words,

To expose students to a variety of mediums and to create a variety into the presentation of material. The use of technology also saves me time. An example of this is PowerPoint [which] allows me to present information quickly. I don't have to create diagrams and write definitions by hand for each class. Technology also provides the information clearly by taking the human element out of the process. Video provides demonstrations and explanation to procedures that are not capable of performing in the classroom due to time constraints and lack of equipment.

Teacher RD replied, "Knowledge base on the Web surpasses anything else a hundredfold. Digital nature of information flows to kids best. Good technology uses a variety of learning styles and approaches. Integrating technology makes me a better teacher. The kids do nothing but gain."

Interview Question 5

Interview question 5 asked what funding sources were respondents provided with to enable them to integrate technology into the curriculum, and had they explored funding sources outside of their school to support technology integration. If the answer was yes, could they tell me about how they learned of those sources and acquired the funding?

Teacher RA's response was, "I was not provided with any funding to integrate technology into the curriculum. I am slowly being introduced to technology integration in my school. I am very interested in acquiring more. However, I don't know what funding sources exist."

Teacher RB responded, "Teachers are provided with \$150 per year allowance for classroom supplies. This must cover software, books, and other supplies. Equipment can be ordered, but only if a grant is available."

Teacher RC responded, "Grant writers provide funding for technology. I have never looked into grants on my own."

Teacher RD responded, "I received a \$1,000 grant from the State for binoculars and field equipment."

Emergent Themes

Themes began to emerge throughout the findings of research data. The first theme to emerge was the belief that computer technology is important for students to survive in the world today. Both the administrative focus team and teacher participants alluded to this theory. The purpose of technology use, even though limited, was to enhance student learning. This was also evidenced in the fact that all participants own a computer for home use.

The technology environment of today's public schools should match the tools and approaches of the work and civil life that students will encounter after graduation. This will ensure that schools stay relevant to today's students, as well as equip them for success in life after school. (National Education Association, 2007, p. 1)

The next theme to emerge was that technology was used for traditional automative techniques. Again, the administrative focus team and teacher participants viewed technology as a tool to do research, communicate via e-mail, utilize Microsoft Office, and record grades. They did not view technology as an innovative tool for students to collaborate, create, and reflect upon, which may be due in part to the age of participants. The youngest participants fell in the 36-40 age category. Digital immigrant philosophy could have played a major role in why traditional automative techniques were primarily used. Chalkboards still exist in the classrooms in the rural high school. Again, the digital immigrant teachers assume that learners are the same as they have always been and that the same methods that worked for the teachers when they were students will work for their students now (Prensky, 2001). Technology was viewed as an instrument to be taught.

Money was another theme that came to light during this study. As in most cases, there never seems to be enough money to fund all aspects of education. This rural high school was not an exception. Technology was not high on the budget priorities. Participant teachers did not seek out their own ways to fund technology uses either, and this could account for the next theme: availability of resources.

Money and resources tend to go hand-in-hand. This rural high school again was no exception. Hardware and software were viewed as expensive resources that are acquired sparsely each year. Only a few new computers are budgeted for each school year. Computer labs were thought to be the most productive way for students to receive

technology instruction. However, there is no dedication to providing a full-time technology support staff. Computers were not repaired in a timely manner and no one on staff could offer support when needed by others. Lack of funding in part could be the result of high transportation costs to bus students to school.

School U, Urban High School

Administrative Focus Group—School U

Administrative Focus Group Interview Question 1

Interview question 1 asked the respondents what drove their decision to implement technology use in the district. The administrator smiled and said, “That is easy if you don’t mind me quoting John Dewey. *‘If we teach today’s students as we taught yesterday’s, we rob them of tomorrow’*. This is a quote that I often refer to when asked about teaching students. My decision is based on teaching students in the world they live in today. Technology makes learning relevant and reflects the world we live in.”

The technology coordinator’s response was more philosophical. She believes that it is the theory behind the digital immigrants vs. digital natives for technology. She clarified by adding that most teachers and adults are the digital immigrants, while students are the digital natives. Her opinion was that ethics plays a role in teaching students to learn with technology tools. Teachers owe it to their students to teach them in their native environment.

Administrative Focus Group Interview

Question 2

Interview question 2 asked what determines the objectives for technology use in the district? The administrator stated, "Technology is the basics that we can teach students with. Technology is the tool kids need to know how to survive in the real world." He ended with saying that, "Technology to students is like oxygen, it is a ubiquitous necessary tool that affects the world today."

The response from the technology coordinator was, "My objectives are determined by the student skills necessary to find information they need."

Administrative Focus Group Interview

Question 3

Interview question 3 asked whether demographics play a role in technology use in the district. The administrator thought that demographics do not play a role in technology use here since they are a 1:1 computer school. He followed the question up by adding,

What we use at school, students also use at home. Since students take their laptops home, they do not have to transfer the knowledge from one place to another. However, if the need arises, our school doors are open from 7:00 a.m. to 5:00 p.m. daily so that students can use the facilities.

The technology coordinator's response was in contrast to the administrator's. She felt that demographics absolutely play a role in using technology.

There is definitely a digital divide among schools even here in the city. Different schools all share the same needs. We need to provide virtual experiences as skill builders for our students. Not all schools have that advantage. It definitely depends on demographics.

Administrative Focus Group Interview

Question 4

Interview question 4 asked respondents to help me understand what purpose technology integration has in their district methodology. In response to this question, the administrator responded by stating,

Technology is the new literacy. There should no longer be the need to integrate technology into the curriculum. It is more about the change of schools, not the integration. Technology is a part of my daily life. I use instant messenger, Drupal content manager, Moodle, office suite, data analysis, web design software, palm pilot, smart phone, profcast, podcasting, and many websites like Del.icio.us. I encourage all my faculty members to do the same.

“Technology prepares students for their life,” was how the technology coordinator began her reply. She went on to say,

Technology is used for so many things. Kids understand digital form. Thought processes have changed. Kids are the digital natives. They are programmed to learn this way. Any form of projection has kids’ attention. It creates a pathway to their minds. Technology also holds kids’ interest level. In my classroom, I use microphones, scanners, digital cameras, server usage uploading, and USB thumb drives. I do my best to portray to my students that my teaching can match the way they learn.

Administrative Focus Group Interview

Question 5

Interview question 5 asked what funding sources were provided to enable respondents to integrate technology into the curriculum. When talking about funding sources used to integrate technology, the administrator replied that they are fully funded by the city.

It is district funds that purchased our laptops and equipment. However, we save money because we do not purchase textbooks. There are no textbooks used here in our high school. We do not have teaching assistants; and the building does not house a school nurse. We spend our money on teachers and equipment. We use a lot of open source or free software, so we save money there too.

He noted that he does not get involved in writing grants. Grants come from the city grant writer. He also acknowledged that students have the opportunity to have free dial-up Internet service at their homes. There is a project called Critical Mass that pays for the expenditures. This allows all students in the district to have Internet service at home. The technology coordinator echoed the fact that their funding comes from the school district budget. She also talked about having an education technology group that aids in finding grants. In the past she has received a grant from Smith Kline Beecham. Each year teachers get a \$500 stipend to spend on supplies. She concluded with the idea that it is helpful when schools form networks to overcome hurdles so teachers can teach.

Tables 8 -12 depict demographic information given by each urban school teacher. Table 8 presents the number of years of teaching in a public school setting. A pre-requisite of the study was for each teacher to have taught at least 3 years in a high school. Due to the lack of availability of staff members at the urban high school who met this criterion, one teacher was given the waiver for this requirement. When asked about the number of years they have been teaching, two participants responded to being fairly new teachers—teaching less than 6 years. The remaining two participants were veteran teachers with each participant having more than 11 years of teaching experience. One participant had taught less than 3 years but was chosen because he was the only English teacher available for this study. The school administrator recommended him as a valid participant, and a waiver was given to allow his participation.

Table 9 illustrates how urban teachers experience computer use in their classrooms. When asked to rate their experience with computers, all participants responded to using their computers for e-mails, grades, and computer applications.

Table 8

Years of Teaching in School U – Urban High School

Years of teaching	<i>f</i>	%
< 3 years	1	25.0
3-5 years	1	0.0
6-8 years	0	25.0
9-11 years	0	0.0
11+ years	2	50.0
Total	4	100.0

Table 9

Computer Experience in School U – Urban High School

Computer experience	<i>f</i>	%
Computers for e-mail/grades	0	0.0
Applications MS Word	0	0.0
Computers for classroom instruction	0	0.0
Both e-mails/grades and applications	4	100.0
Total	4	100.0

Table 10 depicts the frequency of computer use by each urban teacher in this study for instruction in each classroom. When respondents were asked how often they use computers for instruction, three of them responded that they use their computers daily, while only one participant admitted to using a computer occasionally.

When respondents were asked how many hours they used their computer per week at the beginning of the school year, the first respondent answered, 2½-3 hours. The

Table 10

Computer for Instruction in School U – Urban High School

Computers for instruction	<i>f</i>	%
Daily	3	75.0
Weekly	0	0.0
Occasionally	1	25.0
Total	4	100.0

second respondent answered 10 hours. The other respondents did not appropriately answer the question.

When asked how many hours per week they use computers now, the first respondent answered, 2½-3 hours. The second respondent answered, 10 hours currently per week of computer use. The third respondent answered, currently 10 hours of computer use, and the fourth respondent answered, 15 hours currently of computer use.

Table 11 depicts the types of training each urban teacher has received prior to this study. When asked what type of technology training they received prior to this study, no participant felt that he or she received basic computer literacy or computer application training. Two participants felt that they had received training on computer integration; only one participant felt he or she received computer applications and computer applications training, and only one participant felt he or she had received basic computer literacy, computer applications, and computer integration training prior to this study.

