Attitudes, Perceptions, Behaviors and Responses of Elementary Teachers with Varying Computer Proficiencies Toward a Technology Learning Model

Matthew S. Shoemaker

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ATTITUDES, PERCEPTIONS, BEHAVIORS, AND RESPONSES OF ELEMENTARY TEACHERS WITH VARYING COMPUTER PROFICIENCIES TOWARD A TECHNOLOGY LEARNING MODEL

By

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ATTITUDES, PERCEPTIONS, BEHAVIORS, AND RESPONSES OF
ELEMENTARY TEACHERS WITH VARYING COMPUTER PROFICIENCIES
TOWARD A TECHNOLOGY LEARNING MODEL
Matthew S. Shoemaker

ABSTRACT

The purpose of this phenomenological study was to assess the attitudes, perceptions, behaviors, and responses of teachers with varying computer skills after exposure to the Technology Learning Model (TLM), as well as to assess the overall impact of the staff development experiences. The TLM was comprised of a researcher-designed, 10-session, 15-hour training implementation over 8 weeks. The two research questions of the study were: How will participants with varying computer skill levels respond to the TLM? How does the TLM affect participants' attitudes toward integration of computer technology into professional responsibilities?

The purposeful sample was drawn from teachers at a suburban elementary school. Before the training participants were administered two surveys to assess their technology skill levels. The sample was comprised of two teachers each at beginning, intermediate, and advanced levels.

Data were collected from multiple sources, including observations, and researcher and teacher field notes. On training completion, one-to one, open-ended interviews were conducted and teachers' lesson plans were reviewed.
Data were transcribed, coded, and triangulated according to qualitative, grounded theory methods (Miles & Huberman, 1994). Member checks were performed, and participant feedback verified the researcher's interpretations. Data analysis was conducted with the aid of the NVivo software program.

Findings showed that TLM participants perceived that post-training collaboration was the most valued outcome of the training. Collaboration was closely linked with support through many sources, which all participants found extremely beneficial. Familiarity among participants also emerged as an important characteristic of the TLM.

Findings showed that the TLM exceeded the learning expectations of the beginners. Intermediate participants confirmed satisfaction with the learning and made recommendations for future training. Advanced participants enjoyed the collaborative experiences associated with the TLM but reported that the level of instruction fell below their learning expectations. Additional findings, recommendations, and conclusions are presented.
Dedication

This accomplishment is far from my own. It belongs collectively to the friends and family who supported and prayed for me over the past 3 years and who patiently listened to excuses as to why I was unavailable to join in gatherings and social events. Mary, Mel, Scott, Aaron, and my father, Sam, have increasingly believed in me and provided the love to sustain such an effort. No person has had such a supporting cast as I.

A special dedication of thanks to my mother, Sue, who lost her 16-year battle with breast cancer in December and who never lost her faith in God or family. Through her fight, she exemplified courage and determination and was my inspiration to finish my degree on time. I know she will be watching me through a beautiful "picture window" in heaven as I walk across the stage to receive my degree.

Most importantly, loving thanks to my wife Lisa and my daughters Rachel and Emily for praying for me daily and selflessly sharing me with my passion to accomplish a dream. I'm all yours now!
Acknowledgments

Many wonderful people provided direction and encouragement through my doctoral journey. I would especially like to thank the members of my committee. I am most indebted to my Chair, Dr. Carole Warshaw, who was a mentor through the dissertation process every step of the way. Her ideas and guidance provided the qualitative foundation upon which I conducted my study. I am grateful for the guidance provided by Dr. Cheryl Seranno over the past 3 years. Her excitement in my endeavors was empowering. Dr. Cindy Skaruppa's guidance and direction were invaluable. She provided a critical focus to my study, and her wisdom shaped my actions from her very first suggestion.

Being a member of the first cohort at Lynn University is unique and very special to me. I am indebted to friends such as Larry Heiser and Bob DeYoung. Without their support and collaboration I could not have withstood the many personal trials and the intense rigors of the program.

I would also like to express my appreciation for all of the teachers at Southside Elementary who participated and joined efforts in collaboration to reach their potential. Their commitment to learn over the 10 sessions of the training was truly inspirational. Lastly, I would like to thank all of the presenters and supporters of the Technology Learning Model, especially Gary Evans and Kris Swanson for their untiring support of the TLM.
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CHAPTER I
INTRODUCTION

Throughout history several events have had tremendous impact on both the United States and the entire world. The American Revolution and the Industrial Revolution are two such forces which altered the course of history, changed immediate circumstances, and helped shape the world in which we now live. Some experts believe that the world is now on the brink of another phenomenological change, with potentially even greater magnitude than any previous revolution or era (Jukes, 1998). This new revolutionary frontier is firmly grounded in technology.

According to futurists Jukes and McCain (1999), we have been on the road to this revolution for some time, but until widespread access to the Internet was achieved, the events leading to this point were no more recognized by the public than false labor pains. In fact, a maxim established in 1965 concerning technology holds true today. Moore's Law, named after the cofounder and chief research scientist of the Intel Corporation, states that the processing power and speed of an electronic calculating device doubles every 18 months, and the price for that technology declines by about 35% a year (Jukes & McCain, 1999). Moore's prediction has held true to the present. As a result of this exponential technological growth phenomenon, most people can barely
conceptualize, much less keep up with, the advances in technology (Jukes & McCain, 1999).

With the dynamics of such change over the past 30 years, the context of technological change has risen exponentially and is thus much more rapid today than in 1965. Consequently, individuals, businesses, and systems must make adjustments more quickly and responsively (Jukes & McCain, 1999). As Dwyer (1996) states, "Technology, whether we like it or not, is changing the face of the planet. It is changing our notion of who we are as citizens of that planet" (p. 26).

Technology, then, increasingly affects every aspect of our lives, from business to leisure to education. Public education, with regard to most issues has been traditionally conservative and deliberate. However, Gardner (2000) asserts a contradictory view:

Schools--if not education generally--are inherently conservative institutions. In large measure, I would defend this conservatism. But changes in our world are so rapid and so decisive that it will not be possible for schools to remain as they were or simply to introduce a few superficial adjustments. Indeed, if schools do not change rapidly and radically, they are likely to be replaced by other, more responsive institutions. (p. 30)
School districts, administrators, and teachers are aware of the current technological revolution with which they must contend. Several districts and schools across America have taken initial steps toward infusing technology into curriculum. For example, schools such as Slauson Middle School, in Ann Arbor, Michigan, have supplied sixth-grade students with PalmPilots for inquiry-based learning in the science classroom. By way of infrared ports, the PalmPilot allows students to create and beam concept maps to each other in the classroom (O'Donovan, 2000). In New York City, teachers are given handheld computing devices to track student schedules and grades. These devices even enable teachers to connect with projectors to make presentations on PowerPoint and other similar presentation software packages (O'Donovan, 2000). Peripherals such as modems, digital cameras, and extra memory to expand functionality are available. Under ideal circumstances, such peripherals would help infuse technology into the classroom.

As Wilson, Teslow, Cyr, and Hamilton (1994) indicate, "The use of computers . . . serves the role of change agent within the classroom environment, affording and stimulating reflection, redesign, and change" (p. 9). Moreover, a report by the U.S. Department of Education (1999) concludes that computer technology can be of great benefit to students in areas such as writing, organizing complex information,
drawing inferences, communicating, and analyzing information. The question then arises, Why have significant changes not taken place in the way educators use technology for instruction? The answer to this important question may be found in, and addressed through, professional development for teachers in technology.

Professional Development

Technology training for teachers through professional development is perhaps the largest hurdle schools must address, to successfully integrate technology into the classroom (Brand, 1998; Harvey & Purnell, 1995; McKenzie, 1999; Moursund, 1989; U.S. Congress, Office of Technology Assessment [OTA], 1995). Thus far, technology training efforts for educators have produced little transformation of teaching delivery methods which incorporate computer usage into classrooms (Hope, 1997; Maddin, 1997; Sherman, 1998).

According to the 1995 Office of Technology Assessment report, the lack of effective professional development among teachers for technology use is one of the most serious obstacles to integrating technology within the curriculum. This report further indicates that technology training sessions for teachers too frequently focus on technology mechanics in isolation and do not provide opportunities for users to integrate technology into daily professional practices and school curricula. Additionally, the report
lists five barriers which limit teachers from achieving desired results:

1. Limited access to computers.
2. Limited time for training and computer usage.
3. Lack of vision or rationale for technology use.
4. Lack of or inadequate teacher training and support.
5. Poor assessment practices. (p. 18)

Such barriers contribute significantly to teachers' lack of progress and proficiency in technology integration into their classrooms. Many experts do not fault teachers for the lack of progress but attribute the problem to the ignoring of the professional development process for the sake of the final product, that is, placing computers in classrooms with limited or one-shot training sessions for teachers. These one-time workshops are typically assessed through pre/post test methods without procedural analysis.

Nevertheless, Joyce and Showers (1983) unreservedly credit teachers with rapid absorption and assimilation of information through professional development: "... teachers can be wonderful learners. They can master just about any kind of teaching strategy or implement almost any technique as long as adequate training is provided" (p. 2).

In addition, research conducted by Joyce and Showers (1980) established a significant correlation between effective professional development and student achievement. These authors created four levels of impact to assist
teachers, administrators, and professional development coordinators to target levels of infusion:

1. Awareness.
2. Concepts and organized knowledge.
4. Application and problem solving. (p. 380)

This typology establishes a hierarchy of assimilation with which the effectiveness of professional development, in a given program, can be monitored.

Rationale for This Study

As Joyce and Showers (1983) showed, effective professional development will translate into increased student achievement. Moreover, Knowles (1995) demonstrated that effective teacher training must be based on an andragogical approach to inservice.

Knowles (1995) conducted three decades of adult-based learning research, establishing criteria which must be present for achievement of optimal staff learning results. Knowles' theories on educational brokering place the participant in a shareholder position with influence over decisions made about the learning process: "People tend to feel committed to any decision in proportion to the extent to which they have participated in making it" (Knowles, 1995, p. 7).

Consequently, the work of Joyce and Showers (1980, 1983), and Knowles (1995) strongly influenced the design and
analysis of this study. The work by Joyce and Showers (1980, 1983) narrowed the focus of this study to look beyond general outcomes of professional development. These general outcomes have been the culmination of technology training that has been designed at the research site. The study was conducted at an elementary school located in a suburban area in South Florida. Southside Elementary serves kindergarten through fifth grade, with 700 students and 33 teaching faculty. After close examination of previous outcome-based technology training at the school, this study was driven by the premise that conditions of learning, within the context of previously held faculty technology training, have been grossly overlooked.

Computer Equipment at Southside Elementary

Because of the once large population at Southside Elementary, the school houses two computer labs, whereas most elementary schools only have one. In 1999, the school received 50 multimedia computers with an assortment of educational software. Since that time, 61 new Pentium III computers have been added to the classrooms. The school currently has 317 IBM compatible computers on campus. Of that number, 131 are new multimedia-capable computers, and the remaining 186 are 33 MHz or 66 MHz IBM compatible computers.

Teachers have two new multimedia computers per classroom and approximately four older versions. One
computer lab has 33 MHz computers that are limited to "skill and drill" software programs, and the other computer lab has new multimedia machines with access to the new network, interactive software, and the Internet. Teachers rotate grade levels through the computer labs to address specific skill practice software. Moreover, teachers have access to computers in the media center, housed in the professional library.

However, the school does not have a program to teach technology to students. According to reports from the survey conducted by Southside's 1999/2000 Instructional Innovative Team (IIT), very few teachers incorporate computer technology into their classrooms above the "skill and drill" software applications provided by the local school district.

In addition, by the 2001/2002 school year, all kindergarten, first- and second-grade teachers will receive, and be expected to use, newly purchased teacher presentation stations through a school district mandate. The presentation station is comprised of a new multimedia computer on a portable cart, equipped with Internet connectivity, Office 2000 software, a state of the art printer, and a 29-inch display monitor. District plans include the distribution of this equipment into grades three through five in the 2001/2002 school year. Full-scale delivery of presentation stations is not scheduled for Southside Elementary until the summer of 2001. However, due to school district interest in
the present study, kindergarten, first-, and second-grade teachers received presentation stations as part of a district pilot program in March of 2001. Teachers in grades three through five will receive presentation stations in the fall of 2002.

District officials expect kindergarten through second-grade teachers to integrate computer technology into daily lessons beginning in the Fall of 2001. In the 2000/2001 school year, all instructional staff were evaluated on technology proficiency as a part of each teacher's overall district evaluation. The school district technology component of the teacher evaluation was introduced in 1999/2000 and did not receive much emphasis. Greater attention was given to this important objective in 2000/2001. As part of the school district technology objective, each grade in Southside Elementary will be expected to generate a grade-level web page by the Fall of 2001. Seventy percent of the elementary schools in the county have their own websites, but currently Southside is not one of them.

Despite the school district mandates and the rich computer resources at Southside Elementary, administrators have historically promoted the use of technology only passively, encouraging teachers to attend state and district technological professional development seminars and return to the school to train the rest of the staff. However, from
the time computers were placed into classrooms, teacher training sessions at Southside Elementary have not had a significant positive impact on the teachers' degree of comfort, or computer usage, in the classroom.

National statistics indicate that 62% of funding set aside for public school technology is devoted to hardware, 12% to software, 6% to supplies, and 5% to staff development (Dasher, 1997). Schools with known successful technology implementation spend 38% of their budgets on teacher training (U.S. Department of Education, 1996). At Southside Elementary, 15% has been spent on teacher training.

Results of the IIT survey also revealed that the teaching staff experiences a lack of comfort with computer technology usage in general, and specifically in the classroom. When surveyed on the topics of writing, reading, math, technology, early literacy in children (ELIC), exceptional student education (ESE), classroom management, and personal relationship skills, teachers viewed technology as the area in which they were the least informed and most uncomfortable. In fact, out of the teachers surveyed, technology received more than twice the amount of votes as writing, the next highest topic of concern. These outcomes concur with findings from the U.S. Department of Education (1999), which report that both new and experienced teachers do not feel comfortable with or prepared to use technology in their profession.
Moreover, teachers at Southside Elementary have recognized their technological limitations and have suggested teacher training as an option to satisfy their professional needs. A number of training programs have been implemented, but they have not been satisfactory. During the 1999/2000 school year, all teachers at Southside Elementary were trained in five technology training sessions. These training sessions were taught independent of one another without a pragmatic connection. Six teachers also attended a 3-day state sponsored Florida Educators Technology Conference (FETC) workshop. At the end of the 1999/2000 school year, information was collected by the IIT to help determine the global professional development needs of the staff. Results revealed that, despite previous training sessions, very few teachers felt comfortable or proficient using technology in the classroom.

Moreover, previous technology workshops at Southside Elementary had been planned and organized around single-day training sessions with no continued support. More importantly, all previous technology training in the school was conducted to meet outcome-based objectives, with little or no attention to the professional development process or learning conditions for adults. Further, such technology staff development at Southside Elementary was not based on staff development research findings by experts such as

In addition, the National Center for Educational Statistics (1999) reports that approximately 80% of K-12 teachers do not perceive themselves as well prepared to integrate educational technology into their teaching methods. At Southside Elementary, a follow-up survey by the IIT to previous technology training was conducted by the school technology committee to assess the degree of proficiency with various computer software and applications. Results indicated that a wide variety of computer training would be required to address the needs of the faculty, even though numerous previous technology training sessions had been delivered. Further, individual responses to the survey indicated apprehensiveness and anxiety toward computer usage.

Purpose of the Study

Thus, based on these findings, this study was undertaken to assess teachers' responses and attitudes toward the technology learning experience after exposure to a computer learning model, the Technology Learning Model (TLM), as well as the level of impact achieved (Joyce & Showers, 1980, 1983). The study design was naturalistic inquiry, and particular attention was paid to teacher attitudes and feelings toward the TLM, which incorporates ongoing support, access to computers, time to implement
newly acquired computer skills, and time to discuss technology with cohorts. To implement the study, the IIT and the technology committee helped the researcher design a 1-week pilot study to address the scope and sequence of objectives for a 10-session teacher training.

To ensure successful staff development for teachers, the study was designed to incorporate necessary aspects which foster adult learning. Several factors warrant consideration in the design of a technology staff development program. Some of these are participant input, administrative support, appropriate time for implementation, available support personnel, and computer resources (Brand, 1998; Brooks, 2000; Darling-Hammond & McLaughlin, 1995; Fullan, 1985, 1991; Joyce & Showers, 1980, 1983, 1988; McKenzie, 1993, 1999; OTA, 1995). These aspects are summarized by Leggett and Prischitte (1998):

The combination of research, historical documentation, and practitioner perspective related to technology implementation clearly suggest these five categories: Time, Expertise, Access, Resources, and Support (TEARS). As the complexity of the technologies and contemporary classrooms increases, focused consideration of each of these factors becomes more important to effectively implementing and sustaining technology. (p. 98)
Research Questions

With such considerations in mind, the following research questions were addressed for this study:

1. How will participants with varying computer skill levels respond to the technology learning model?

2. How does the technology learning model affect participants' attitudes toward integration of computer technology into professional responsibilities?

Significance of the Study

As noted earlier, the computer is a tool which has greatly changed the way society accesses information. Business, commerce, and many other areas of living and working have become dependent on the use of computers and informational technology. Regarding education, Gardner (2000) predicts that computers will greatly change teaching methods and the entire educational process. He insists that if teachers do not accept the responsibility of technology acquisition, the educational system will ultimately be replaced by a more proficient mechanism of informational delivery, one in which teachers' roles could become severely curtailed.

However, a chasm exists between society's dependence on technology, high school graduates' computer proficiency, and teachers' preparedness to use computers in the educational process. Unless teachers are provided with appropriate and effective technological professional development, the
actualization of Gardner's (2000) predictions could potentially endanger the entire educational system.

Numerous organizations and governmental reports have suggested computer training for teachers to counteract the potential demise of public education (National Commission on Excellence in Education, 1983; OTA, 1995; Office of Educational Technology 1996; Panel on Educational Technology, 1997; U.S. Department of Education, 1996, 1999, 2000) Authors such as Jukes and McCain (1999) and governmental reports such as the 1983 U.S. government A Nation at Risk (National Commission on Excellence in Education, 1983) offer evidence that teacher preparation and student performance are matters of national security and global competition. The common message of these reports indicates the urgency and necessity for technological professional development for teachers.

On the more immediate and local levels, information obtained in the study will help identify relevant and beneficial factors present in a technology learning model. Results also are to be shared with two elementary schools which have requested the information, as well as the school district technology personnel, as requested. The data will be potentially used by technology district personnel to establish learning sessions in other similar schools in the county through the use of Public School Technology Fund (PSTF) dollars.
Public School Technology Funds are made available through state grant funding to each school district in Florida. Twenty percent of the funds allocated must be used for professional technology development, but, according to district personnel, some schools are reportedly not taking full advantage of the state funding for technology training. As with many state-funded initiatives, if the underutilization of training monies exists, the district could possibly lose subsequent funding unless it can demonstrate that schools are spending the training portion of the PSTF dollars effectively. Consequently, the district has a close interest in the results of this study.

Finally, results of this study will contribute to the knowledge base of teacher technology training. The study may also serve district personnel in future development of technology training models for educators. As such, with outcome studies, these models may be applicable for implementation in schools across the nation, so that more teachers will become more comfortable and more proficient with the integration of computers in their curricula and the daily use of computers in their classrooms.

Operational Definitions

Attitude. Webster's Third New International Dictionary defines attitude as "a disposition that is primarily grounded in affect and emotion and is expressive of opinions" (Babcock, 1986, p. 141). For the purpose of this
study, teacher attitudes pertained to their disposition, expressed emotions, and opinions toward the TLM as revealed through interviews, participant field notes, and observations. Interview responses were used to measure teachers' attitudes toward the level of impact (Joyce & Showers, 1980) of the TLM, as demonstrated by the integration of computer technology into professional responsibilities.

Behavior. Webster's Third New International Dictionary defines behavior as "the response of an individual, group, or species to the whole range of factors constituting its environment" (Babcock, 1986, p. 199). For the purpose of this study teachers' behaviors pertained to their responses toward the conditions and factors present in the learning model environment. Data were collected documenting teachers' behaviors through recordings of lesson plans, memos, interviews, observations, and participant field notes.

Computer skills. For the purpose of this study, computer skills refer to participants' ability levels in their usage of computer equipment and peripherals. Their needs were determined by the results of a pre-implementation survey administered through the school technology chairperson (see Appendix A). Based on the results, computer skills were taught as appropriate during the 10-session program, the Technology Learning Model.
Integration of computer technology into the classroom by participating teachers. This phrase is operationally defined in this study in several ways. First is teachers' increased awareness of computer use for professional performance. Second is students' increased use of computers. Third is a range of computer applications which includes, but is not limited to, web page design and format, searches for information, email accounts, software programs, word processing, class newsletters, lesson plans, and use of computer peripheral devices.

Technology Learning Model (TLM). The TLM is operationally defined in this study as a 10-session workshop series during 8 weeks for teachers with varying ability levels. Each training session of 1 3/4 hours featured a presenter, with three to four roving troubleshooters available for individual assistance. The TLM is synonymous with the terms, "staff development," "professional development," and "teacher training," and all of these terms will be used interchangeably unless specifically noted otherwise. Generally in the literature, according to McKenzie (1999), in a learning model participants must have input as to the scope and sequence of the training series, whereas the other terms frequently do not take into account the needs and essential conditions of the learner.

Technology. Webster defines technology as "the science of the application of knowledge to practical purposes"
(Babcock, 1986, p. 2348). For the purpose of this study, technology refers to computer equipment, computer components, software, and peripheral devices such as scanners, digital cameras, projection devices, monitors, and printers. In the study, the term as applicable to any equipment other than computers and components was specifically delineated.

Summary

In this chapter, the impact of the computer in recent history was briefly traced first, and the tremendous impact of technology in the public schools and student learning was discussed. Next discussion centered on teachers' technological professional development, which is severely lacking in most schools. Barriers to teachers' technological proficiency were noted, including their limited access and time for training, as well as lack of training itself. However, studies have shown a significant correlation between technological professional development and student achievement.

Southside Elementary, the research site, is well provided with computers and auxiliary equipment. However, several needs assessment surveys have revealed that the sparse teacher training has had little influence on teachers becoming more comfortable or proficient with using computers in their daily responsibilities. Thus, the present study was undertaken to assess the effects of a technology learning
model, a 10-session training technology program, on teachers' attitudes and integration of computer technology into the curriculum. This study is significant not only as a model for other neighboring elementary schools but also for application nationwide to aid teachers to increase their levels of comfort and applications of technology in the classroom.

Chapter II reviews the literature pertaining to this study, followed by a description of the design and procedures in Chapter III. Chapter IV reports the findings of the study, illustrated by tables, and Chapter V discusses these findings and their implications, as well as offering recommendations for further research.
CHAPTER II

REVIEW OF LITERATURE

Technology, Education, and the Work Force

The public educational system in the United States is charged with the responsibility of preparing students for the work force. Historically, the American educational system has been the source of an underlying purveyance of cultural transmission. However, education is lagging in the current technological movement and needs to catch up and lead in the ensuring of ethical computer behavior (Sahlman, 1999).

Advanced technology has burst upon the educational system so quickly that reactions have been slow, compared to the business world (Jukes, 1998). The creation of a new technology culture has quickly pervaded businesses, homes, commerce, and governments (Levin & Thurston, 1996). Thus, today's educational system must make responsive adjustments in the field of technology training so that teachers may meet the needs of children for the future. However, the technological knowledge gap is widening between students and their teachers. As Salpeter (1998) contends, "Children are native to the digital age and adults are immigrants" (p. 30).

Today's children are obviously tomorrow's adult work force. To this point in history, the work force has been a predictable entity, with predictable standards and skills
required of the employee. This history has required minimal changes in the educational system to meet the demands of the work sector (Jukes, 1998). However, the technological revolution has created a discrepancy between highly technical businesses and the technologically dormant educational system. This gap has led to educators playing "catch-up" with society (Levin & Thurston, 1996).

According to technology futurist Jukes (1998), the explosion of new and rapidly changing roles in the workplace complicates education in unprecedented ways. Most adult teachers and parents will not have the experiences necessary upon which they can draw to prepare youngsters for a world in which they can expect to change jobs regularly.

Today only 22% of people currently entering the labor market possess the technological skills necessary for 60% of the new jobs required (Zuckerman, 1994). Such disparity has been long known and prompted the 1983 landmark government report, A Nation at Risk (National Commission on Excellence in Education, 1983). The report addresses teacher preparation methods and compares the educational system and student achievement in the United States with other countries. As a result of this report, which virtually condemns the American educational system, the U.S. government commissioned educational research to establish national educational standards.
National Standards for Students and Teachers

Efforts to produce prepared workers through the educational system have intensified over the past two decades. A number of reports have emphasized the immediacy of addressing the problems. Within the last 10 years, the U.S. Office of Educational Technology has generated two reports indicating the need to produce technologically literate graduates (OTA, 1995, 1996). As a result of the 1997 report to the President on the use of technology to strengthen K-12 education in the United States (Panel on Educational Technology, 1997), President Clinton increased technology funding for schools. This report recommended that a minimum of 30% of all technology allocations be reserved for staff development. Research indicates that the higher the percentage of funds reserved for staff training, the more likely will computers in schools be utilized (U.S. Department of Education, 1996).