Table 12 is an illustration of the location of computer training received by each urban teacher in this study. When asked where they received training, not one participant responded to being self-taught or taught by the school district solely. However, two

Table 11

Computer Training Received in School U – Urban High School

Computer training	<i>f</i>	%
Basic Computer Literacy	0	0.0
Computer Applications	0	0.0
Computer Integration	2	50.0
Basic Literacy and Applications	0	0.0
Basic Literacy and Integration	0	0.0
Applications and Integration	1	25.0
Basic Literacy, Applications, and Integration	1	25.0
Total	4	100.0

Table 12

Location of Training Received in School U – Urban High School

Location of training	<i>f</i>	%
Self-taught	0	0.0
School district	0	0.0
College or university	1	25.0
Other (1, 2, 3)	2	50.0
Self-taught and school district	1	25.0
Self-taught and college/university	0	0.0
School district and college/university	0	0.0
Total	4	100.0

participants replied to being self-taught, taught by the school district, and college trained. One participant primarily received computer training at a college or university, and the final participant responded by having a combination of being self-taught and college or university trained.

Participants were asked if they had a computer at home. All four respondents replied yes. Again this percentage is above the national average of U. S. homes that have a personal computer. When asked if they had a computer at home, all four participants responded that they did have a computer at home.

The next background question asked participants to identify if they were male or female. Three participants were male; and one participant was female.

Table 13 illustrates the age of each urban participant in this study. When asked about their age bracket, participant responses resulted in two participants being below 40 years of age, while the other two participants ranged in age above 41 years of age.

Table 13

Age of Participants in School U – Urban High School

Age of participant	<i>f</i>	%
20-25 years	1	25.0
26-30 years	0	0.0
31-35 years	1	25.0
36-40 years	0	0.0
41-45 years	1	25.0
46+ years	1	25.0
Total	4	100.0

Observations of Urban School District Teachers

Upon arrival at School U, the urban high school, I met with the administrator and the technology coordinator. A schedule was put together for a building tour and observation of core classroom teachers. The first classroom observation was conducted in a ninth-grade biochemistry classroom. The physical arrangement of the room placed a wall-mounted whiteboard on the far left-hand side of the room. The teacher's desk and computer were also located in this area. A video projector displayed a model of a molecular structure on the whiteboard. The digital art teacher, also the technology coordinator, was team teaching a unit on molecular structure to the class. Each student sat around small circular tables that allowed for classroom collaboration. Every student had a laptop open and connected to the Internet in front of them. The teacher was introducing a project to the class. African American month was the theme; and students had previously created diagrams of their favorite foods broken down into molecular structure. The assignment this time was to find a food that a slave would have carried as they traveled on the Underground Railroad. Then they were to research its molecular components and create a 3-D model depicting what this food would have looked like in its molecular form. The digital art teacher was explaining 3-D spatial elements. Learning was coming from student inquiry, research, collaboration, presentation, and reflection. Every student was actively engaged in research using the Internet.

The next classroom observation took place just down the hall in the ninth-grade social studies classroom. The physical arrangement of the room consisted of the teacher's desk in the far left-hand corner of the classroom. The teacher computer and video projector were also located in this area. There was a whiteboard to the left of the

teacher desk, mounted on the wall. Small tables were set up facing each other where students could collaborate and have room to operate their computers. Every student had a laptop connected to the Internet. In staying with the theme of the month, students were researching routes of the Underground Railroad. Each student was to research a route that a slave would have traveled during his or her escape to freedom. There were no prescribed websites for students to follow. The teacher walked around the room acting as a resource for students. Students were directing their own learning. Often the teacher would say, "How do you know that?" "Who is the source?" Students were to gather information that was accurate and valid. They used searching techniques that allowed them to document the author of their research findings.

From here I followed the hallway back to a ninth-grade English classroom. The physical arrangement of the room consisted of the teacher desk and computer in the far left-hand side of the room. A large whiteboard was mounted on the wall behind the teacher workstation. Student tables were placed in a shape of a U. Each student had a laptop connected to the Internet. The lesson was on poetry. Students were creating poems to depict a mood during times of slavery. The teacher played a song on his computer, and asked the students to listen to the mood, rhythm, and flow of words. He explained that the song was originally a poem; and was later put to music. Students were asked such questions as, "What did you feel as you listened to the words?" "Were you happy, sad, unaffected?" The teacher then explained that the objective is to gain better understanding of composition and how you can use words and music to depict emotion. Previously students had created podcasts of student-created poetry. The assignment this time was to create a poem that depicted how African Americans would have felt during

times of slavery. Poems could be placed on the school website. Every student has a webpage where they have the ability to do podcasts and blogs.

The last classroom observation was conducted in a ninth-grade math class. The teacher was conducting a quick overview of a study guide, which the students needed to know for the day's test. The physical room arrangement was such that the teacher's desk, computer, and video projector were located on the far right-hand side of the room. The teacher also had a scanner that was connected to her computer. A large whiteboard was mounted to the wall behind her desk station. Tables were arranged in the room so that all students faced forward. Each student had a laptop connected to the Internet. The teacher was projecting study guide questions onto the whiteboard as a review for students. I was unable to physically enter the classroom as students were ready to take a test. My observations were conducted from a classroom window. Once the students began the test, the classroom teacher came into the hall to discuss the lesson with me.

Once the last observation was completed, I was able to meet individually with the focus group. Focus group participants were the school administrator and school technology coordinator. The technology coordinator is also the digital arts teacher for the school. There was not a curriculum coordinator in the building.

Table 14 illustrates participants' responses to survey questions in school U, the urban Pennsylvania high school.

Background information on this high school is needed to better understand responses to survey questions. There are no chalkboards in this school building. Whiteboards are mounted in every classroom. Every teacher has a video projector available in his or her classroom as well as an interactive smartboard. Therefore, older

Table 14

Urban School District Teacher Responses to Survey Questions

Survey question	Never	5 or fewer	6 to 9	10 or more
1. How many time this school year have you used a chalkboard?	4	0	0	0
2. How many times this school year have you used a whiteboard?	0	0	0	4
3. How many times this school year have you used a smartboard?	4	0	0	0
4. How many times this school year have you used overhead transparencies?	4	0	0	0
5. How many times this school year have you used video projectors?	0	0	1	3
6. How many times this school year have you used videotape players?	4	0	0	0
7. How many times this school year have you used audio players/recorders?	3	1	0	0
8. How many times this school year have you used video cameras?	1	3	0	0
9. How many times this school year have you used e-mail communication with students for instruction?	1	0	0	3
10. How many times this school year have you used listserv or online discussion forums?	1	1	0	2
11. How many times this school year have you assigned tasks such as: hotlists, treasure hunts, or WebQuests requiring computer technology?	1	0	1	2
12. How many times this school year have you taught in the computer lab?	4	0	0	0

Table 14—*Continued.*

13. How many times this school year have you used PowerPoint presentations?	1	1	0	2
14. How many times this school year have you used a course website that you created using an authoring program such as Adobe Contribute 3, Front Page, or School Wires?	1	0	0	3
15. How many times this school year have you used a course website hosted by a service such as WebCT or Blackboard?	0	0	0	4

technologies such as overhead projectors are no longer part of the classroom equipment. The school is wireless, allowing teachers to easily obtain materials from the Internet. Classrooms also have computers equipped to allow the use of audio recordings needed for instruction and learning. Lessons are being created using a podcast format. Before the school year begins, students are encouraged to go online and communicate with teachers. Discussion boards are used in place of e-mail for communication. This type of communication helps students gain an understanding of teacher expectations before their classes even begin. It also forms a bond between communication of teachers and students. Teachers in this school are encouraged to participate in discussion forums created by their high-school principal and other teachers. Every teacher has access to Elgg, which is an open-source software platform designed to allow people to easily connect and share resources. In addition, every teacher has a self-created webpage created with open-source software called Moodle.

Since this school is a 1:1 laptop school, there are no computer labs in the building. Instruction is not lost during transitional time between classroom and computer lab as there are computers in every classroom.

Urban School District Teacher Responses to Interview Questions

Interview Question 1

Interview question 1 asked participants what drives their decision to implement technology in their high school. I assigned letters corresponding with each teacher's response. Each urban teacher was coded as UA, UB, UC, and UD. Teacher UA was the first teacher who responded. His answer was reflected in the following statements, "Availability of technology drives my decision to implement technology. The philosophy that technology enriches both the teaching and learning process also plays a role in my decision to implement technology."

Teacher UB stated,

Pedagogical cores drive my decision to implement technology. Technology brings teaching and learning to a new level. Technology makes communication easier. It is more transparent and accessible – you can replicate your objectives and distribute them to the class. Students can tap into vast resources outside of the school.

Teacher UC responded by saying, "Management. A lot of information can be found in one place. Technology gives kids focus."

Teacher UD replied, "I see it as a core part of working at my school. Implementing technology is the school's philosophy."

Interview Question 2

Interview question 2 asked participants what determines the objectives for technology use in their high school. "My objectives are determined by whether

technology addresses student needs. I also look at whether or not technology provides a broader range of presentation and reflection,” replied teacher UA.

Teacher UB concurred, “The objectives for technology use are based on my school’s core values – inquiry, research, collaboration, presentation, and reflection. I ask myself if these things will be met by using technology.” Described in Marzano, Pickering, and McTighe’s (1993) dimensions of learning are five tasks that significantly enhance learning and meaningful application of knowledge. These tasks were identified as: decision-making, investigation, experimental inquiry, problem solving, and invention. This urban high school seems to characterize its core values much in the same manner. The response from teacher UC stated, “Management again determines the objectives for technology use. Technology allows students to not have to take notes and all students see the same exact information from one class to the next.”

Teacher UD concluded with, “The objectives don’t focus on the use of technology. They focus on what the kids have to learn. I only think of technology as students working with it to perform the types of activities they will need in the real world.”

Interview Question 3

Interview question 3 asked whether demographics play a role in technology uses in this high school. When discussing demographics and its role in technology use, teacher UA replied,

Yes. We are fortunate to have a school district that is encouraging us to experiment with educational technology, a principal who is excited about technology and sees how it can support teaching/learning, and students’ families who support curricular innovation that is grounded in experiences.

Teacher UB's response was, "No. Demographics do not play a role in technology use. Every student has their own laptop."

The response from teacher UC took on a different light. He replied, "Yes, it plays a role. Some districts get things like technology so they can 'shine.' Not all urban schools look like our school."

Teacher UD stated, "No."

Interview Question 4

Interview question 4 asked participants to help me understand what purpose technology integration has in their teaching methodology. How do the respondents integrate technology in their teaching?

Teacher UA put much thought into this response:

I use technology in education for these reasons: the educational technology assists students in the writing, re-writing and editing process; students review current events in science (via the web) and then use MS Word to draft their summaries; the students also print out drafts for peer review; they use on-line and hard-drive storage for their written portfolio; the educational technology assists students in creating graphic organizers or graphic representation of biology and chemical systems; for example, students employ K-W-L strategies when beginning a new topic of study; they can sometimes use the "Draw" function of MS Word to diagram molecular or cellular interaction the educational technology helps students gather, organize and present their data, whether it's in MS Word, Excel, PPT, iWeb or Drupal (blog software); the students also use Vernier probes (software and hardware) to gather data on chemical interaction, O₂ concentration, solutions, pH, etc.; this Vernier data is logged onto their computers for analysis.

Teacher UB remarked, "I use technology because I believe in the school's pedagogical philosophy – the integration of 21st-century tools in teaching and learning. I also use technology because we are a 1:1 laptop technology high school."

Thoughts from teacher UC were, "I use technology because it is an aid to distribute information."

Teacher UD commented,

I use technology not to replace the teacher, but to assist learning in a variety of environments both in and out of the classroom. Ideally, computers will free students to direct their learning for themselves. Technology is the cornerstone of the Information Age. In an environment that is ubiquitous, computer technology taps into the reality we live in. Most traditional classroom teaching takes place in an environment that was set up in an age where access to information was restricted. Hence, there is an emphasis on memorization and recall. Technology helps us work with students whose challenge will not be to create manipulatives and understand a world with too little information, but too much of it.

Interview Question 5

Interview question 5 asked participants what funding sources they were provided with to enable them to integrate technology into the curriculum. They were further asked whether they had explored funding sources outside of their school to support technology integration. If the answer to the latter question was yes, I then asked them to tell me about how they learned of those sources and acquired the funding.

When asked about funding sources provided to enable technology integration, teacher UA spoke about the building being a 1:1 computer technology school. Technology was provided as part of his classroom. However, he did receive a grant from GlaxoSmithKline for a Healthy Choice project. He received equipment for "You-build-it-radios." The school district grant writer brought the information to him.

Teacher UB said that she was provided with a laptop for herself and each of her students. She also was provided with a scanner and projector.

In the same sentiment as teacher UB, teacher UC restated that their funding for technology is acquired by the school district. He also echoed that each classroom received a laptop computer for every teacher and every student.

"I have not searched out any funding for technology on my own. We are a 1:1 computer school, and I rely on other people in the building to find money for additional technology," was the final response from teacher UD.

Emergent Themes

Themes for the urban high school were much the same as the rural high school. However, positions on themes were not identical. All participants agreed that computer technology is important for students to survive in the world today.

The technology environment of today's public schools should match the tools and approaches of the work and civil life that students will encounter after graduation. This will ensure that schools stay relevant to today's students, as well as equip them for success in life after school. (National Education Association, 2007, p. 1)

However, the purpose of technology use was much different from the rural high school. Students learn in a project-based environment where the core values of inquiry, research, collaboration, presentation, and reflection are emphasized in all classes. This was also evidenced in the fact that all participants were given a laptop computer for both school and home use.

The next theme to emerge was that technology was not used for traditional automative techniques. Here innovative techniques were used to incorporate technology into daily classroom practices. The process was emphasized, not the product. Technology was not a tool to be learned, but a tool to enhance learning. They were well beyond the idea of trying to integrate technology into the classroom. Technology was part of their everyday learning pedagogy. Age may have played a factor again in this school. One half of the participants fell in the age brackets younger than the rural high-school participants. This could account for the ease of technology integration throughout the high-school

environment. Although not all participants could be viewed as digital natives, perhaps another account for the enthusiasm in using technology could be the theory of "keeping up with the Joneses" (Lamb, Johnson, & Obrenovich, 1994). Chalkboards did not exist in the classrooms in the urban high school. White boards and interactive white boards were prominent in every classroom. Video projectors were used daily during lessons.

Money again emerged as a theme in the urban high school. While teachers themselves did not worry about funds or seek out funds on their own for technology, administration made technology funding a high priority. Even though spending per student was lower than spending per student in the rural high school, technology purchases were a priority. This theme merged with the availability of resources. Technology was abundant throughout the urban high school. Not only does every student and teacher have a laptop, but free open-source software is incorporated into daily practices. Moodle, Elgg, and Drupal allow teachers and students to communicate, collaborate, and create. A full-time computer support specialist is available daily to maintain equipment and assist in technological uses. No money is needed to transport students as public transportation is available for all students. This frees up funding to be dedicated to the purchasing of new technologies.

Summary

This chapter reported the results of the study within the framework of data source and question number. The next chapter provides a cross-case analysis to explore the common themes that emerged across both cases.

CHAPTER FIVE

CROSS-CASE ANALYSIS

This chapter examines the analysis of data collected from observations, face-to-face interviews, and survey questionnaires. As data were coded and analyzed, three distinct themes began to emerge.

Theme 1

The first theme emphasized the belief that technology is a necessary and critical component for educating students in today's world. Administrative response from the rural Pennsylvania high school was that, "I know technology is the wave of the future. Students must learn technology to survive in the world today." Teacher UA stated, "The philosophy that technology enriches both the teaching and learning process also plays a role in my decision to implement technology." In keeping with the same philosophy, the administrator of the urban Pennsylvania high school said, "Technology makes learning relevant and reflects the world we live in." In addition he added, "Technology to students is like oxygen, it is a ubiquitous necessary tool that affects the world today." It seems as if high value is placed on a concept, then priority is given to that idea. During observation it became evident that a high value was placed on technology use in the urban Pennsylvania high school. Every classroom was equipped with interactive whiteboards, video projectors, and teacher computers running Windows XP operating

systems, and every student received a laptop connected wirelessly to the Internet. District funds were allocated to provide such technology enhancements. Teachers displayed the core values of the school building: inquiry, research, collaboration, presentation, and reflection. Teacher UD stated, "I see technology as a core part of working at my school. Implementing technology is the school's philosophy." Teacher UB concurred that "the objectives for technology use are based on my school's core values—inquiry, research, collaboration, presentation, and reflection."

Students were collaboratively learning in classrooms where furniture arrangement fostered interaction and collaboration. A dedicated technology staff member provided on-site assistance and technical support. Here this school projected a highly valued, technology-driven, educational learning environment. To further strengthen that belief, the urban Pennsylvania administrator ended by saying, "Technology is a part of my daily life. I use instant messenger, Drupal, Moodle, office suite, data analysis, web design software, palm pilot, smart phone, procast, podcasting, and I encourage all of my faculty members to do the same."

It appeared that the same level of value was not placed on technology in the rural Pennsylvania high school. This lack of value, however, does not in any way reflect the belief that technology is important when educating students. On the contrary, both Superintendent and technology coordinator stated that "technology is important for student success in today's world." It only reflects the value placed on obtaining and maintaining technology in the high school. The administrator added, "I only purchase ten new computers a year." Here classrooms still portrayed a more traditional style of learning. Chalkboards were used throughout the building instead of interactive

whiteboards. Overhead projectors provided for the use of transparencies to display content to students. Television sets and VCR technology provided for much of students' technology interaction. This was evident in the science classroom where almost an entire wall was dedicated to VCR tapes. While each teacher did have a computer in the room for teacher service, the operating systems were old and outdated. The high-school building had one computer lab equipped with 19 computers. However, since a dedicated technology staff member was nonexistent, many computers were not in operation for student use. Teacher RB said, "I previously had a student computer in my classroom, but the computer was taken away to be used in another classroom by a teacher." While teachers recognized the need to provide technology they did not seek out ways to integrate or acquire new technology in their classrooms.

Theme 2

The next theme to emerge was the use of technology in the classroom. Again the two high schools differ in technology integration. The urban high-school teachers use technology for innovative ideas of teaching and learning. The process of technology integration was emphasized over the product. Technology use was an inherent part of everyday classroom pedagogy. According to teacher UD, "I use technology not to replace the teacher, but to assist learning in a variety of environments both in and out of the classroom. Ideally computers will free students to direct their learning for themselves." He goes on to add, "Technology helps us work with students whose challenges will not be to create manipulatives and understand a world with too little information, but too much of it." Not only did teachers collaborate on themes to provide a structure for student inquiry-based learning, but students collaborated on projects as well. Knowledge gained

from one core subject was transferred into the other core subject as well as non-core subject classrooms. Students and teachers saw the school day as not being committed to an 8:00 a.m. to 3:00 p.m. day. This was evident in the fact that communication takes place before and after school via access to the school's multiple methods of online communication. The fact that learning was also taking place at night was evident as students posted projects, created poetry, and communicated with peers from their homes on nights and weekends. In addition, teacher UD stated, "The objectives don't focus on the use of technology. They focus on what the kids have to learn. I only think of technology as students working with it to perform the types of activities they will need in the real world."