According to the OTA (1995) report, the lack of professional development among teachers in technology use is one of the most serious obstacles to integrating technology within the curriculum. Staff development funds should be allocated to address five barriers prevalent in public schools in America which inhibit usage. As noted earlier, these are (a) limited access to computers, (b) limited time for training and computer usage, (c) lack of vision or rationale for technology use, (d) lack of or inadequate
teacher training and support, and (e) poor assessment practices.

Federal assistance is available to public schools through the Technology Literacy Challenge Fund (TLCF), which provides national funding for technology across the United States (U.S. Department of Education, 2000). Funding through this source has been available since 1994, and the federal government has established the following general National Technology Goals:

1. All teachers in the nation will have the training and support they need to help students learn to use computers and the Information Superhighway.

2. All teachers and students will have modern multimedia computers in their classrooms.

3. Every classroom will be connected to the Information Superhighway.

4. Effective software and on-line learning resources will be an integral part of every school's curriculum to help ensure that no child is left behind.

In addition, in 1998, to ensure consistent technological learning environments in schools across the nation and specific computer standards for students, the National Educational Technology Standards (NETS) for Students was created by the International Society for Technology in Education (ISTE). This initiative was funded by the U.S. Department of Education; the National
Aeronautics and Space Administration (NASA); the Milken Exchange of Education Technology; and Apple Computer, Inc. (U.S. Department of Education, 1999).

State Standards and Goals

In the state of Florida, the Florida Department of Education, Division of Educational Technology, created a technology framework for the public schools within the state (Florida Department of Education, 2000). This plan reflects the input and deliberations of the Florida Education Technology Planning Task Force, and serves as a guidepost for instructional technology planning within the state. The framework consists of six goals to foster the effective use of technology:

1. All students and educators will have equitable and effective access to technology during and beyond the school day.

2. An infrastructure that supports all students will provide state-of-the-art voice, video, and data access to the point of learning.

3. In order to enhance the impact of technology on student performance, all educators will master and model educational technology standards as established by the Department of Education.

4. All educators will receive "just-in-time" support.

5. All students will become proficient users of technology.
6. Schools will be accountable for the effective utilization of technology resources by educators and students.

These state goals clearly place educational responsibility with teachers, educational leaders, school centers, and school districts to integrate technology into the classroom and model effective technology standards. These goals further illustrate the need for instructional technology professional development for teachers.

Local District Goals

Local school district goals have been established with consideration of national, state, and local environments. In the district of this research site, 16 goals were formulated by school district technology personnel and school board members. In alignment with the district mission statement the school district technology goals are as follows:

1. Provide teachers and administrators with staff development opportunities that will enable them to successfully integrate technology into classroom instruction and improve their professional productivity.

2. Provide support to high-needs Quartile I and II students.


4. Provide educational technologies that will make students active participants in their own learning and
enable them to acquire the skills to become lifelong learners.

5. Assure that acquired technologies are integrated into the curriculum in a manner which reflects the goals and standards of Florida's Initiative in School Improvement and Accountability and the Florida Sunshine State Standards.

6. Establish a continuum of K-12 student performance competencies for the application of technology.

7. Identify and support the use of technology that facilitates the use of information for data analysis.

8. Identify and utilize adaptive and assistive devices that make technology available to all learners, including students with special needs.

9. Identify and support student use of technology that is present in the modern workplace.

10. Provide access to electronic communications by establishing, maintaining, and upgrading the district-wide data and voicemail, including expanding Internet access for appropriate educational uses.

11. Identify and support the use of technology for educational, professional, and personal growth and development, thereby enabling learners to be global and responsible citizens.

12. Provide direction and support to school centers, enabling them to maximize their investments in technology, assuring adherence to district-established core standards,
facilitating volume purchasing, and assisting them with future decisions.

13. Provide ongoing opportunities for all district departments that support instructional technology, to share information on the needs and plans with regard to implementation of instructional technology projects for the school centers, as well as to continually review, monitor, and review this instructional technology plan.

14. Comply with federal, state, and local health, safety, and administrative codes and regulations.

15. Progress toward providing a 1:5 ratio of multimedia computers to students, as proposed by the Department of Education.

16. Ensure equitable access to technology for all schools and students.

Several of these district goals were addressed through the course of this study, most importantly the first, which promotes staff development and integration of technology into classrooms. Achievement of other district goals, such as the 11th, 12th, and 13th, relate in varying degrees to this study and are contingent upon the effectiveness of the TLM.

Can Technology Shape the Future of Education?

With the enunciation of such comprehensive national and local technological goals, how, then, can technology shape the face of education? Technology experts Bielaczyc and Collins (1999) predict a shift from teacher lecture and
recitation to coaching, and a shift from whole-class to individualized instruction. This shift will result in a transformation from the traditional didactic approach. Because these authors contend computer usage entails active learning, this change in practice will eventually foster a shift in society's present paradigm toward a more constructivist view of education.

Similarly, many experts anticipate a radical change from the traditional educational approach to a more individualized and cooperative approach to educating children. Computer technology is seen as the catalyst which will make this conversion possible. In fact, Gardner (2000) predicts:

In the future, education will be organized largely around the computer. Computers will permit a degree of individualization-personalized coaching or tutoring--which in the past was available only to the rich. All students may receive a curriculum tailored to their needs, learning style, pace, and profile of mastery, and record of success with earlier materials and lessons. Indeed, computer technology permits us to realize, for the first time, progressive educational ideas of personalization and active, hands-on learning for students all over the world. (p. 35)

Such a vision is exciting indeed and augurs new concepts of learning and innovative roles for both teachers
and students. Although some futurists, such as Cuban and Tyack (1995), maintain that schools will not support the radical changes heralded by technology, Gardner (2000) and others predict that computers will be the impetus for educational reform (Collins, 1991; Jukes, 1998; Papert, 1996). However, in spite of a decade of governmental reports, national student technology standards, state and local initiatives to increase computer usage, and warnings and promptings from futurists, most schools across the nation have taken few steps to implement technology into the curriculum that would affect the delivery of instruction in the classroom (Maddin, 1997).

Concepts of Effective Professional Development

Change

It is clear that the presence of computers alone will not drastically change the way teachers teach and students learn without effective technology training for teachers. As Poole and Morgan (1998) contend, too often money is spent on teacher technology training and computers still sit collecting dust. Poorly designed staff development, including one-shot workshops and lack of continued support, leads to the overall ineffectiveness of technology training.

Even with training, Hixson and Tinzmann (1990) suggest that meaningful change will only take place when schools take into consideration the attitudes, beliefs, knowledge, and skills necessary to translate new ideas and concepts
into meaningful and specific plans for change. However, change, especially in professional development, should take place gradually and incrementally (Doyle & Ponder, 1977; Fullan, 1985; Sparks, 1983).

An important variable in greater acceptance of technology integration is the support and vision of the school administration. These elements are critical components to the increased quality of professional development and its overall success (Kinnaman, 1990). However, administrative support alone will not bring about change in teacher attitudes and behaviors toward the use of technology (Persky, 1990). Fullan (1985), a professional development expert, asserts that meaningful staff development involves change, and change involves loss, anxiety, and struggle. It is with such recognition that Cuban and Tyack (1995) predict teachers will not shift from traditional methods of instruction. In addition, teachers are little motivated to use technology because many view computer technology as another passing fad (McKenzie, 1993).

Moreover, measurements of change should not be reported in linear terms (Fullan, 1992) and are greatly dependent on the goals and contexts in which change occurs (Loucks-Horsley, 1997). Both Miles and Huberman (1984) and Fullan (1992) suggest that the unique characteristics of instructional settings will always be critical factors in education. What may be successful in one situation may not
be in another. For this reason, professional development must conform to the needs of the specific organization and individuals involved and must contain a component of contextual flexibility (Griffin & Barnes, 1984; McLaughlin, 1990).

**Innovation**

Rather, adoption of such innovation must take place over time, through the process of diffusion. Rogers (1983), the founder of diffusion theory, defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p.10).

Rogers (1983) maintains that adoptions of innovations, such as technology, are made over time, and change occurs only through the experiences of individuals. Rogers' diffusion theory, although developed for social anthropological work, has clear relevance to the study of how instructional technology is accepted in organizations (Stefl-Mabry, 1999).

Rogers (1995) further describes the innovative-decision transfer. It is the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to
implementation of the new idea, and to confirmation of this decision. (p. 20)

Thus, the transformation from innovation to adoption consists of stages over time and involves groupings of people according to five adopter categories: (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. It is documented that up to 68% of individuals appear in the early and late majority with less than 3% acting in the innovator category.

Innovators are change agents, and Rogers (1995) describes seven essential functions of change agents:

1. To develop a need for change on the part of the client [or school].
2. To establish an information-exchange relationship.
3. To diagnose problems.
4. To create an intent in the client to change.
5. To translate an intent to action.
6. To stabilize adoption and prevent discontinuance.
7. To achieve a terminal relationship. (p. 337)

It is the role of the change agent, and in the particular case of the TLM, the researcher's role, to create a positive climate in which Rogers' change conditions can be achieved.

Rogers' (1995) precepts had an influence on the present study. However, there are distinct differences concerning the role of the implementer. Rogers (1995) contends that the implementer's role must be one of change agent, and that
change occurs over time in a linear fashion. However, the present study emphasizes rather the facilitative role of the implementer through the comprehensiveness of delivery methods, responsiveness to participants' needs, and attention to their responses to their learning experiences.

With these observations in mind, professional analysts recognize that the few advances in technology implementation in schools to date are largely due to the lack of innovation, leadership, and support in the delivery model of professional technology inservice (OTA, 1995; Woolley, 1998). Truly successful professional training programs must, according to Woolley (1998), "go beyond teaching about technology; they must also help teachers understand how technology relates to student learning" (p. 62). This concept closely concurs with findings by Knowles (1995) and Brandt (1998), who assert that learners must experience the value of what is to be learned in order to maintain meaning and relevance.

The Role of Adult Learning Concepts

Potential solutions to remedy the lack of success in traditional technology professional development practices have been suggested by McKenzie (1999). A former superintendent of schools in Bellingham, Washington, he suggests that those responsible for technology training may have possibly trained staff adequately in terms of time, but have failed to recognize and address adult learning
concepts. That is, the problem with much of professional development may be not the reluctance of the trainees but the absence of important learning conditions in the teaching.

McKenzie (1999) concludes that professional development offerings are usually attempts to impose a predetermined set of objectives upon the would-be learner through a training model rather than a learning model. Training models typically involve objectives of trainers and systems and are pedagogical in delivery, whereas learning models consider the needs and abilities of the learners, and parallel those precepts of andragogical methods.

In this regard, Knowles (1995), known as the father of andragogy, delineates the difference between these two models. Pedagogical methods are typically used for students, and instructors are given the sole responsibility of deciding the scope and sequence of what the pupils should learn. In contrast, andragogical methods address adult learners, involving them in the planning and learning processes: "adults are themselves the richest learning resources for one another for many kinds of learning" (Knowles, 1995, p. 2).

Process and Product

Further, each individual has his or her own learning pace and style, and thus experiences learning uniquely. Smith (1982) differentiates important concepts of learning:
a) when learning refers to a PRODUCT, the emphasis is on the outcome of an experience: the acquisition of a particular set of skills or knowledge, b) when learning describes a PROCESS, the emphasis is on what happens when a learning experience takes place: how learners seek to meet needs and reach goals, c) when learning describes a FUNCTION, the emphasis is on aspects believed to help produce learning: how learners are motivated, what brings about change (pp. 34-35)

Thus, according to Smith (1982), the product of learning is more frequently analyzed than the process and function. Product results can easily be obtained through quantitative measures, whereas analysis of the process and function of learning can be assessed through qualitative methods.

The human learning condition has been studied extensively. Summarizing research on human learning, Brandt (1998) describes the 10 most important conditions in which people learn best:

1. People learn what is personally meaningful.
2. People learn when they are challenged and they accept the challenge.
3. People learn when content is appropriate developmentally.
4. People learn best in their own way, when they have choices, and when they feel in control.
5. People learn when they use what they already know as they construct new knowledge.

6. People learn best when they have social interaction.

7. People learn best when they receive helpful feedback.

8. People learn best when they acquire and use strategies.

9. People learn best when they experience a positive emotional climate.

10. People learn best when the environment supports the intended learning. (p. 11)

Following from such principles and in application to professional development, experts such as Brandt (1998) and Knowles (1995) fully support emphasis on process and function of professional development rather than the product. Other researchers in staff development have distilled several crucial principles, based on research, that incorporate these 10 significant learning principles.