In the rural high-school, technology was used more for automative techniques. The rural Pennsylvania high-school technology coordinator stated, "We look at several factors prior to implementing new technology. For example, we have identified the need to improve communications within and between the school and community. Particularly, we want to communicate regularly, efficiently, and effectively with parents about their child's progress. That need led to the implementation of Edline, a web hosting and portal solution, for facilitating that communication." Teacher grading, e-mail communications, and research were the predominant uses of technology for these teachers. Computer usage was done in isolation from the traditional classroom as students' primary contact working with computers was done in the school computer lab. This was evident in the teacher responses to the survey question regarding how often they use computers for instruction. Only one teacher used the computer daily for instruction, one teacher used the computer weekly, while the other two teachers used the computer only occasionally.

Although the social studies teacher did take his class to the computer lab, students were conducting research only for their specific subject. Knowledge gained while learning social studies was not transferred to other curriculum content. For students and teachers, content existed within the four walls of each individual classroom and did not cross other core curricular subjects.

Theme 3

The last theme to emerge from data analysis focused on funding sources to acquire technology for classroom instruction. Neither the rural nor urban Pennsylvania high-school teachers sought out funding sources on their own. Teacher RA said, "I was not provided with any funding to integrate technology into the curriculum. I don't know what funding sources exist." Teacher RC's response to technology funding was, "Grant writers provide funding for technology. I have never looked into grants on my own." Even the administrator from the urban Pennsylvania high school stated that "I do not get involved in writing grants. Grants come from the City grant writer." They all believed that grant money was obtained primarily through a district grant writer. However, this was the only similarity between the rural and urban Pennsylvania high-school teachers.

In the urban Pennsylvania high-school district, funds were used to purchase an environment that produces a 1:1 laptop initiative. Teacher UB said, "I use technology because we are a 1:1 technology high school." Teacher UC also spoke about being a 1:1 computer technology school. Teacher UB added, "I was provided with a laptop for myself and each of my students. I was also provided with a projector and a scanner." This meant that every student and teacher has their own laptop for use. Wireless networking access allowed for ease of Internet use. Most of the resources needed in the classroom

came from free open-source applications such as Drupal, Moodle, and Elgg. These free source code applications allow monies to be spent on hardware instead of expensive alternative programs. Another source of revenue is found in the fact that all students who attend this high school either walk or take public transportation to school. The district does not have to pay for bus contracts. The administrator of the building believed that “monies saved, by not having a school nurse on the premises or teaching assistants, allows me to spend my entire budget on teachers and technology.”

In the rural Pennsylvania high school, money was a different matter. The technology coordinator stated, “Unfortunately, the amount of funding available in grants has dropped considerably in the past few years.” The high school encompasses nearly 325 square miles. Expensive bussing contracts are needed to bus students not able to walk to school. With the ever-increasing gas prices, bussing students becomes extremely costly. The Pennsylvania rural high school actually spends more dollars per student than the urban Pennsylvania high school, and bus contracts could account for a large portion of the difference. Although the rural high school does employ a full-time nurse, it does not employ a full-time technology support staff member. Instead it subcontracts to the local Intermediate Unit for part-time technology support. When a computer is nonfunctional, it could take weeks before it is examined for repair. It is not funding alone that affects the acquisition of technology for the rural Pennsylvania high school. The technology coordinator pointed out that “our rural location means that we sometimes do not have access to some technologies. An example would be cell phones, paging, and broadband internet. Other times technologies are not available due to our small numbers.

Living in a rural area also means we have to travel to learn about new technologies. It is rare for a salesperson to visit our location.”

Funding discussions with the administrative focus teams of both the rural and the urban Pennsylvania high school centered on the fact that there are few grants available. The administrative focus teams from both the rural and urban Pennsylvania high schools felt the need to have a grant writer provided by the district to ensure dedication to locating funding sources. However, the rural high-school administrators were more knowledgeable about the opportunities of grants available for high-schools in Pennsylvania. The rural high-school Superintendent and technology coordinator agreed that they use programs such as e-rate, e-fund, and PDE grants. In contrast, when asked about E-rate funding, the urban high-school administrator did not know what the program was and replied with, “Our grants come from a district grant writer. I don’t personally have to be involved in the process.”

Participant Background Knowledge

When comparing the participants from the rural Pennsylvania high school to participants in the urban Pennsylvania high school, there are similarities and differences again. Tables 6 and 13 compare the age of participants in the study. Table 6 reflects the ages of the rural Pennsylvania high-school teachers. In the rural Pennsylvania high school two participants were between 36 and 40 years of age. The other two participants were between 41-45 years of age. With age of participants in mind I also looked at the number of years teaching for each teacher in the rural Pennsylvania high school. One participant had taught between 3-5 years, two participants had taught between 6-8 years, and the last participant had taught more than 11 years.

Table 13 reflects the ages of the teachers in the urban Pennsylvania high school. In the urban Pennsylvania high school, one participant was between 20-25 years of age, one participant was between the ages of 31-35, one participant was between the ages of 41-45, and the last participant was older than 46 years. Teaching experience reflected that one participant had been teaching less than 3 years, one participant had been teaching between 3 -5 years, and two participants had been teaching for more than 11 years. What is interesting to note is, if you follow Mark Prensky's (2001) digital native, digital immigrant philosophy, the urban Pennsylvania high-school teacher participants should not have displayed such an ease of technology integration. Actually participants from both the rural and the urban high schools were close in age range with the exception of the oldest participant being in the urban high school. Thus technology integration should have been more difficult to achieve in the urban Pennsylvania high school.

If age then was not a factor, what made for such a difference in technology integration between the two Pennsylvania high schools? I believe it stems from availability of resources and teacher knowledge.

Teacher Knowledge

When examining the questionnaire responses from both the rural and urban high schools it became evident that knowledge also played a role in technology integration. Tables 2 and 9 examined how each high-school teacher was experiencing computer use in their classroom. In Table 2 the rural high-school teachers' experiences reflected that one half of the teachers experience automative techniques only for computer use. All four teachers from the urban Pennsylvania high school used technology for innovative

techniques encompassing e-mail/grades, Microsoft Word applications, and computers for classroom instruction.

Tables 3 and 10 depict the frequency of computer use by each participant in the study. Rural teachers, as shown in Table 3, expressed that two teachers use computers occasionally, whereas the other two teachers used computers either daily or weekly. In contrast, Table 10 depicts that frequency of computer use by the urban Pennsylvania high-school teachers was achieved daily by 75% of the participants. One teacher answered that he or she only used computers occasionally. Since the technology in this school was a priority to be placed in the hands of the students, with the teacher as facilitator, this could account for the reply.

Tables 4 and 11 compare computer training received by each participant. Table 4 examines computer training received by the rural Pennsylvania high-school teachers. One teacher responded to having basic computer literacy training only. Two teachers responded as having basic computer literacy and computer application training. The fourth teacher responded to having basic computer literacy training as well as computer integration training. Table 11 reflects the urban Pennsylvania high-school teachers' responses to the same question on computer training. While coupled with other training, all four teachers received training on computer integration. One teacher received training in computer application and integration, two teachers received training in computer integration, and one teacher received training in basic computer literacy, computer application, and computer integration. Here again the urban Pennsylvania high-school teachers received more technology training than the rural Pennsylvania high-school

teachers. It is a fact that the more you know a concept, the more comfortable you are at using it.

Tables 5 and 12 compare responses for both the rural and urban high-school teachers on the location of where computer training was received. Table 5 reflects the response by the rural high-school teachers. One teacher received computer training at a college or university only. One teacher received computer training at a school or district, college or university, and by learning on his or her own. One teacher received computer training located at a school or district and by learning on his or her own, and the final teacher received computer training at a college or university as well as being self-taught.

Table 12 reflects the urban high-school teachers' responses. One teacher received computer training at a college or university only. Two teachers received computer training at a school or district, college or university, and by learning on their own. One teacher's computer training was located at a school or district and by learning on his or her own.

In the rural Pennsylvania high school, only two teachers had received computer training in their school or district. In the urban Pennsylvania high school, three teachers received computer training in their school or district. It is also interesting to note that in the rural high school, three teachers received computer training at a college or university while only two teachers in the urban high school received computer training at a college or university. This brings to light the question of what is being taught at the college or university level about computer technology use in education. I think it bears further study as three teachers from both the rural and the urban high schools responded to being self-

taught on computer use. Is there a correlation between continued exploration of computer training on one's own after being taught at a college or university?

Discussion of Findings

Research Question 1

An important finding evident in this case study is the belief that technology is a necessary and critical component for educating students in today's world. This thought echoed throughout the interviews with the administrative focus teams as well as with teachers. Teacher RA stated that "student preparation for the future drives the decision to implement technology into lessons." He also added, "Computer skills are a must for every student. If students do not have the basic computer knowledge and skills that our foreign competition has, we stand to lose far more in the future." Teacher RC believed that technology is part of our society and will only increase student learning. The same teacher also added that "by using technology, it is the best way to get my students involved." Teacher RD related that digital nature of information flows to kids best. He also added that "integrating technology makes me a better teacher and kids do nothing, but gain." For the rural Pennsylvania high-school teachers, technology knowledge of the importance of its use in instruction was evident. However, the change had not become one of deep change where innovative technology uses had become a part of educational pedagogy.

For the urban Pennsylvania high-school teachers, this was a different story. They too understood the importance that technology integration plays on educating today's students. However, they took this one step further. Teachers in the urban high school were model examples of technology integration incorporated into educational pedagogy.

The entire school's motto states that students will learn in a project-based environment where core values of inquiry, research, collaboration, presentation, and reflection are emphasized in all classes. Teacher buy-in to this philosophy was evident in all classrooms.

Bruner's theory of discovery learning suggests that providing students with an inquiry-based model for learning can help to integrate technology into the curriculum. Research results have shown that School U, the urban school, has adopted the discovery learning theory model as teachers encouraged students to discover principles by themselves. Students were actively learning in an inquiry-based environment. Problem-solving situations were created by faculty members offering students the opportunity to discover facts and relationships on their own. At the same time, faculty members were collaborating on lessons that allow concepts to be interdisciplinary. Bruner's philosophy suggests that we should encourage students to discover on their own. Bruner also believed that mastery of the fundamental ideas of a field involves not only the grasping of general principles, but also the development of an attitude toward learning and inquiry, toward guessing and hunches, toward the possibility of solving problems on one's own. "For if we do nothing else we should somehow give to children a respect for their own powers of thinking, for their power to generate good questions, to come up with interesting informed guesses. We should make study more rational, more amenable to the use of mind in the large rather than memorizing" (Bruner, 1960, p. 20; see also Bruner, 1966, p. 96).

According to Snelbecker (1974) proponents of discovery learning theory believe that discovery learning has many advantages, including: encourages active engagement;

promotes motivation; promotes autonomy, responsibility, independence; the development of creativity and problem-solving skills; and a tailored learning experience. The discovery learning mode requires that the student participates in making many of the decisions about what, how, and when something is to be learned; and even plays a major role in making such decisions. Instead of being 'told' the content by the teacher, it is expected that the student will have to explore examples, and from them 'discover' the principles or concepts which are to be learned (Snelbecker, 1974, p. 425).

Technology is one avenue where students can achieve these objectives. Because of the flexibility technology offers teachers and students in the classroom, an inquiry-based learning model can effectively change the learning process of students. Inquiry-based learning was evidenced by students actively engaged in their own direction of learning in each classroom of School U, the urban high school.

Technology also had an impact on participants of this case study by bringing changes, positive and negative, to their teaching strategies and classroom management. Every teacher is challenged by the need to create a classroom that supports students' inherent ability to learn (Kozma, 2003). Teachers in School R, the rural high school, displayed a negative attitude for technology use. While they understood the importance technology can play on student learning, they also felt the frustration of the lack of technology available to them and their students. Technology only slowed down the learning process for their students as hardware and software issues were on the forefront of integration. Having to disconnect their students from the content-specific classroom to take them to a computer lab lost valuable classroom instruction time. It also enhanced the

focus of technology on hardware and software. The lack of technology available once in the computer lab created a frustration for both teacher and students.

J. M. Carroll's minimalist theory also played a role in understanding the successful integration of technology in the classroom (Patsula, 1999). According to Patsula (1999) the minimalist theory focuses on the instructor or teacher of a course. Teachers should design courses that minimize instructional materials that obstruct learning and focus the design on activities that support learner-directed activity. With this process, learners are allowed to fill in the gaps themselves (Carroll, 1990).

Carroll's theory (1990) suggests that:

1. All learning activities should be meaningful and self-contained.
2. Activities should exploit the learner's prior experience and knowledge.
3. Learners should be given realistic projects as quickly as possible.
4. Instruction should permit self-directed reasoning and improvising.
5. Training materials and activities should provide for error recognition and use errors as learning opportunities.
6. There should be a close linkage between training and the actual system because "new users are always learning computer methods in the context of specific preexisting goals and expectations." (Carroll, 1990).

This way of learning reflects more of a guided-exploration approach. School U, the urban high school, portrayed this theory in an exemplary fashion. Guided questions were posed in each classroom, minimizing the extent of instructional materials. Reading was only minimized by the lack of predetermined textbook readings. Teachers were collaborating on themes that created interdisciplinary connections for students. Activities were assigned to students who then chose the direction of their individualized learning outcome. Themes also set clear goals and objectives for students to follow. Predetermined outcomes were not assigned to every student. Each student was not destined to arrive at the same conclusion to specific concepts. Interest level of each

student played a major role in deciding which direction learning would take place. Traditional classroom materials did not place constraints on students' research methods. Instead the use of computers and the Internet afforded students opportunities to explore a wealth of resources. The computer in essence minimalized the tools (textbooks) students use on a daily basis.

Research Question 2

Another major finding is that technology is used differently in School R, the rural school, from School U, the urban school. In School R, a rural Pennsylvania high school, technology is used on sporadic occasions as an automative tool. Students use technology to author, edit documents, or search predetermined Internet sites based on teacher objectives. Teachers view technology through the concept of hardware and software. Technology uses seem to correspond with available technologies and teacher knowledge. Teacher RB conveyed the message that it is the availability, or lack of it, that drives her decision to implement technology in her lessons.

The technology coordinator of the rural Pennsylvania high school felt that needs determine the uses of technology in the school. Improved communication was a high priority need for them. They implemented an online grading system that allows for communication through the Internet. Since not all students have a home computer or access to the Internet, I wonder how effective this system works. He also added that teachers use technology for research and Microsoft Word applications. These types of uses are still focused on automative uses of technology.

The Superintendent of the rural Pennsylvania high school saw technology use as a way to enhance student learning. He said they use technology to analyze student results

on tests, such as 4 Sight and PSSA. Again these are for automative uses. However, he later added that they were looking at using video conferencing and taking virtual field trips in the near future.

Students in School U, the urban high school, use technology as an innovative tool. Teachers only guided students in the learning process. The direction of student learning was chosen by each individual based on his or her technological skills and concept interest. Teachers turned over learning to the students and they eagerly took ownership and responsibility for their work and learning (Herman, 2002). Students were actively engaged with the content of study. Internet sites were not pre-determined by the teachers. Students used their searching skills to locate information relative to the topics. Writing assignments were often turned into podcasts or blogs using free open-source software such as Moodle and Elgg. Conversations took place between peers and teachers using the same format. Time constraints, such as the classroom day, are being overlooked as teachers were available via the Internet during evening hours. Student collaborations took place during evening hours as well. The city provided for free Internet access to all homes in need of the service. This option was literally unimaginable in the rural school district where many of the students do not have access to the Internet at home. Due to their rural nature, Internet service providers were unavailable. For students lucky enough to have Internet service providers available, dial-up accounts were the only option. Slow connectivity hindered the learning process.

Along with the full-time use of technology in School U, the urban high school, the district employed a computer support specialist who is fluent in many computer programming languages and had a background in educational technology support.

Students and teachers do not have to wait days before technology issues are rendered.

School R, the rural high school, relied on a part-time Intermediate Unit employee to take care of technology issues in their building. Needless to say, this type of maintenance was slow and hindered the use of consistent technological practices.

For the urban administrators, technology uses are believed to be innovative. The principal of the urban Pennsylvania high school quoted Dewey, "If we teach today's students as we taught yesterday's, we rob them of tomorrow." To echo the sentiment, the technology coordinator stated, "Ethics plays a role in teaching students to learn with technology tools. Teachers owe it to their students to teach them in their native environment." "Technology is like oxygen, it is a ubiquitous necessary tool that affects the world today," completed the principal's thoughts.

Teacher UA agreed that technology enriches both the teaching and learning process. "I look at whether or not technology provides a broader range of presentation and reflection."

Teacher UC summarized technology use by saying that he uses technology not to replace the teacher, but to assist learning in a variety of environments both in and out of the classroom.

Technology is the cornerstone of the Information Age. In an environment that is ubiquitous, computer technology taps into the reality we live in. Most traditional classroom teaching takes place in an environment that was set up in an age where access to information was restricted. Hence, there is an emphasis on memorization and recall. Technology helps us work with students whose challenge will not be to create manipulatives and understand a world with too little information, but too much of it.

It became evident that students in School R, the rural high school, did not view technology as an important part of their learning process. In many cases they saw it as a

hindrance or an unnecessary part of daily learning. In contrast, in School U, the urban high school, students were actively engaged with technology in every aspect. Technology was not a hindrance as it allowed them to easily generate, obtain, manipulate, and display information (Herman, 2002). The seamless integration of technology enhanced students' learning of concepts by providing opportunities to obtain higher levels of learning.

Common themes of teachers in School U, the urban high school, helped deepen the understanding of what leads teachers to integrate technology (Herman, 2002). Integration of technology was never the focus of these high-school teachers. They concentrated more on the philosophy of the high school; students learn in a project-based environment where the core values of inquiry, research, collaboration, presentation, and reflection are emphasized in all classes. This type of philosophy calls for classroom environments to be such that computers appear seamless in student activities (Herman, 2002).

According to Jaber's (1997) study, access to computers influences instructional activity frequency of use. Teachers also need to be surrounded by other computer-using teachers in their schools in order to benefit from collegial sharing of ideas, resources, and teaching strategies (Mouza, 2002). Collaborative meetings are commonplace in School U, the urban high school. Teachers meet regularly to discuss themes to be shared throughout the building. Concepts are expanded upon from one classroom to another. Team-teaching exists as teachers incorporate specialty areas into the curriculum. Concepts cross traditional boundaries and lend themselves to true cross-curricular learning. Students transfer high-level thinking skills from one classroom to another without the influence of "subject specific matter." Homework becomes a blog or podcast

that is openly shared with others. Students voice their knowledge to the world on their self-created webpages. Technology helps bring relevancy and meaning to students at this high school. In contrast, students at School R, the rural high school, still hand-write homework. These students see no relevancy to the use of technology in the curriculum. They do not share information and ideas with others outside of the four walls that contain their content-specific subject. Connections between concepts are lost as teachers do not relate content in relevancy to other classrooms. In School R, the rural high school, subjects are still taught in isolation.