The following principles for staff development result from the work of Darling-Hammond and McLaughlin (1995), Fullan (1992), Lieberman and Miller (1991), and Loucks-Horsley (1997):

1. Staff development must engage teachers in concrete tasks of teaching, assessment, observation, and reflection that illuminate the process of learning and development.

2. Staff development must be grounded in inquiry,
reflection, and experimentation that are participant driven.

3. Staff development must be collaborative, involving a sharing of knowledge among educators and focus on teachers' communities of practice rather than on individual teachers.

4. Staff development must be connected to and derived from teachers' work with their students.

5. Staff development must be sustained, ongoing, intensive, and supported by modeling, coaching, and the collective solving of specific problems of practice.

6. Staff development must be connected to other aspects of school change.

Optimal Learning Climate

For staff development to be maximally effective, the environment of the learning is crucial. Einstein once commented, "I never teach my pupils. I only attempt to provide the conditions in which they can learn." This observation is paramount to the success of any professional development effort.

The optimal learning climate is integrated with the adult learning principles identified above. Both Brandt (1998) and Knowles (1995) emphasize the importance of a nurturing psychological climate and an atmosphere of pleasure so that adults may achieve their full learning potential. In fact, Knowles (1995) points out that positive psychological conditions are more important than physical surroundings for adults. He pinpoints the following:
1. A climate of mutual respect.
2. A climate of collaboration.
3. A climate of mutual trust.
4. A climate of support.
5. A climate of openness and authenticity.
6. A climate of pleasure.
7. A climate of humanness. (p. 6)

Brandt (1998) concurs, emphasizing that learning takes place best in positive and stimulating settings, with curiosity, excitement, laughter, enjoyment, and appreciation. Both Brandt (1998) and McKenzie (1999) point out that the learner's emotions must be engaged for meaningful change to occur. Brandt (1998) contends further that strong emotions actually enhance memory in the learning process.

Learner Involvement and Proficiency

For successful staff development, the first and most important step in meeting the optimal psychological conditions is the collaborative preplanning involvement phase with participants. That is, learners' input should be solicited as to topics of interest, as well as the level of proficiency they bring to the subject.

In staff technology development, it is vital to ascertain the teachers' levels of proficiency (McKenzie, 1999). Prior to entering a course of study, participants need to determine their technological comfort level to help
create their personal and individual goals (Hite, 2000). McKenzie (1999) recommends the use of questionnaires and surveys to help guide the planning of professional development. In particular, he suggests the Mankato Survey of Professional Technology Use, Ability and Accessibility Version 1.0, to collect data on potential participants in technology staff development (McKenzie, 1999).

Created by Johnson (2000), the Mankato instrument is widely used and is somewhat of an industry standard for assessing teacher proficiencies in order to construct meaningful technology training for teachers. The researcher communicated with Johnson via email and arranged to speak with him during the Florida Educator's Technology Conference (FETC) in Orlando prior to study implementation. From this communication it was ascertained that the instrument is a compilation of assorted various technology assessment instruments and has no established psychometric dimensions.

The Mankato Survey is one measure of technological proficiency. In addition, Morton (1999) suggests the "Stages of Use" questionnaire (p. 10). Morton used this questionnaire to document participants' progress, and the first use was to assess participants' level of proficiency. Further, informal discussions with participants should take place before the beginning of the program. In these discussions, especially if they are conducted in an open, respectful, and pleasant climate (Knowles, 1995), learners
will reveal their needs, desires, and anxieties. Such feedback will guide the design of an optimal program and increase the probability of successfully meeting the learners' needs (McKenzie, 1999). Such methods to ensure the learner involvement are essential to the planning and success of a professional development program.

Models for Professional Development

Participant input and assessment of proficiency are the first steps in design of a program. Several factors must be considered, and a number of models exist to guide this design.

A professional development model which creates a nonthreatening environment sensitive to the individual learner's level of expertise and experience is critical (Shelton & Jones, 1996). Research suggests that enthusiasm for technology integration will dissipate if sufficient support and skill maintenance which promotes the use of newly acquired skills is not provided during the implementation phase (Garavaglia, 1996). The most effective models are those which incorporate cooperative learning, collaborative problem solving, and participant feedback. Such models lead to professional development effectiveness (Stager, 1995; Tucker & Mandel, 1986).

The Technology Acceptance Model was developed by Davis (1983), based on Rogers' (1983) early change theories on innovation and adoption. The Technology Acceptance Model
addresses (a) perceived usefulness, and (b) perceived ease of use. As Davis (1983) asserts, the effectiveness of professional development is contingent upon the achievement of usefulness and ease of use.

Ease of use may often be dependent on ease of attendance. Researchers have found that training sessions work best when they do not occur during the day, but rather after school when teachers do not feel the responsibility to return to class (Shelton & Jones, 1996). In accord with change and adult learning theories, Brooks (2000) recommends incremental training, e.g., 15 to 30 hours of technology training delivered over time as the most effective means to train teachers.

To better facilitate learning, Brooks (2000) supports a training model which is combined with application. Participants experience a session of training and then integrate new skills into their classrooms prior to the next training session. The design of the current technology learning model incorporated this approach. The training took place over 8 weeks, for 10 sessions, and totaled over 15 hours of after-school technology training. Weekly intervals between sessions allowed participants to practice learned skills before advancing to other topics and skills.

Design of the technology learning model was also influenced by corporate and educational models of technology training and adult learning. Several educational technology
development models have been implemented over the past two decades. The Essen Learning Model is often applied to various technology and staff development initiatives (Adelsberger, 2001). This model was established at the University of Essen in Germany and consists of the development of three processing levels: development of curricula, learning sequences, and learning units.

Another important model is the Concerns-Based Adoption Model, developed by Hall and Hord (1987), which has been applied to instructional technology in various studies. The premise underlying this model, which was developed through change theories and is in accordance with staff development principles, is that staff development must be directly related to the needs of the teachers. As Hall and Hord (1987) maintain, "Historically teachers have all too often been provided with workshops, materials, and other resources based on the needs of others rather than on an understanding of teachers needs" (p. 5). In the Concerns-Based Adoption Model, Hall and Hord (1987) focus on the stages of concern, levels of use, and innovation configurations. The instructor acts as a change facilitator, working together with participants to meet their collective needs (Hall & Hord, 1987).

Such learner-based andragogical methods were the subject of Joyce and Showers' (1980, 1983, 1988) extensive research. Spanning over three decades, their work led them
to synthesize five essential factors that contribute to the transfer of knowledge or skills into classroom practice, and it is these that comprise their model:

1. Presentation of theory or description of a new skill behavior.
2. Modeling or demonstration of strategy or skill.
3. Initial practice in simulated or protected settings.
4. Structured and open-ended feedback about performance.
5. Coaching for application. (Joyce & Showers, 1983)

In individual training, these components vary in degree of importance for achievement of the transfer level of impact. Evidence suggests that modeling and feedback are the most important components (Joyce & Showers, 1983). However, for optimal effectiveness, all five components should be emphasized.

The Joyce and Showers (1983) transference model, and their (1980) typology of levels of professional development impact, helped formulate one of the rubrics of measurement of this study. This typology is as follows:

1. Awareness.
2. Concepts and organized knowledge.
Studies of Technology Training

These models and others have been used in a number of studies on aspects of professional technology development. The present TLM was designed after extensive study of these models and careful adaptation of several significant components. In a qualitative technology-related study, Morton (1999) conducted interviews, recorded field notes, and administered of a Stages of Use Questionnaire. Thus, descriptive analysis was supported by questionnaire results. Her research supported the application of Hall and Hord's (1987) Concerns-Based Adoption Model for change.

In Morton's (1999) study, the Stages of Concern (SOC) questionnaire was administered three times during the 4-month implementation period to evaluate participants' progression through the application of Hall and Hord's (1987) change theories. However, Morton's (1999) research addressed only grades K-3 and was limited to a single case study. Consequently, one of her recommendations was to broaden the inquiry to provide a more distinct understanding of the implications of instructional technology staff development at the elementary school level.

In comparison with Morton (1999), the current 10-session TLM incorporates Joyce and Showers' (1980) professional development level of impact model, as well as Knowles' (1995) adult learning conditions. Further, whereas Hall and Hord (1987) and Morton (1999) obtained results on
outcomes of staff development and did not relate findings to the process and function of learning within the staff development itself, in the current TLM assessing such relationships was a primary consideration.

In another study related to the present research, Nelson (1998) designed a qualitative/quantitative study which investigated the effect of a 2-week staff development technology workshop on teachers' ability to integrate technology into instruction. Data were gathered through interviews, email messages, lesson plans, and a survey. Results of the study indicated a relationship between learning and technology integration in three areas:

(1) The level of confidence a teacher has when problem solving and the method by which a teacher may approach or avoid a problem may be indicators as to the level of technology integration for that teacher; (2) the level of control needed in the role of the teacher may be an indicator as to whether a teacher may move beyond the integration level in the technology integration hierarchy; (3) and the view of what is important for professional development sessions on technology may be influenced by the level at which a teacher integrates technology. (Nelson, 1998, p. iii)

Nelson's (1998) conclusions reflect a correlation between integration levels and what teachers believe is important in professional development. In addition,
collaboration during training seemed to promote the general acceptance and success of the seminar. The presence of collaboration in staff development for adults is necessary for effectiveness of a program, and consequently was incorporated in the development of the TLM (Darling-Hammond & McLaughlin, 1995; Fullan, 1985; Knowles, 1995; Lieberman & Miller, 1991; Loucks-Horsely, 1997).

However, there are several differences between the Nelson (1998) study and the present TLM design. Nelson did not delineate between pedagogical methods and andragogical strategies. She therefore did not provide specific learning conditions for adult learners. Her study also included students, was outcome-based, and classified participants into five levels of integration: (a) familiarization, (b) utilization, (c) integration, (d) reorientation, and (e) evolution. A primary emphasis was the improvement of students' critical thinking, and the implementation of the staff development technology workshop was geared toward meeting the needs of students through technology.

Like Nelson's (1998) study, the prevailing goal of previous technology training workshops at Southside Elementary focused on behavioral changes of professional practices through the use of technology. However, as discussed earlier, results of the 1998/1999 Instructional Innovation Team staff development needs survey revealed that teachers effected little or no application of technology or
integration of technology into instructional practices or professional responsibilities, as a result of the previous outcome- or product-based technology workshops.

This result supports Showers, Joyce, and Bennett's (1987) generalization: "For a complex model of teaching to reach implementation, we estimate that about 25 teaching episodes during which the new strategy is used are necessary before all the conditions of transfer are achieved" (p. 86). Therefore, the present technology learning model emphasized support, feedback, collaboration, alternating instruction and application, and the learning continuum of the participants.

Evaluation

Evaluation of technology professional development outcomes is nevertheless as important as appropriate elements of design. The International Society of Technology in Education (ISTE) (1993) itemizes four accepted levels of evaluation of technology professional development outcomes. These are as follows:

1. Level I: Implementation of the inservice program. This level addresses the quality and integrity of the training itself.

2. Level II. Teacher improvement. This level addresses and measures actual classroom behavior change with participating teachers.

3. Level III. Change in student performance. This level
addresses the degree to which student improvement is
impacted as a result of the participation of teachers in the
professional development.

4. Level IV. Changes in the environment. Through this
level, systemic, attitudinal, and climate issues toward
technology may be addressed. (p. 15)

According to the ISTE (1993), most school-based and
district technology professional development occurs at
Levels I, II, and III, and "almost none are evaluated at
Level IV. Thus, we gain little information about whether the
professional development is really making a significant
difference" (p. 15). In recognition of this statement, the
present study analyzed Levels I, II, and IV with specific
emphasis on Levels I and IV.

The foundation for the design of this study was
grounded in this review of pertinent literature. Especially
pertinent to the creation of the TLM have been the work of
Crucial to the overall design, implementation, and
evaluation have been the works of Brandt (1998), Joyce and
(1999). Through incorporation of the precepts and models of
these researchers, this study sought to provide the
fundamental learning conditions, enhance teachers'
professional technology development, and enable them to
utilize technology in the classroom to increase student achievement (Showers et al., 1987).

The next chapter describes in more detail the design of this study and the procedures implemented. With reference to the literature, the descriptions include both the creation of the 10-session training program and the evaluation of the processes and experiences of the participating teachers.
CHAPTER III

DESIGN

Purpose of the Study

The purpose of this qualitative phenomenological study was to assess the attitudes, perceptions, behaviors, and responses of teachers with varying computer skills after exposure to a technology professional development learning model, the TLM, as well as to assess the level of impact achieved by their technology integration in the classroom. To effect this purpose, a necessary component was the design of the TLM, the 10-session, 15-hour program in staff development. This study was guided by principles of adult learning concepts and conditions as enunciated by Knowles (1995); principles of effective staff development as described by Darling-Hammond and McLaughlin (1995), Fullan (1985), Joyce and Showers (1980), and Loucks-Horsley (1997); and the technology development models of Davis (1983) and Hall and Hord (1987).

Two research questions were formulated for this study:

1. How will participants with varying computer skill levels respond to the technology learning model?

2. How does the technology learning model affect participants' attitudes toward integration of computer technology into professional responsibilities?
Research Design

The research design used a qualitative phenomenological approach with grounded theory methods, in which multiple sources of data were used, compared, and interrelated (Miles & Huberman, 1994). A qualitative approach was chosen for several reasons. First, educational experts have noted the lack of impact of educational research on practice. Such research has been largely quantitative and therefore little related to teachers' daily experiences and concerns (Bolster, 1983).

Second, the naturalistic qualitative approach emphasizes the teachers' perspectives, experiences, and understanding of a particular setting. Results of these studies have far more potential for accurately informing educational practitioners of problems and potential problems than quantitative results (Bolster, 1983). Observations of participants involved in staff development can provide evidence of technology use in an actual work setting environment. Interviews can be used to provide rich descriptions of each participant's perceptions of his or her experience in the learning model (Miles & Huberman, 1994).

The value of the qualitative approach in teacher training was pointed out over 20 years ago by Patterson and Czajkowski (1979):

Effective implementation of social innovations [those that require role changes] requires time, personal
interaction and contact, inservice training, and other forms of people-based support. Research has shown time and again that there is no substitute for the primacy of personal contact among implementers, and between implementers and planners/consultants, if the difficult process of unlearning old roles and learning new ones is to occur. All this means is that new approaches to educational change should include longer time perspectives, more small-scale intensive projects, more resources, time and mechanisms for contact among would-be implementers at both the initiation or adoption stages, and especially during implementation. Providing these resources may not be politically and financially feasible in many situations, but there is no question that effective implementation will not occur without them. (p. 161)

More recently, the Panel on Educational Technology (1997) of the President's Committee of Advisors on Science and Technology (PCAST) supported the qualitative approach for effecting change in the use of technology. The panel members concurred that "the real promise of technology in education lies in its potential to facilitate fundamental, qualitative changes in the nature of teaching and learning" (p. 33).

Third, the use of qualitative methods enables the researcher to describe and analyze patterns of relationships
among participants from many data sources (Miles & Huberman, 1994). Consequently, in the present study, participants' experiences regarding the Technology Learning Model were examined by a search for themes and patterns within and across sample groups. Open-ended interviews resulted in a thematic narrative, with supporting data collected from observations, memos, participant field notes saved on diskette, researcher field notes, and examination of the sample groups' lesson plans. To arrive at the results, the researcher triangulated the data from all of these sources.

Setting

This study was conducted at Southside Elementary School located in a suburban area in South Florida. The county in which the school resides spans nearly 2,300 square miles and includes a broad spectrum of socioeconomic representation among its residents. The county has recently been impacted by a rapid population growth, due to the migration to Florida by a diversity of U. S. citizens and foreign immigrants.

The district is home to nearly 140 schools and serves over 150,000 students, with a yearly growth rate of 5,000 students. Southside Elementary is 12 years old. Prior to 1999/2000, enrollment had grown to 1,500. However in that year, the school experienced a large change because 415 gifted students, 385 regular education students, and 53
employees were moved to a nearby newly opened school to relieve overcrowding at Southside Elementary.

Presently Southside houses 700 kindergarten through fifth-grade students. The school employs 72 faculty members, including 33 teachers, 24 of whom are regular education teachers. Experience among the teachers ranges from one first-year teacher to educators with over 30 years of elementary teaching experience. On the average the faculty has 12.5 years of teaching experience. Class size ranges from 25 to 34 students per teacher. Seventy percent of the students are White, with 7% Black, and 14% Hispanic. Students on free and reduced lunch programs have doubled over the past 2 years to 15%.

This change has affected Southside's standing in student achievement. Public schools in Florida are graded according to student standardized test results in grades 3 through 10. Grades awarded to schools range from "A" for outstanding performance schools to "F" for those with insufficient standardized test scores. Southside Elementary has been awarded the grade of "A" for the past 2 years, the best rating available to schools in Florida. However, the student population has changed as a result of boundary changes and the opening of the new school. With the doubled percentage of students on free and reduced lunch programs and the elimination of gifted students from Southside, test
scores are expected to drop for the 2000/2001 school year, resulting in the potential of a lower state grade.

It has been widely acknowledged that student achievement increases with use of computers in the classroom (U.S. Department of Education, 1999; Wilson et al., 1994). At Southside, however, despite the abundant technology resources, as described earlier, of two computer labs and 317 computers, teachers use few of these resources for their professional responsibilities. Therefore, administration of the TLM is especially timely.

Instrumentation

Several instruments were used in this study. These were the School-Based Technology Survey (see Appendix A), the Mankato Survey of Computer Skills (see Appendix B), the Focus Group Questions and Discussion Form (see Appendix C), and Participants' Interview Questions (see Appendix D).

Southside Technology Survey

This instrument was designed by the researcher in conjunction with the technology chair and instructional innovation committee chair. The survey was based on the recommendation of Maddux (1985) for collecting and organizing information in new disciplines, as well as the technology chair's experience with needs assessment surveys. In addition, this survey was intended to provide a benchmark of teachers' needs and interests in anticipation of attendance at an inservice technology program. The survey
also asked for teachers' self-assessments in their knowledge of computer skills (basic, intermediate, advanced). In addition to this self-assessment, three sections asked for their interest in learning about general computer skills, the Internet, and applications. Space was left for additional software programs they would like to see addressed.

**The Mankato Survey**

The Mankato Survey of Professional Technology Use, Ability and Accessibility, Version 1.0 (Johnson, 2000) was created and utilized in 1997 for the Mankato Public Schools in Mankato, Minnesota, and has been widely used to assess teacher computer proficiency. The survey has been modified by various school districts such as the Bellingham, Washington, school district, and is recommended for use by several educational technology experts (Anderson, 2000; Carter, 1998; McKenzie, 1999). The Mankato Survey was used to delineate participants' computer proficiency levels and to compare these with their self-reported computer proficiencies on the Southside Technology Survey.

The Mankato Survey does not need to be used in its entirety. Johnson (2000) recommends the use of selected portions of the assessment on the basis of information desired. For the purposes of this study, the applications section of the Mankato Survey, which contains proficiency and frequency rating scales, was used to compile data from
participants to ascertain their responses according to individual skill levels and usage rates.

Seven interrelated sections of the Mankato Survey were used in this study. The first was a short demographic survey, including participant's primary job function, level of instructional responsibility, gender, primary school computer platform, home computer platform, and home Internet access. The second was 19-item applications section, including rating availability, proficiency, importance, and frequency of many applications, such as word processing, email, and graphics on 5-point scales (5 = high, 1 = low). The third section was on frequency of use of 11 technology resources, such as computer, fax, and laser printer, on a 5-point scale (5 = high, 1 = low). The fourth was a two-question section on a 5-point scale (5 = high, 1 = low) on frequency of computer use in school, classroom, home, and other.

The fifth section measured 11 attitudes about technology, such as "I am comfortable learning about using technology," on a point scale (3 = Strongly agree, ? = Not applicable). The sixth section asked for five preferred times for inservice training, e.g., "After school," on a 4-point scale (3 = Very likely, 0 = Very unlikely). The seventh section measured 11 items concerning the importance of support services, e.g., "Computer to take home," on a
4-point scale (3 = Very important, 0 = Would not use). Space was available for additional comments.

The Mankato Survey is widely used as an educational standard assessment of teacher computer proficiency. The researcher spoke with the creator of the instrument at the Florida Educators Technology Conference (D. Johnson, personal communication, January 12, 2001). He reported that the Mankato is an eclectic assessment compiled for the use of the Mankato School District and has no tested psychometric parameters. For the creation of the Mankato, important information and questions from other various computer proficiency assessments were excerpted. This instrument was used in the present study only to verify the self-reporting of the sample population and was not utilized for the data analysis. Thus, the Mankato was incorporated solely into the preliminary aspects of the study.

Focus Group Questions

The focus group questions consisted of five questions asking for participants' input on, for example, what they would like to have covered in the TLM, what barriers they have experienced in previous technology training, and what they would like to experience from this training series. These questions were formulated by the researcher and the technology chair after informal discussion and feedback with teachers. The questions were also based on the literature on staff development, technology training, and barriers to
computer usage by experts such as Joyce and Showers (1980), Knowles (1995), and OTA (1995).

Participants' Interview Questions

The open-ended interview questions for participants originally numbered 14 questions, and requested participants' input on their self-perceived level of technological proficiency after the training, as well as their views on many elements of the training and suggestions for future workshops. The questions were constructed to elicit a wide range of responses yet structured enough to provide information in answer to the research questions. As the interview progressed, and based on participants' responses, an additional seven questions were added (noted by asterisks in Appendix D), based on participants' responses and member checks. The original 14 questions were formulated as a result of participants' responses to the School-Based Technology Survey, the Mankato Survey, and the models of Morton (1999) and Nelson (1998). For validation of questions, the researcher consulted with the school technology chair and dissertation chair, both of whom provided input, suggestions, and eventual approval.

Population and Sampling

The population for this study was comprised of all teachers at Southside Elementary. Two months before implementation of the TLM, the Southside Technology Survey was distributed, with accompanying consent forms for
participation (see Appendix E) and the use of audiotape for interview (see Appendix F).

Teachers who returned the survey and forms, and who indicated they were able to participate in the TLM, comprised the sample. Many teachers could not participate because of scheduling conflict and child care responsibilities, but they indicated interest in future summer computer training sessions. A total of 20 teachers completed the Southside Technology Survey. From these a sample population was formed of teachers based upon outlying data on their computer usage and proficiency rating (Miles & Huberman, 1994).

After all participants completed the two surveys, two teachers from the lowest third, intermediate third, and highest third were purposefully selected. Stratification was verified and cross-referenced with the Southside Technology Survey and the Mankato Survey. The final sample population consisted of six teachers, with two teachers in each of the following categories of technological proficiency: beginner, intermediate, and advanced.

A systematically selected small sample size provides more confidence in conclusions than does a sample population of similar size based upon random selection (Maxwell, 1996). Stratification of the participants into three different skill levels enabled the researcher to evaluate the effectiveness of the learning model in meeting the needs of
participants with varied levels of technological ability. Moreover, stratification of sample groups also enabled the researcher to address within-case groups and cross-case group analysis (Miles & Huberman, 1994).

Procedures

The procedures for this study took place over 2 months. Six months prior to implementation, a pilot study training session was conducted. This session was conducted for the purpose of evaluating presenter effectiveness and eliciting participants' feedback on all aspects of the session. In the early fall of 2000, the researcher and the technology chair met several times to discuss implementation of the study. The researcher also consulted with the facilitator of the pilot study to discuss potential topics and presenters for the TLM. In November 2000, 3 months prior to the start of the TLM implementation, the technology chair distributed the Southside Technology Survey to all future participants. All 20 teachers returned the survey, and in December 2000, 1 month prior to the implementation, the Mankato Survey was administered to all participants to create a framework of grounded theory (Maxwell, 1996).

As noted above, results of these two surveys were used to stratify participants into three groups of beginner, intermediate, and advanced for purposeful sampling. During this time as well, the researcher conducted consultations with the technology chair and district technology personnel,
who were extremely supportive and generous with their involvement for the development of the TLM. Two weeks prior to implementation, the researcher conducted the focus group with the selected participants. Their input was noted, and as a result minor adjustments were made in the TLM regarding the scope and sequence of topics. One such adjustment was to condense the TLM from 10 weeks to 8 to avoid conflict with the statewide assessment in early March.

Beginning in January 2001 and continuing for 8 weeks through February 2001, the 10-session, 15 hour TLM was conducted by six presenters. Twenty teachers participated, and one nonsample participant dropped out due to scheduling conflicts. During this time, throughout all 10 sessions, many types of data were collected by both researcher and study participants, including field notes, observations, and lesson plan analysis.

Members of the sample population were specifically monitored, and sample participants compiled field notes for the researcher through comments on a diskette after each training session. Sample group members and self-characterized computer skill ability levels were recorded by the researcher. All names were changed to protect the anonymity of the study participants.

Upon completion of the training, the researcher scheduled individual interviews of approximately 1½ hours with each participant. After the first interview session was
conducted and additional questions emerged, each sample member returned to respond to additional questions and member checks.