Research Question 3

A third finding is that demographics play a role in funding and was evidenced in the wealth of information gained from administrative focus group discussions and teacher interviews. Rural communities often feel the pressures that go along with being remote. This particular rural Pennsylvania high school portrayed this fact. Internet service providers were scarce, making it difficult for students and teachers to make a connection between home use and school use of technology. In fact many students do not own a home computer. Due to large amounts of the budget dedicated to bus contracts, technology is limited even for school use. The technology coordinator at the rural Pennsylvania high school reinforced the remote disadvantage by adding that, "Technologies are not available due to our small numbers." What he meant was that the greater the population, the more parents there are to demand that technology become available for student use. A greater student population also places a demand on certain technologies to be incorporated in their learning. The technology coordinator went on to

say, "Living in a rural area also means we have to travel to learn about new technologies. It is rare for a salesperson to visit our school to show us new technology."

Teacher RB stated that "demographics play a big role in technology uses in our high school. Wireless is unavailable, and due to our rural nature, Internet service providers are limited. We have students who cannot get Internet access at home."

Teacher RC added, "Once rural students go on to higher education they are at a disadvantage and struggle to catch up because of the lack of technology use in both home and school."

Teachers at the urban Pennsylvania high school looked at demographics from a different viewpoint. Most of the urban Pennsylvania high school teachers felt that they are at an advantage because the school district they work in provides them with a wealth of technology. They saw demographics as meaning relating to their own area and more on the socioeconomic status. It was difficult for them to relate to the disadvantages of being rural in nature. With this information in mind, teacher UC thought that demographics do not play a role in technology integration because every student in the school has access to the same technologies while at school and at home.

The principal at the urban Pennsylvania high school mirrored the response of teacher UC. He felt that demographics do not play a role because there is a 1:1 ratio of student to laptops in the building. The technology coordinator's response though was slightly different. She felt that there is a digital divide among even city schools.

School U, the urban high school, is located in the heart of a major city where public transportation is acquired for students not located within walking distance. No federal funds are used toward transportation of students.

Population helps increase the local tax base. The greater the population, the more revenue generated for education. The latest recorded state revenue audit reported that the rural high-school district (School R) generated \$2,093,079 in state revenue. According to the same report, the urban high-school district (School U) generated \$756,159,557 in state revenue (Pennsylvania Department of Auditor General, 2007). However, according to Greatschools.net (Jackson, 2007), School R, the rural high school, reports spending \$11,993 per student, whereas School U, the urban high school, reports spending \$8,831 per student. With student spending much less in the urban high school, the school was able to provide an environment where every student and teacher has a laptop connected to the Internet. Students are able to take their laptops home to complete school work since every student also has access to the Internet in his or her home. Computers and Internet access are scarce in the rural high school, even though spending per student was higher. This discrepancy also reveals that demographics play a role in technological experiences as they relate to access and availability of technology-related elements of instruction.

Neither school district received the Classrooms for the Future grant sponsored by Governor Rendell. However, the same initiatives to create a 1:1 laptop school was achieved without government-subsidized funding in School U's district. Administrative commitment to technology purchases and the use of innovative techniques by teachers allowed for funding allocations to go toward the purchase of technology over the purchase of traditional textbooks. According to the administrator of the building, due to low state revenue, School R, the rural high school, struggled to purchase 10 new computers each year. Traditional textbooks still dominate the teaching pedagogy of the district. School U, the urban high school, was equipped with technology such as video

projectors, interactive whiteboards, and laptops for every student and teacher. State revenue assisted in providing this unique classroom environment. The culture of each school reflected the available technologies. Teachers in School R, the rural high school, struggled with frustrations of how to teach students to compete in a technological world. They also voiced the concern that students from rural high schools often struggle to play catch-up when they enter higher educational environments. At least in part, this may be because they have not had the same technological experiences as their counter urban students. Due to the remoteness of their environment, such technological experiences are inconceivable. Even if teachers and students wanted to use technology in the same manner as School U, the urban high school, the lack of Internet service providers hinders their progress.

Summary

This chapter is a cross-case analysis of data collected during observations, face-to-face interviews, and from survey questionnaires. Three themes that emerged while comparing data were discussed followed by a cross-case analysis of data collected as shown in various tables in the previous chapter. A discussion of the findings is presented as they relate to the three research questions. The next chapter summarizes this study, discusses the results of this study, and provides recommendations based on the results.

CHAPTER SIX

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a summation of the research project followed by a summary of results and implications of this study. Concluding this chapter is a list of recommendations for further research.

The intent of this case study was to examine the perception of technology use in rural and urban Pennsylvania high schools. Purposive sampling was used in this qualitative case study to select one rural and one urban Pennsylvania high school. The U. S. Census Bureau (2004) was used to classify a rural high-school as having a county population of less than 50,000. The U. S. Census Bureau (2004) was also used to classify and identify an urban high school with a county population of more than 200,000. Once each school was identified, an introduction letter was sent to each corresponding high school administrator. Accompanying the letter of introduction was a consent form inviting each high school to participate in this case study. Dates for observations were set up with each administrator. Before arrival for observation, each administrator identified his purposively selected core subject classroom teachers to participate in this study. Permission forms were sent to all participants before the study began. Teacher participants were chosen based on 3 years of integrating technology into their core subject classroom practices. Upon arrival to each high school, I met with each

participating classroom teacher to obtain consent forms and go over the procedure for data collection.

The research questions were identified as:

1. What are the differences that exist in the way technology is acquired and used in rural and urban Pennsylvania high schools?
2. What are the benefits of understanding the impact technology has on rural vs. urban high schools in Pennsylvania?
3. Why do teachers use technology?

Instrumentation for this case study was a combination of open-ended questions, questionnaires, and observations created and conducted by myself. Once all data were collected I used triangulation to verify the validity of the data.

The literature review indicated that there is an ongoing need for research on the effectiveness of technology integration into educational classroom settings. I also believe that there is value in understanding the impact technology has on rural vs. urban schools. This study provided evidence that teachers believe students need to have technology skills in order to succeed in the world beyond high school. Evidence was also shown to support the fact that urban high-school students have an advantage over rural high-school students when acquiring and using computers with Internet access.

School R, the rural high school, was selected because it met the criteria of a county population of less than 50,000. School U, the urban high school, was selected on the criteria of a county population greater than 200,000. Teachers from both high schools were purposively selected by the administrators meeting the criteria of integrating technology, for at least 2 years, into the core academic areas—mathematics, English,

science, and social studies. School U did not have an English teacher who met the criteria for the study; therefore, an English teacher who did not meet the 2-year requirement was purposively selected for the study.

Once consents were obtained, I began collecting data through observations, interviews, and survey questions to solve an educational problem. Triangulation was achieved through convergence of multiple data sources (Denzin, 1978). Tables were used to organize and identify patterns of technology practices by participant teachers.

Summary of Procedure and Findings

Eight high-school teachers participated in the study. Four rural, core-subject, high-school teachers and four urban, core-subject, high-school teachers were purposively selected by the administrators in each corresponding high school. A focus group from each high school also participated in key components of this study. Focus group members included administrators, technology coordinators, and curriculum coordinators.

While observing urban high-school teacher C (UC) in School U, I thought back to statements made by James H. Stronge (2002) in *Qualities of Effective Teaching*. Under the subheading of Teaching Experience and Teacher Effectiveness, he implies that

experienced teachers differ from rookie teachers in that they have attained expertise through real-life experiences, classroom practice, and time. He also adds these teachers usually have a greater repertoire from which to incorporate and organize routines for monitoring students and creating flowing, meaningful lessons. (p. 9)

In the classroom of the urban high school, teacher A, who was a relatively new teacher, portrayed mastery in student learning. Perhaps this is because his age places him closer to the digital native category than the digital immigrant (Prensky, 2001).

There have been many debates on the effectiveness of technology in the classroom. One debate that does not seem to go away is the fact that technology enhances the learning process. Mark Prensky (2001) has established the theory that students are the digital natives—speakers of the digital language of computers, video, games, and the Internet—whereas most teachers are digital immigrants speaking an outdated language, struggling to teach a population that speaks a new language. Therefore, does that not lead to the question, Are young teachers already equipped with expertise through real-life experiences? After all, these young teachers are a product of growing up in a technology-driven world. What I observed in the classroom of urban high-school teacher C would suggest that young teachers have the real-life experiences of growing up with technology. Students were actively engaged in learning through the use of computers; students were on task both objectively and behaviorally. Stronge's (2002) statement also creates an image in my mind of the sage-on-the-stage teacher. Classrooms today need to reflect more of the teacher as guide-on-the-side.

To investigate and attempt to answer the research question, What are the differences that exist in the way technology is acquired and used in rural and urban Pennsylvania high schools? I asked teachers the following interview questions:

1. What funding sources were you provided with to enable you to integrate technology into the curriculum?
2. Have you explored funding sources outside of your school to support your technology integration?
3. If yes, tell me how you learned of these sources and acquired funding.

At School R, the rural high school, teachers overall did not have a sense for how funding is acquired for technology. They stated that each year they are given \$150 for supplies, which include any software or technology purchases, textbooks, and other general supplies. The next question provided understanding that only one teacher had received any grants for technology acquisition. All teachers thought that grant writers for the district locate technology funding. Resources provided by the district were as follows: one teacher computer that ran the Windows 98 operating system, standard overhead projectors, and whiteboards that were located in each classroom. Some classrooms still had chalkboards available. One video projector, for the entire school, was available for teachers and could be signed out for classroom use. One school computer lab, designed to provide 19 computers with Internet access, was available for student and teacher use. However, not all computers were working. The administrator's input was that about 10 new computers are budgeted each year for purchase. These 10 computers were distributed throughout the building, which is a K-12 environment. All teachers shared the belief that the school needed to acquire additional technology to enable them to teach students real-world applications. They were very hungry for information that might lead to any future technology purchases.