**Development of the Technology Learning Model (TLM)**

Several critical factors must be taken into account in the design of a technology learning model for teachers. Leggett and Prischitte (1998) point out that the combination of research, historical documentation, and practitioner perspectives related to technology implementation clearly suggest five categories for consideration: Time, Expertise, Access, Resources, and Support (TEARS). These factors are important for the effective implementation and sustainment of technology (Leggett & Prischitte, 1998). Moreover, lack of continued support is assessed as the most crucial of the five barriers to effective technology training (Leggett & Prischitte, 1998; OTA, 1995).

**Pilot Study**

The need for technological professional development was identified in the spring of 1999, through planning sessions organized by teachers on staff at Southside Elementary. According to Maxwell (1996), valuable interpretations for qualitative studies can be generated through the use of a pilot study. Therefore, the researcher initiated a prototype 1-week training session during the summer of 2000. The rationale for the pilot study was to evaluate presenter effectiveness as well as participant feedback on topics,
scope, sequence, support structures, and pace of delivery of presented technology objectives.

In order to maintain a clear distinction between the pilot study and the learning model, the pilot study was conducted 6 months prior to the full learning model. The pilot study also took place on another elementary school campus with representatives from three elementary school faculties. Participation of the 28 teachers involved in the pilot study was voluntary and on a first-come, first-serve basis.

Instructors for the pilot study were comprised of staff members from area schools. Participants received training based upon their interests in the following areas:

1. PowerPoint.
2. Hyperstudio.
3. Printshop.
5. Using a digital camera.
6. Internet.
7. Windows applications.
8. Book publishing incorporating a scanner.

Maxwell (1996) indicates that in a qualitative design the researcher must blend grounded theory, thought experiments, and existing theory to construct the conceptual framework for the study. Therefore, during the pilot study,
informal observations took place, and general feedback was collected by the inservice coordinator and reviewed by the researcher. From this feedback, grounded theory for the 10-session learning model was generated, which could be merged with existing theory (Maxwell, 1996).

For the feedback collected, the inservice coordinator used standard school district component evaluation forms required for all district inservice programs. Particular attention was paid to the presentation pace, potential implementation problems, and support-related issues of participants, since the literature indicates that lack of teacher support is a common threat to the success of technology integration (OTA, 1995).

Support personnel present during the implementation of the pilot study varied from a 6:1 participant-to-trainer ratio to a 12:1 participant-to-trainer ratio. In addition, a variety of presenters was scheduled, as recommended in the 1995 OTA report.

Information was gathered during the pilot study to better understand the training process and how to meet the learning needs of participants for future learning sessions. Three significant findings from the pilot study influenced the design of the 10-session TLM:

1. Participants uniformly did not feel comfortable with one of the presenters, and this presenter therefore did not participate in the 10-session learning model.
2. More time was needed for the Internet component and especially for web page creation; therefore, 3 out of the 10 sessions were devoted to Internet skills and web page design.

3. For 2 out of the 5 days, there was a ratio of one trainer to each of the six learners. Participants responded highly favorably, noting that presenters could move more swiftly through their agendas because help was immediately given without stopping the presenter. Consequently, a ratio of better than one trainer per six participants was provided for each of the 10-training sessions in the TLM.

Important information obtained through the pilot study was merged with the recommendations of Leggett and Prischitte (1998) and ISTE (1993) for an effective technology inservice model. For the entire sequence from initial assessment through evaluation, the ISTE recommendations include the following components: (a) perform a needs assessment, (b) plan thoroughly, (c) recruit participants, (d) do extensive advance preparation, (e) prepare inservice facilities, (f) conduct hands-on sessions, (g) focus on classroom implementation, (h) formally and informally evaluate sessions, (i) perform a summative evaluation at the conclusion of the training, (j) continue to provide follow-up support to the participants after the inservice series ends, and (k) evaluate the long-term residual impact.
In addition, the ISTE (1993) report cautions training designers on common flaws of technology staff development. Thus, in this study, threats as well as barriers to technology training were taken into account as to avoid problems in the planning, design, and implementation. It was also recognized that teachers may be fearful of the computer because interaction allows many acceptable responses, and people are not always comfortable with open-ended learning environments (Steineger, 1998).

Input of Participants: The Focus Group

Input of the learner is a fundamental aspect of Knowles' (1995) andragogy theory, as well as a key element of Brandt's (1998) learning conditions and McKenzie's (1999) technology training recommendations. Moreover, adult learners need to be involved in the planning and development of their own learning (Knowles, 1995). Consequently, after the administration of the Southside School-Based Technology Survey and the Mankato Survey (see Appendices A and B), a focus group was conducted by the researcher to elicit input regarding the chosen scope and sequence of the 10-learning sessions. Topics, presenters, and dates were confirmed as displayed in Table 1. Focus group members were asked prepared questions (see Appendix C), and open discussion followed regarding TLM characteristics. The focus group emphasized the belief that positive learning requires positive attitudes, which is supported by Knowles' (1995)
### TLM Schedule and Time Line

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10/01</td>
<td>W</td>
<td>Windows: Desktop management, installation of software, word processing</td>
<td>Staggs</td>
</tr>
<tr>
<td>1/17/01</td>
<td>W</td>
<td>Windows continued: Plug and play VCR, Projector hook up, digital camera, FIRN registration</td>
<td>Staggs</td>
</tr>
<tr>
<td>1/26/01</td>
<td>F</td>
<td>PowerPoint: Making slides</td>
<td>Bell</td>
</tr>
<tr>
<td>1/30/01</td>
<td>T</td>
<td>FIRN: Access and accounts</td>
<td>Deaton</td>
</tr>
<tr>
<td>1/31/01</td>
<td>W</td>
<td>PowerPoint: Clip art, importing graphics, creating charts and graphs into presentations</td>
<td>Bell</td>
</tr>
<tr>
<td>2/7/01</td>
<td>W</td>
<td>GradeQuick: Seating charts, progress reports, tracking attendance and grades, creating graphs</td>
<td>Turner</td>
</tr>
<tr>
<td>2/12/01</td>
<td>M</td>
<td>Students Writing Center: Presentation stations and peripherals with software introduction</td>
<td>Swanson</td>
</tr>
<tr>
<td>2/14/01</td>
<td>W</td>
<td>Surfing the Net, search engines, web pages</td>
<td>Swanson</td>
</tr>
<tr>
<td>2/21/01</td>
<td>W</td>
<td>Web page creation</td>
<td>Keller</td>
</tr>
<tr>
<td>2/27/01</td>
<td>T</td>
<td>Web page creation, continued</td>
<td>Keller</td>
</tr>
</tbody>
</table>
research on the physiological dimensions of learning. Participant input led to adjustments to the scope and sequence of the learning model.

For example, it was suggested that Friday afternoon tutoring sessions be added for participants who needed one-on-one help or extra practice in what was learned during the previous 2 days. Another suggestion was to include a session on the range of technology that was available at school, and demonstrations of how to use the technology.

Additionally, the focus group requested that the 10 sessions span only 8 weeks instead of the regularly scheduled 10 weeks. This request was to avoid conflicts with the yearly standardized testing, which was set to take place during the 9th and 10th weeks of the Technology Learning Model. In addition, the researcher assured them that the training would encompass 15 hours, the minimum recommended for technology development (Brooks, 2000).

Learning Climate

Learning climate is of paramount importance to retention of learners. Knowles (1995) identified one of the physiological factors in adult learning as the climate of pleasure, whereby participants reach gratification and fulfillment through learning. Incorporating this principle in the TLM, plans were made and carried out to provide door prize items at the end of each training session to help foster a climate of pleasure. Participants earned door
prizes by correctly answering the trivia questions which pertained to the training session skills.

Goals

The establishment of goals is also of importance in the adragogical approach (Knowles, 1995). Technology goals for the 10 sessions were generated by participants at the outset of the second training session as part of the instructional process. Participants' goals for the workshop series were also identified. Participants' saved these goals on a floppy disk, which they kept for continued workshop use.

Support of Participants

The support component of the TLM was perhaps the most important of all issues to consider. Based on input from the pilot study, at the first training session, teachers were informed of the extra support they would receive as participants. During each of the training sessions, four support personnel served as troubleshooters in addition to the presenter, and the ratio of troubleshooters to participants was 1 to 5. In addition, participants were informed of the presence of the technological support staff member, who was available daily from 10:30 a.m. to 1:30 p.m., to assist teachers with the integration of technology, or to model software and help with hardware problems.

Alternating Instruction and Application

Brooks (2000) recommends the development of a technology training model which allows participants the
opportunity to experience training and then implement new-
found strategies and knowledge into their classrooms before
the next training session. Teachers need to discuss their
experiences at the next training sessions with their cohorts
(Brooks, 2000). Therefore, the learning model design
included this principle.

The first 20 minutes of each session were devoted to
group discussion and sharing of technology tips and tricks
among participants. This period was important for several
reasons. It promoted socialization and collaboration, and
served to establish a climate of learning and participation
(Knowles, 1995). This period also allowed for a forum at the
beginning of each session for participants to talk about
implementation issues they had experienced since the
previous training session. These discussions were highly
valuable because the weekly training arrangement provided
for participant experimentation between sessions, and
participants could therefore reflect on and refine their
implementation.

As part of this strategy, in accordance with Patterson
and Czajkowski's (1979) assertions regarding staff
development, recommending the need for teachers to
experience tangible and practical values in change,
participants in the TLM were asked to bring to the sessions
several themes and topics. These were so that they could
create a sequential lesson using technology, which could be
applied in the classroom the following week. Teachers found this method especially helpful during PowerPoint presentations, which were more individualized than other software presentations. By participants providing their own topics of interest, facilitators were able to individualize instruction to the needs each teacher. Thus, an essential element in the TLM design was application of the model to specific teacher needs in the classroom (Brandt, 1998).

Further, according to Leggett and Prischitte (1998), teachers need access to the same technological resources outside the classroom setting as inside. Thus, computers used in the training sessions were the same type as assigned to them during the 2001 school year for classroom use. As a result, participants experienced consistency of hardware and software programs, and no adjustment time or effort was necessary in their applying the new technology learning in the classroom.

Multiple Presenters

Findings from the pilot study, as well as research from the OTA (1995), indicates that there are benefits to technology presentations hosted by multiple and complementary presenters with a variety of methods and support techniques. Therefore, in the TLM a series of guest presenters conducted the 10 training sessions, as shown in Table 1. Presenters were selected after teachers submitted input on session topics, so that presenter expertise could
be aligned with participants' needs. Moreover, school
district officials, who were extremely supportive of the
TLM, offered to five presenters the equipment necessary for
technology training.

Administrative Support

It is axiomatic that administrative support and
involvement are vital to the effectiveness of teacher
training (Kinnaman, 1990; Persky, 1990). For technology
training to be successful, administrators need to model
technology and supportively participate in each technology
training session with teachers (Sherman, 1998).

With regard to the TLM, the researcher had a dual role.
He is an administrator at Southside Elementary and has
modeled technology, as well as having previously presented
sessions at Southside Elementary technology training days
and district technology workshops. During the 1998/1999
school year, the researcher was influential in promoting
technology and imbedding it within the various objectives of
the school improvement plan. Every school in the state has a
school improvement plan, and this plan governs the actions,
financial expenditures, and direction of the school
curriculum. As the researcher recognized, the overt modeling
of computer advocacy to instill technology into classrooms
and everyday activities is one of many necessary
requirements for successful staff development (Kinnaman,
However, because of the researcher's administrative role, such direct involvement in technology promotion could potentially lead to reactive bias of participants. This possibility, and the fact that the researcher holds a supervisory position at Southside Elementary, led him to utilize the help of the school technology committee to communicate with participants when possible.

That is, the researcher did not initiate memorandums, evaluations, or presentations during the model sessions in an effort to minimize possible effects of his supervisory position. Further, the researcher deliberately did not give any presentations during the training, but rather acted as a member of the support team at each of the sessions. In this capacity, the researcher was able to remain in the workshops and foster encouragement and support for teachers as well as record observations necessary for data triangulation. Because of his passive role, participants' responses to presenter effectiveness did not pertain to him, and therefore the integrity of the data was not compromised.

All of the preceding elements were incorporated into the TLM, based especially on the invaluable contributions of Joyce and Showers (1980) and Knowles (1995) in the andragogical approach to technological professional development. In graphic summary of the development, Figure 1 illustrates sequentially and elaborates on each component of the TLM.
Figure 1. Technology Learning Model Design

Technology Learning Model (TLM)

Level of Impact

Application

Skills

Concepts

Awareness

Note: P's = Participants

PWBCS = Participants with beginner computer skills

PWICS = Participants with intermediate computer skills

PWACS = Participants with advanced computer skills
Data Collection

In accordance with qualitative methods (Miles & Huberman, 1994), many types of data collection were employed. Observations were made of each participant during each of the 10 training sessions, and field notes were additionally created. Each session was also videotape-recorded to allow participants to review sessions, as well as for verification of field notes. Field notes were collected and compared through the triangulation process to glean themes, or patterns, and relationships when referenced to other data.

Following every training session, each participant wrote freely of his or her impressions of the session, and their comments were saved on a diskette. No parameters or restrictions were placed on participant field notes by the researcher, so that the most open and honest responses would result. Participants notes were collected following the final session and were referenced against verbal responses during interviews. This comparison of data served as a valuable member check method.

On completion of the TLM, individualized interviews were arranged. Each participant responded to questions (see Appendix D) in a one-to-one interview with the researcher in a neutral conference room setting. Each session was audiotaped, and once transcribed, descriptions were made
available and reviewed with participants for member checks to ensure trustworthiness of data.

The primary objective of professional development in the teacher technology learning model is open-ended growth. Consequently, growth, or the level of impact, was partially assessed based on participants' interview responses. Their self-perceived changes in attitudes, behaviors, and computer skills were observed and recorded through the naturalistic inquiry methods of this research. In addition, following the conclusion of the TLM, teacher preparation procedures, such as lesson planning, lesson research, lesson presentation, and student assignments, were also observed. Results were reported through the researcher's thematic narratives by means of interaction descriptors relating participants' experiences in the learning model.

Data Analysis

Data analysis took place by several methods. Data analysis hinged not only upon the matrix of questions and responses during open-ended interviews, but also on researcher memos, observations during training, participant comments placed on their floppy disks after each learning session, electronic artifacts produced by participants.

Lesson plans of each sample participant were also collected and photocopied over the 10-session period and were analyzed. Data generated from this source indicated participants' absorption and application of learning through
changes in the technological content of their plans, in addition to the format of the plans.

Data collected from the interviews were coded and analyzed within the three skill groupings and across skill groupings in an effort to locate patterns and contextualize information (Maxwell, 1996). Patterns were also examined to determine causal relationships and linkages of teacher attitudes and behaviors in relation to the learning model implementation. In addition, participant responses were referenced against Knowles' (1995) conditions of learning as well as Joyce and Showers' (1980) levels of staff development impact.

Data analysis was performed primarily through the use of the NVivo software system. NVivo is designed to manage and integrate data for qualitative data analysis. The program is a complex data organizer and is predicated on a node coding system which allows the user to input data from various sources in order to contextualize information. NVivo was used in the present study to analyze transcribed participant interviews, observations during training sessions, and field notes. The program supports the construction of informational sets and enabled the researcher to code transcriptions based upon attributes of the text. NVivo therefore allowed for the connection and integration of data, as referenced to the constructs of

In summary, triangulation of data occurred from collection of the following data sources:

1. Researcher observations in classrooms and computer lab.
2. Researcher interviews, memos, and field notes.
3. Evidence of technology usage in lesson plans.
4. Comments of participants after each training session.
5. Electronic artifacts produced by participants.
6. Member checks to ensure validity.

Data from these sources were sorted and reconstructed to identify patterns which could explain causal links in the database (Miles & Huberman, 1994). As Guba and Lincoln (1989) assert, such a comparative method is highly effective in analyzing data, and this method was used in the present study.

From the results of this study, generalizations can be made for the sample group affected by the learning sessions, and a relationship may occur among other participants in the staff development model. Under similar conditions within the school district, similar results may be anticipated; however, face generalizability is the goal of the researcher rather than external generalizability.
Based on this extensive data analysis, the findings of this study are reported in Chapter IV. First a demographic profile is presented, and this is followed by a detailed reporting of findings for each of the 10 sessions of the TLM.
CHAPTER IV

FINDINGS

Findings of this study were categorized into four related yet distinct sections. Initially, a detailed description of observations and field notes of each learning session was chronicled, followed by individual case interviews. The interviews were reviewed to reveal descriptive accounts of the TLM experiences of the sample group. A descriptive assessment detailed accounts of individuals, and their responses, to the level of impact of professional development and learning environment. Descriptive accounts of participant interviews not only provided the foundation of data for this study, but also allowed for a database where credibility, through triangulation of additional data sources, was achieved. Moreover, descriptive analysis allowed reference and exploration of data to address the research questions of the study.

The third and fourth sections, within-case analysis and cross-case analysis, are important to both research questions of this study. Research Question 1 was: How will participants with varying computer skill levels respond to the TLM? Research Question 2 was: How does the TLM affect participants' attitudes toward integration of computer technology into professional responsibilities?
The TLM displays a wide range of ability levels and attitudes among teachers pertaining to computer usage. A sample of six participants was divided equally into three different skill categories: participants with beginner computer skills (PWBCS), participants with intermediate computer skills (PWICS), and participants with advanced computer skills (PWACS). These participants were assessed through observation, open-ended interviews, lesson plan reviews, and field notes. A comparative analysis within sample subgroups and across the sample group was performed to address both research questions and to explore data patterns of similarity and difference. These explorations were based on Knowles' (1995) seven conditions of adult learning and Joyce and Showers' (1980) levels of professional development impact typology.

Sample Population Demographics

Participants, as noted above, were divided into three ability groups (see Table 2). Both Linda and Sally were recognized as PWBCS. Linda is a kindergarten teacher and is in her 18th year of teaching. Linda is quite social and enjoys talking about her students and her work. Sally is a second-grade teacher. She has completed 15 years of teaching and will be moving at the end of the school year.

Ellen and Marcus were classified as PWICS. Ellen is a fourth-grade teacher and recruited several of her friends to attend the TLM. She has taught at the school since it opened
### Individual Teacher Proficiency Levels

<table>
<thead>
<tr>
<th>Teacher Name</th>
<th>Proficiency Level (Proficiency Code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally</td>
<td>Beginner (PWBCS)</td>
</tr>
<tr>
<td>Linda</td>
<td>Beginner (PWBCS)</td>
</tr>
<tr>
<td>Ellen</td>
<td>Intermediate (PWICS)</td>
</tr>
<tr>
<td>Marcus</td>
<td>Intermediate (PWICS)</td>
</tr>
<tr>
<td>Amy</td>
<td>Advanced (PWACS)</td>
</tr>
<tr>
<td>Carla</td>
<td>Advanced (PWACS)</td>
</tr>
</tbody>
</table>

Note: PWBCS = Participant With Beginner Computer Skills  
PWICS = Participant With Intermediate Computer Skills  
PWACS = Participant With Advanced Computer Skills
12 years ago and is in her 14th year of teaching. Marcus teaches fourth grade and is currently in his third year of teaching. He aspires to be an administrator and is the chair of the Southside Elementary School Advisory Committee. Carla and Amy were the two PWACS participants. Carla is a first-grade teacher and has taught for 9 years. Carla has a family who enjoys working on the computer. Amy is a first-year teacher and teaches second grade. Her classroom is located across the hall from Sally who is her mentor teacher.

Each participant characterized his or her own skill level, as shown in Table 2. The following account of the TLM sessions provides dates, subjects, and pertinent information for each training session.

Session One

Participants appeared somewhat anxious about the computer training sessions. Discussion among participants was minimal initially, and apparent tension increased as the presenter was late arriving. The presenter was a familiar character to the staff. He was the former technology support assistant for the school. He told a few jokes and the tension appeared to lessen. The room was very cold, and a few people registered complaints regarding the temperature. Some commented that when all 20 adults got into the narrow room it seemed too small.

It was explained to all participants at this session that, during the school day, two people were on staff as
troubleshooters, to assist with technology questions or problems. Four people were available to assist during workshops. The troubleshooters had a difficult time hooking up the projector, which was borrowed from another school. Therefore, a makeshift version was used for the first session. The presenter instructed the group about desktop-related issues, and gradually led into the word processing software package, Microsoft Word. A few advanced participants were already familiar with the program and were encouraged to work ahead.

Participants were allowed to sit where they liked, and most sat with other teachers on their same grade level. During the very first lesson, Carla, an advanced computer user, seemed to assume a mentor relationship with Nancy Joe, her neighbor. By request, through the focus group, a video camera was set up for all of the sessions to capture information in the event participants needed to review a session, or in case they missed a session.

At the conclusion of the training session, door prizes were given out, as well as a list of future topics, and participants received a schedule of revised dates. Participants appeared to enjoy themselves, but by the end they were still somewhat apprehensive about the training experience.
Session Two

After the first session, one participant dropped out of the TLM sessions. She was a beginner user, was not part of the sample group, and cited scheduling conflicts with afterschool activities as the reason she stopped attending.

Session Two was a continuance of Microsoft Word and featured the same presenter as the previous session. He covered various windows and desktop skills, such as transporting files and moving from one program to the next with the minimize and maximize tool.

The group disposition was somewhat better during the second session, but there remained an apprehensiveness among participants. Teachers returned to the very same seat they had occupied the previous week, with two exceptions. Two advanced teachers positioned themselves so they could help beginner users on the same grade level.

In the week that transpired since the last workshop, the school's new projector had arrived and was installed in the computer lab. Sample group participants were asked to keep a weekly journal on a floppy disk to serve as one method of member checking. The data could also be used for triangulation at the conclusion of the study.

One field note comment at the conclusion of Session Two was from an advanced user, who said, "This is a review of skills I already use. However, I have found that since I am self-taught, I always learn something new." Once again,
three items were given as door prizes as participants left for the afternoon. They were also provided with a subscription copy of Technology Pathfinder, a monthly publication which critiques websites for teachers and provides instructional technology tips at the elementary level.

Session Three

PowerPoint was the topic of this session. Many teachers were eager to learn PowerPoint to use in their classrooms. The presenter was a former teacher from Southside Elementary.

The pace was a little slow during the first half of the workshop, with a long introduction period. Some teachers were restless and ready to begin about 10 minutes prior to the presenter starting the actual hands-on portion. The presenter brought "cheat sheet" notes for all participants. From their field notes, it became clear that the teachers liked the handouts, so they could add their own notes. Consequently, future presenters were requested to provide handouts of material covered.

Participants were led through the preliminary functions to register for Florida Information Resource Network [FIRN] accounts. Once a FIRN account is opened, teachers have free access to the Internet and have an email address to communicate electronically.
Session Four

A regional presenter for the State of Florida demonstrated techniques to use with FIRN. The presenter was excellent and had a wealth of information regarding FIRN accounts and what can be done with them. It was obvious that the presenter had experience speaking on the subject, and he moved quite rapidly in order to finish on time. The teachers were very excited about the FIRN account.

The presenter covered an enormous volume of information, and provided a state-published "how-to" instructional manual for each teacher. Much of the information dealt with customization of account functions, and it left many participants with more questions than answers. As Marcus, one of the intermediate participants, put in his field notes, "The FIRN lesson was a bit overwhelming . . . it is unlikely that I will ever be able to use all of the options successfully." Even Amy, one of the advanced participants, responded, "The FIRN lesson was a bit MUCH at times."

The FIRN contact, Cathy, was established at the school, and she served to clarify FIRN problems for the staff. An assignment for each of the participants was to send their first FIRN email to the principal. Door prizes were given once more as teachers left the computer lab.
Session Five

At the onset of Session Five, the researcher asked participants to pull up their FIRN email accounts, in which he had responded to everyone, and the troubleshooters helped them create a buddy list from the names received. Participants seemed to like this activity because they could communicate with each other via email.

Many participants had been overwhelmed by Session Four, which was only one day before this PowerPoint session. Sample group field notes indicated that Session Five, the second PowerPoint session, was excellent. Teachers learned how to import images into the PowerPoint presentation and how to customize presentation slides to their specific needs. One of the beginners commented in her field notes that it was too much information and covered too quickly. However, one advanced user wanted it to go a step further into moving graphics. All participants received professional quality laminated study notes on PowerPoint, Microsoft Word, and the Internet as door prizes.

Session Six

At the beginning of Session Six, one of the teachers on staff demonstrated how to make a template to use for lesson plans. Teachers were very interested in this skill because of its timesaving capability. Amy, one of the advanced users, commented in her field notes, "I've got to start doing this; it saves so much time."
Participants were apparently enthused after the fifth session. Many of them were talking about using Powerpoint during curriculum night during the next school year. Enthusiasm was also high because the topic for Session Six was GradeQuick, the district adopted and supported software system which enables teachers to average and assign grades very efficiently. Teachers were eager to learn about GradeQuick to save time and improve accuracy.

A district trainer was the presenter, and she led the group through all the skills they needed to use the software. One of the intermediate users said in his field notes, "This was the best class yet. It was very informative. I think using GradeQuick will be extremely effective in the classroom." The GradeQuick session was so successful that, 2 weeks later, one of the nonsample group participants, at the beginner level, taught the rest of the teachers how to use the software program during a professional development day.