At School U, the urban high-school teachers also did not seek out funding on their own for technology purchases. Technology funding offered by the district was a stipend of \$500 per classroom to purchase supplies, which included any software or technology purchases, textbooks, and other general supplies. All teachers believed the district grant writer seeks funding for technology acquisition. However, the resources available to this high school differed dramatically from School R. The district purchased laptops for

every student and teacher in the high school. This type of classroom environment is known as a 1:1 computer initiative. Maine led the way in this initiative with Governor Angus King's idea of providing a laptop for every student and teacher in Grades 7 and 8 across the state (Muir, 2006). Scanners, video projectors, and whiteboards were also located in each classroom. These items were not just located in the classrooms, but were being actively integrated into curriculum on a daily basis. One teacher did receive a grant for technology. However, the district grant writer brought the information to his attention. Locating funding to acquire technology is not a priority for these teachers.

The results indicate that funding resources available to each high school differ greatly. While rural high-school teachers are given \$150 allocations for classroom expenditures, urban high-school teachers are given \$500 for those same allocations.

Standard overhead projectors are used to display overhead transparencies, with limited information, for students in the rural high school. Video projectors display information that is produced by using a computer and its technological capabilities. The district for School R, the rural high school, can budget just 10 new computers each year, while School U's, the urban high school, district has budgeted for 1:1 laptops, scanners, and video projectors for the entire school. Students in School U, the urban high school, are at a great advantage by having one laptop for every student. Access to a computer not only at school, but also at home, allowed the students and teachers to view computers as an ordinary essential learning tool. These laptops were given out to every student much in the same manner a textbook was given out in School R, the rural high school. Digital cameras in School U, the urban high school, are obsolete as most laptops have a built-in camera complete with software that utilizes the extent of the technology. Computers in

School R, the rural high school, were not new enough to be equipped with such a feature as built-in cameras.

During the interviews with teachers, I examined the answer to the next question: Do teachers use technology for reasons other than individual learning outcomes? To help clarify the question, I asked teachers the following series of questions:

1. What drives your decision to implement technology in your classroom?
2. What determines the objectives for technology use in your classroom?
3. What purpose does technology integration have in your teaching methodology?
4. Why do you integrate technology in your teaching?

At School R, the rural high school, teachers portrayed an overall theme where technology prepares students for the future by meeting goals better and improving student interest. The rural high-school teachers also state that technology is the best way to get students actively involved. Another theme that emerged was that the world has become a data-driven society where computers are the means and access to these data. Finally, many teachers felt that they were better teachers when given the opportunity to integrate technology into the classroom curriculum. With this philosophy in mind, the rural high-school teachers felt frustrated because they often cannot meet their own objectives. The only opportunity for them to integrate technology into curriculum is for them to disconnect students from the classroom setting and take them to the computer lab. Valuable classroom time is lost during the transition. Once in the lab, even more time is lost on the fact that not all computers are in working condition. With the lack of a computer support person in the building, computers are not repaired in a timely manner.

It is evident that teachers felt computers are necessary for students to develop strategies that are needed to exist in a global society. However, in this school setting, hardware and software are the focus of technology integration. Neither teachers nor students displayed the use of technology to take curriculum in a new direction.

Teachers in School U, the urban high school, expressed emerging themes based on the enriched availability of technology in the building. Because technology exists in great capacities, teachers did not focus on student benefits in the same way. Pedagogical cores and school core values were more on the forefront of these teachers' minds. Technology was a part of the school climate, which gives kids focus, makes communication easier, and brings teaching and learning to a new level. These were the responses that flowed throughout the data. Here the philosophy of technology does not focus so much on how to integrate technology, but more on the aspect of where and when to use it. They are integrating technology every day by having access to student laptops and Internet service wirelessly throughout the building. Students also took their laptops home, supporting the idea that technology integration is already complete. Computers to urban high-school students are no more than a textbook that they carry home every night. Only with this "textbook" they control the learning process. In contrast, the traditional textbooks that students had in School R limit the learning process to just collective words on paper. Technology integration was not even a concept that teachers in School U focused upon. To them, technology integration is a concept of the past. Their own teaching pedagogies had been affected. Collaboration exists among colleagues as well as students. Each month a theme was established upon which learning takes place. African American history echoed throughout the learning community during this case study.

Each student was responsible for the direction where learning occurred. In social studies, students surfed the Internet for routes the slaves traveled during their attempt at freedom during the early 1860s. Students were not subjected to pre-determined websites to locate information. During language arts class, students wrote poems that depict daily life as an African-American slave during the early 1860s. These poems were then transformed into musical composition. Science afforded students the opportunity to graph molecule structures of food that was believed to have been available to slaves along their journey to freedom in the early 1860s. All learning outcomes were being initiated by individual students. Teachers were there merely to ask guided questions and to facilitate.

In School R, the rural high school, learning took place in an entirely different format. Classrooms were disconnected from each other. Themes did not emanate throughout the school's classrooms. Teachers were not collaborating on curricula. Students were not making connections between concepts. Knowledge was dispersed by the teachers as students were directed to specific locations to find information relevant to the topic. Students were not self-directed in their learning processes. Instead they practiced automative technology skills. Predetermined websites were assigned to students, word processing techniques were used, and outdated computers and software were the only technological resources. No innovative ideas were being used by either teacher or student. Pedagogical beliefs of teachers were not impacted by ideas of innovation into school-based approaches to new millennium learning (Muir, 2006).

Conclusions

The cross-case analysis of this study projected three distinct conclusions:

1. There is a belief that exists, in both the rural Pennsylvania high school and the urban Pennsylvania high school, that technology is a necessary and critical component for educating students in today's world.
2. Technology is used differently in School R, the rural school, than in School U, the urban school.
3. Demographics play a role in funding sources needed to acquire and sustain technology in the educational classroom.

Programmatic Recommendations

One benefit that the integration of educational technologies affords teachers is the capability to effect change at a curricular or programmatic level. Through the use of sharing content and learning activities, teachers are creating classroom environments where they are able to facilitate the development of more effective learning experiences across the curriculum. Through the use of thematic team teaching, students are allowed to shape their own learning outcomes. The content is learned through experiences students create on their own. However, change does not happen without examining the costs and benefits of using technology to facilitate programmatic change. While developing the school climate for School U, the urban high school, a team of administrator and faculty met to discuss the roles and responsibilities of faculty leadership and buy-in; collegiate and departmental support and encouragement; training, technical, and development support; as well as the technological infrastructure of the building. Once all of these issues were addressed, the school was able to move forward

in their goal of becoming a model technology school. This was not a top-down systematic change. The buy-in was from everyone involved. We can learn many things from this type of effective leadership change.

All educational communities, whether urban or rural, must change and expand to meet the needs of educating today's digital native students. According to the Student Advisory Committee report (Massachusetts Institute of Technology, 1998) education for life in the 21st century includes the ability to lead change, think critically, work in teams, create and quickly adapt to new technology, be a self-managed learner, communicate effectively in a global economy, and understand the needs of the communities in which we work and live. Educators must create a blend between the education students receive inside the classroom with what students receive through interaction with technology at home. A clearly articulated set of competencies, created by all parties involved, would enable faculty and students to produce learning objectives geared toward developing all the skills necessary to be successful in the 21st century.

Recommendations for Further Research

This case study represents the perception of technology use in two Pennsylvania high schools, urban and rural, and must be considered in context. The study was not meant to represent all urban and rural high schools. I do not imply that the results are transferable to all Pennsylvania high schools. I also do not imply that the findings are generalizable to rural and urban high schools anywhere in the nation. Due to the very limited population of schools and teachers from each demographic location this study cannot be generalized to all rural and urban high schools. For instance, the rural high school examined in this study portrays a very technological-challenged environment. Not

all rural high schools in Pennsylvania are as isolated as this high school. The nearest university for these teachers to attend is located 36 miles away. Online learning is hindered by the lack of Internet service providers and connectivity. In ranks of numbers this is one of the smallest school districts in the state and encompasses nearly 325 square miles. There are approximately 16.7 people per square mile. The median household income as reported by the U. S. Census Bureau (2004) is \$36,088. School U, the urban high school, reflects a high school that is also not of typical composition. This high school is led by an administrator with innovative vision. While there are 805 square miles within this high school's demographics, there are 526.2 people per mile. The median household income as reported by the U. S. Census Bureau (2004) is \$69,042. Because School U, the urban high school, is located in a major city there are 27 neighboring public high schools. When students reach the ninth grade they are offered the choice of attending any one of the city high schools.

Findings, however, may reflect similarities and may encourage faculty, administration, and state agencies to consider the perceptions in their own communities. Further research could be considered to compare relationships between school districts and state agencies that provide funding for continued uses of instruction technologies. It is interesting to note that while the urban Pennsylvania high school spent less money per student, it incorporated more technology than its counterpart in the rural Pennsylvania high school. Another area that should be researched is the type of technology training that colleges or universities offer their students. Additional research could also provide more depth and breadth to the understanding of integration of technology in the classroom setting.

Further studies could include:

1. Native vs. Digital Immigrants: Is there a changing role students play in technology use in the classroom? A descriptive look should be made at the differences that exist in the way today's students learn in and outside of the classroom. Can the knowledge that students are gaining from technology uses at home change the way students learn at school?
2. Technology Integration: Is it more than hardware and software? Is the term technology integration outdated? Are images of technology integration portrayed only by hardware and software acquisition? If so, what should replace the idea of technology integration in 21st-century schools?
3. What role does funding play between rural and urban school districts? What is the process for deciding on the dollar amount that school districts are awarded in grant applications to state agencies? Furthermore, who decides where these funds are to be distributed? What is the effect of politics on funding school districts for the use of technology?
4. Learning in the 21st century: Where is the classroom setting? To compete with cyber school enrollments, many of today's public high schools offer their own cyber curriculum. Students may take online core-subject courses at home, while also taking elective courses at their community public school. With a revolving door now existing in public high schools, must *all*, or most, learning continue to take place in the traditional classroom setting?
5. Bricks and Mortar: Classrooms constructed one byte at a time. Building a learning community online for public education is closer to a reality than we can imagine.

When we think of classrooms for the future, where do we imagine they exist? The term itself—"classrooms for the future"—should make us realize that the future happened yesterday. We must prepare for education today. As one of the administrators in the urban high school of my study said, quoting John Dewey, "If we teach today's students as we taught yesterday's, we rob them of tomorrow." The Internet has become an environment that produces one of the greatest opportunities for learning.

These topics for further research may enable us as educators, administrators, business people, and governmental agencies to find ways to work together to prepare students to become 21st-century global citizens.

APPENDIX

APPENDIX A
PROTOCOLS

Background Questions

How long have you been teaching?

- 1) 3-5 years
- 2) 6-8 years
- 3) 9-11 years
- 4) 11+ years

How would you rate your experience with computers?

- 1) I have used computers in my classroom, but for e-mails/grading only
- 2) I have used applications like word processing, spreadsheets, etc.
- 3) I use computers for instruction in the classroom
- 4) Both 2 and 3

How often do you use computers for instruction?

- 1) Daily
- 2) Weekly
- 3) Occasionally

How many hours per week did you use computers at the beginning of the school year? _____

How many hours per week do you use computers now? _____

What type of technology training did you receive?

- 1) Basic computer literacy
- 2) Computer applications
- 3) Computer integration
- 4) 1 and 2
- 5) 1 and 3
- 6) 2 and 3
- 7) 1, 2, and 3

Where did you receive your training?

- 1) Self taught
- 2) School district
- 3) College or university
- 4) Other
- 5) 1 and 2
- 6) 1 and 3
- 7) 2 and 3

Do you have a computer at home?

- 1) Yes
- 2) No

What is your gender?

- 1) Male
- 2) Female

What is your age bracket?

- 1) 20-25 years
- 2) 26-30 years
- 3) 31-35 years
- 4) 36-40 years
- 5) 41-45 years
- 6) 46+ years

Questionnaire adapted from:

Christensen, R. (1998). *Effect of technology integration education on the attitudes of teachers and their students*. Doctoral dissertation, University of North Texas, Denton.

APPENDIX B

SURVEY

Preamble:

The purpose of this interview/survey is to seek information to expand our understanding of the various ways in which technology is being used within instructional practices at urban and rural Pennsylvania high schools.

In general I am seeking information in three broad areas:

1. Integration of Technology into Teaching
2. Purposes of Technology Integration
3. Funding Sources

Integration of Technology into Teaching

Please indicate which of these technologies you have used since Fall of 2006 and how frequently you use them. The scale is in the context of the number of times each year that you use a particular technology, and consists of the following options: "never", "5 or fewer", "6 to 9 times", "10 or more".

Technology Used	Never	5 or fewer	6-9	10 or more
Chalkboard				
Whiteboard				
SmartBoard				
Overhead Transparencies				
Video projectors				
Videotape players				
Audio Players/recorders				
Video Cameras				
E-mail communication with students for instruction				
Listserv or online discussion forum				
Assigning tasks such as: hotlists, treasure hunts, or WebQuests requiring computer technology				
Teaching in the computer lab				
PowerPoint presentations				

Course web site that you created using an authoring program such as: Adobe Contribute 3, Front Page, or School Wires.				
A course Web site hosted by a service such as WebCT or Blackboard				
Other: (specify) _____				

Notes:

Purpose of Technology Integration

Please help me to understand what purpose technology integration has in your teaching methodology. Why do you integrate technology in your teaching?

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Funding Sources

What funding sources were you provided with to enable you to integrate technology into the curriculum? Have you explored funding sources outside of your school to support your technology integration? If yes, tell me about how you learned of those sources and acquired the funding.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

“The Perception of Technology Uses in Rural and Urban High Schools.”

Interview Questions:

1. What drives your decision to implement technology use in your high school?
(District) (What is your philosophy)

2. What determines the objectives for technology use in your high school? (District)
(What are the needs of the students)

3. Do demographics play a role in technology uses in your high school?
(Does living in a rural area affect reasons you use or don't use technology or does it affect the way you acquire technology?)

APPENDIX C
LETTER TO PRINCIPAL

February 22, 2007

Principal Name
School Address line 1
School Address line 2
City, State Zip Code

Dear Mr.

My name is Brenda Freeman and I am currently enrolled in a doctoral program at Andrews University, Berrien Springs, Michigan. My dissertation title is "The Perception of Technology Uses in Rural and Urban High schools."

As part of this research, I would like to talk with you as an administrator to gain insight into various aspects of technology integration within your curriculum. I would also like to conduct a case study at the Science Leadership Academy that would involve working with teachers in the four core curriculum areas.

I am particularly interested in:

- teacher integration of technology in the classroom
- the purpose for selecting technology applications in the classroom
- support of administration for technology applications in the classroom
- funding to integrate technology into the classroom.

If you agree to participate in this research, I would like to interview you in person at your school. I have enclosed a copy of the questions I would like to ask you. The interview should take about an hour, and may be tape-recorded. In addition, by signing and returning this letter you are granting permission for research to be conducted at your high school building.

Any information collected for this project will be kept confidential, and held in a secure location. This includes your name, your teachers' names, and the name, location and details of your school. You may have access to your interview data at anytime, and you may withdraw from the project at any time.

Your participation in this project would be greatly appreciated. Your ideas and insights will assist me in collecting data to interpret what differences may exist in technology's role in rural and urban high school education. You will be sent a copy of the finished report.

Please let me know if you are able to take part in this project by filling in the enclosed PARTICIPANT CONSENT FORM, and sending it back to me in the envelope provided. If you have any further questions or concerns about this research, please contact me at the phone number, address, or e-mail below. You may also contact my advisor Dr. James Tucker at jatuck@mac.com.

Yours sincerely,

Brenda M. Freeman

Brenda M. Freeman
831 Kellytown Road
Mansfield, PA 16933
(570) 662 - 7856
E-mail: bfree@ptd.net

APPENDIX D
LETTER TO PARTICIPANTS

The Perception of Technology Uses In Rural Verses Urban High schools

The following information is provided for you to decide whether you wish to participate in the present study. You should be aware that you are free to decide not to participate or to withdraw at any time without affecting your relationship with the researcher.

The purpose of this study is to describe the process of meaningful technology integration for high school teachers. The process of meaningful integration of educational technology into the curriculum is influenced by a number of factors including school culture, effective staff development programs, administrative support, and funding. Data will be collected during a site visit to your high school. Data collection will include interviews, surveys, and direct observations.

Please do not hesitate to ask any questions about the study either before participating or during the time that you are participating. I will be happy to share the findings with you after the research is completed. However, your names will not be associated with the research findings in any way, and only the researcher will know your identity as a participant.

There are no known risks and/or discomforts associated with this study.

The expected benefits associated with your participation are the information about the experiences in learning skills necessary to meaningfully integrate technology into the secondary curriculum and the opportunity to participate in a qualitative study.

Please sign your consent with full knowledge of the nature and purpose of the procedures. A copy of this consent form will be given to you to keep.

If you have any questions concerning this project, please feel free to contact me by e-mail at bfree@ptd.net or by telephone at 570-662-7856. You may also contact my advisor, Dr. Jim Tucker at jatuck@mac.com or 423-425-5261. If you have any questions concerning your rights as a research subject, please contact Andrews University Institutional review Board at 269-471-6361.

Choose one of the following options: I understand that if I do participate in this study all data will be reported anonymously. (Please print a copy of this letter for future reference.)

_____ I am at least 18 years of age and I AGREE to participate in this study

_____ I am at least 18 years of age and I DO NOT AGREE to participate in this study.

Print Name

Signature

Date

Adopted from Creswell, J. Qualitative inquiry and research design (1998).

REFERENCE LIST

REFERENCE LIST

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VITA

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OBJECTIVE

Technology Education Leadership

EDUCATION

MANSFIELD UNIVERSITY, Mansfield PA 12/14/96
B.S.E. Elementary Education, 1996

MANSFIELD UNIVERSITY, Mansfield PA
Master of Education, 2000

ANDREWS UNIVERSITY, Berrien Springs, MI
Ph.D., 2008

RELATED EXPERIENCE

LIBERTY ELEMENTARY SCHOOL, Liberty, PA. 9/97-6/99
Social studies teacher for fifth and sixth grades.

LIBERTY ELEMENTARY SCHOOL, Liberty, PA 9/99-6/02
Social Studies, Reading, and Language Arts Teacher- Fifth Grade.

SOUTHERN TIOGA SCHOOL DISTRICT, Mansfield, PA 9/02-7/03
Instructional Technology Specialist/ Technology Coordinator.

SOUTHERN TIOGA SCHOOL DISTRICT, Mansfield, PA 7/03-PRESENT
Director of Technology

PERSONAL

My husband, Tom, and I have been married since July of 1981. We have two grown children who are pursuing careers in the educational field. I enjoy the challenge of working with educators to assist with integrating technology into the curriculum, and strive to be open minded and ready for change.