Session Seven

Student Writing Center information was presented during Session Seven. Participants were buzzing with excitement after the two previous sessions. This session apparently was somewhat of a letdown for some. The delivery of information was well received and the presenter was commended in the field notes. However, the software reported by one participant was too similar to Microsoft Word and was not
relevant for some teachers in the upper grades. Conversely, a primary grade advanced computer user commented in her field notes that she would like to infuse this into the classroom: "I wish we could now teach this to our children." One of the intermediate sample members said, "I liked learning how to import graphics and pictures into this program." Door prizes were given out at the conclusion of Session Seven.

Session Eight

The same presenter for Session Seven was featured in Session Eight. He covered surfing the Internet and finding websites suitable for teachers and students. Once again, he was well received. However, Ellen, an intermediate computer user, who gave him positive remarks concerning his provision of background information in Session Seven, was critical of his delivery in Session Eight. She said, "He tells us to do this, do that, without explaining why. It becomes confusing." Carla, an advanced user, commented in her field notes that the session was largely review for her but that she "found the presenter's enthusiasm about the web and how he used it in the classroom to be infectious. I can't wait to have this wonderful teaching tool in my classroom."

At this point in the TLM, participants were free to explore, ask questions, and practice navigating the mouse and web. The beginners especially seemed to enjoy these activities because they opened up a new world to them.
Session Nine

This session covered a complex software program with intricate skills in web design. The presenter had to adjust the pace of instruction to meet the needs of the beginners in the group. In most other sessions, troubleshooters were ready to assist individuals who deviated or had questions. Session Nine, however, was such that the three troubleshooters could not keep up with the questions of participants, and the lesson slowed down considerably.

Sample members in the intermediate and advanced groups became frustrated over the slow pace of Session Nine. However, the pace of instruction was beneficial to the beginners in the session. One of the beginners was encouraged and reported in her field notes, "I can't believe that I am really learning how to design my own web page when I just started surfing the net not too long ago." However, many of the participants left somewhat frustrated that more information had not been covered.

Session Ten

This session was a continuation of the web creation workshop. Teachers were apprehensive about this session, since it was essentially a continuation of Session Nine. The presenter was clear and once again gave excellent general computer tips, but this time covered enough material, so that the teachers were satisfied with their product. Each teacher received a 90-day free trial of the software package.
"DreamWeaver," and the promise was made to those who developed their web design skills that the administration would provide them with the most current version of "DreamWeaver" for their class.

Individual Case Interviews

Participants with Advanced Computer Skills

Interview A: Amy

Amy recently relocated to Florida from the Midwest and is in her first year of teaching. She is 23 years old and has lived in the state for approximately 7 months. Amy is a skilled and talented teacher, with an outstanding reputation for a first-year instructor. Her mentor teacher professes that she has been well received by the faculty and is seen as very mature for her age and limited teaching experience. The interview occurred in a relaxed and neutral conference room setting.

Amy's responses were modestly confident. She characterized herself as an advanced computer user at the beginning of the TLM, and there was no change in her assessment of her skills subsequent to the training sessions. She cited her college teaching preparation as excellent: "They're now even offering more [technology] courses for teachers that we have to take. They are really going into computers for education so we can get computer endorsements." Amy indicated that the professional development TLM was very similar to college experiences.
"They're about the same. It's just that with college you have to follow through with assignments and you have to turn everything in."

Having no children of her own, Amy states that she reviews software programs because, "I want to be above them [children] or ahead of them, so that I know what they are getting themselves into--say like when we do the Internet in the classroom. I want to know how to do it if they are asking me questions, I need to be knowledgeable about it--I can't say I don't know." Amy reported, "It was kind of neat to have somebody almost at the same level next to me so we could kind of feed off of each other and go a little bit further even than what the presenter was doing."

During training sessions, Amy sat in the same seat for each of the sessions and made herself available to assist a colleague at the beginning level of skill development. She had a concern about the pace of some of the sessions for the beginners. "I think in the beginning they [training sessions] may have been a little confusing at times because it did move quite quickly. However, I've seen so many people come up with more than what they knew before--I think it [TLM] targeted all areas, and if people were frustrated, they got through it, and I think that was a plus."

Amy expressed her satisfaction with the components, environment, and presenters of the TLM and commented excitedly on the importance of training like this:
Technology is the way of our future. We have to get into it and we have to use it regardless of if you want to or you don't want to. It's our future and the kids need that, and I know we want kids to stay hands-on and to be able to explore. But their exploration is towards computers now, and that's basically it and I think that's all that we can do is continue to build their minds. Get them used to it right now so that they can advance even more as they grow up.

However, for the training, Amy did have a recommendation to split the ability groups up so that the advanced learners and computer users can make more progress. She also suggested asking "the people with the higher ability to help with the lower classes 'cause then that reinforces what they [advanced users] know and gives them [beginner users] a site to know that they [beginners] can go to those people [advanced users] for help."

Amy was encouraged by the development of some of the veteran teachers who rated themselves as beginners. "It was inspiring because they [beginners] know they can do it now, and they are learning something new--even though it might take them a little bit longer. I thought it was wonderful when Sally was so excited." When asked why, she responded, "I guess she is my example for everything and 'cause she is towards the end of her teaching career, and she's loving every minute of it, and wanting to do this, and I don't
know, I thought it was great." Amy commented on the connection between software programs and specific skills, such as the minimize button and saving a file.

One of the factors originally considered as a supportive device for the training session was the availability of a video camera for those who might have forgotten some of the skills addressed in a particular software session. Ironically, Amy considered the camera more of a threat than supportive device. "I think I felt I had to be quiet. I knew everything I would say would be recorded."

The position of the camera was directly behind Amy for each session. This information was not revealed in the participant field notes.

The school-wide impact of the computer TLM was mentioned in Amy's responses to interview questions. "I think everybody's wanting to know what we were learning in our technology classes." She continued,

I saw almost all of our staff go to GradeQuick training. I mean it shows right there they all want to learn what we've learned 'cause we're making an impact by saying we learned this great thing and how to make presentations and use this for teaching, and kids are going to be excited about this. I think it has impacted us greatly and everybody is gonna ... I think want to feed from that.
Throughout the interview, Amy was more concerned about skill development and application concepts for herself. However, she focused much of her attention toward helping other participants, especially those at the beginner level. She transferred many of the learning conditions concerns to the beginner participants. She has many future plans about application of technology, and several of those plans include the involvement of one of the participants, Sally, who characterized herself as a beginner.

Interview B: Carla

Carla is a veteran teacher of 9 years. She has had teaching experience in private and public schools in two different southern states. She teaches in the primary grades, and is one of the technology leaders among the faculty. Her responses to questions were unassuming and modest.

Carla does not see herself as a technology contact, but she simply knows more about technology than any other teacher on staff, and by this virtue, she is considered by most faculty members as the resident expert. Carla has worked at Southside Elementary for the past 4 years. She sits on the technology committee for the school and has attended the Florida Educators Technology Conference in Orlando for the past 2 years. Carla takes initiative, tries on her own, and is willing to share her technology experiences with others. However, she is unobtrusive and
modest with her talents, so most of the time people must
approach her for assistance.

Carla's background of software knowledge and her
modesty is identified in several of her responses to
questions:

I use Word quite a bit--I'm on the Internet often, I do
a lot of research. I've become familiar with PowerPoint
and Hyperstudio. I hesitate a little bit because
there's other things I don't know, like Excel, that I'm
not familiar with at all. I'm to the point where I'm
using the computer to do lesson plans and I'm keeping
the grade book on there, so I mean I feel like in terms
of skills I'm using the computer every day.

She also uses the software program GradeQuick and found that
workshop session to be most beneficial to her.

Carla felt that for all of the levels of ability, the
icons and toolbar reviews were good because many people are
self-taught and there are gaps in what people know. When you
learn on your own, she said, "you play around with that one
till you're comfortable with it and you kind of fall into a
habit of these are the ones you use. When you're in a formal
setting and they're saying this does this and they go
through each one, it's more beneficial."

Each of the learning sessions began with a discussion
and practice period for approximately 20 minutes prior to
the presentation. Carla suggested making a change in the
format for future presentation designs. "I felt like you were being handed a lot of information and that there really wasn't a lot of practice time. And possibly even if you did this again, I would consider having one time where it's the instructional time followed by a practice session rather than another information session, so, that especially, with some of the things that were new to me even it would be nice to go in there and just have a little time to practice."

Carla felt like the first four or five sessions were review for her and that she was wasting time and money. Because of her ability level, I had informed her toward the end of the second session that she could work ahead instead of staying with the presenter. She felt that it was a benefit to the participants to be given the opportunity to work ahead. However, she expressed concern about working ahead on one particular occasion with one presenter: "I know there was another session--I don't know who the presenter was but I really kind of got the idea he didn't want me going off from what he was doing. He kind of wanted you to stay there with him."

Carla surmised that much of her skill development came as a result of raising four teenagers. Her youngest designs a section of the web page for a local middle school. "My youngest one says he's going to be the next Bill Gates, so that's his goal in life. He can take them apart and put them back together, and so whenever I get stuck I can call him to
help me." Since the beginning of the TLM, Carla has had several opportunities to share her computer knowledge with staff members. She said, "I've been helping a lot of people set up their lesson plans because it's easier if you walk through one by one." Since she is the main contact among teachers, Carla has a different kind of appreciation for Cathy, the noninstructional technology support person present in the workshop as one of the troubleshooters.

"Cathy has been just a godsend to this school because, I mean, you tell her I need something and man, she's in your room before I get back. She's in my room taking care of it."

Carla had already experienced most of the software programs that interested her, and she planned on focusing on increasing her knowledge base on web design and perhaps create a classroom web page. Carla and Mindy, another advanced computer user on staff, have recently registered to present information about instructional technology applications at the School District Technology Fair. The two teachers will present to the faculty of Southside Elementary prior to advancing to the district. This is the first time teachers from Southside will have presented at the School District Technology Fair.

One suggestion Carla made regarding the level of impact of the TLM was the following: "I would have sessions based on ability. Like I would have a beginner session, which I felt like this was probably more focused toward, and then
maybe have an advanced session for people who are a little more comfortable with their computer skills." Even though she thought the troubleshooters handled most of the questions and made sessions run smoother, she suggested ability grouping for future learning models. She also had concerns about the setting. The computer lab in which all of the sessions were held was approximately half the size of a regular classroom and was "cramped," according to some. Carla said that she thought sometimes the troubleshooters were restricted as to how quickly they could respond to someone, based upon the configuration and size of the room.

Many participants asked Carla for assistance after school and on weekends since the inception of the TLM. She feels that the sessions have had a positive impact on the school:

I've talked to, well, you know, some of the people I've helped with lesson plans. They are just so fired up about what they're doing, and I think that's the first step--if you can get them turned on to just one thing it's just going to grow from there. Linda Smith is so funny 'cause she's been calling me at home and, you know, she's like, I'm ready to set up my folders and in fact we're supposed to meet again either this week or next week so I can show her how to set up the folders. That's the way I started out, you know, you do a little bit and then you get comfortable with that and you go
to the next step, and I think having the sessions ... because as people get more comfortable with one thing then they can go back to another session and learn something new that they can expand on. And that's a good thing, and I think with the presentation stations coming, I think they realize how much they are gonna [sic] have to expand.

Carla not only assisted other participants after school and on weekends, but she also helped participants during the training sessions: "I liked the format and I think if you're working with beginners or people who aren't really comfortable with their skills I thought the format was great. I do know I got some comments from Nancy Joe that a couple of the presenters were going a little bit too fast for her. If Mindy and I hadn't been sitting there saying, punch this, punch this, she would of, you know, gotten totally lost." Carla commented that some participant teachers now have the skills to present to their peers, and this might be good for future sessions.

The fact that all participants in the TLM knew each other was good, according to Carla, especially if participants had questions, "If you're in a room where you don't know, you're not gonna [sic] maybe ask some question, where you're gonna [sic] look stupid. Here you're kind of with your peers, and then everybody knows everybody and there's a comfort zone there, a kind of a trust level."
Participants with Intermediate Computer Skills

Interview C: Marcus

Marcus is in his fifth year of teaching and his second year at Southside Elementary. His involvement in the school has greatly intensified this school year. He teaches in the intermediate grades, chairs the School Advisory Council, cosponsors the Student Council, and is a member of the school CORE Team, which provides guidance to teachers with students who may need additional assistance. Marcus is by nature quiet and somewhat reserved but has a wonderful personality and many personal strengths. He recently enrolled in a doctoral program at a local college and is participating in the school district principal's training program. The interview took place in a neutral environment under casual conditions.

Marcus rated himself an intermediate user at the onset of the TLM. He said that he has had no structured training and has adapted to computers out of necessity. "I've had no formal training, but a combination of just at home--playing around on the computer--I've been around them, and then also going to school for my master's program. It's thrown me to the deep end of the pool, having to work with a computer whether I've wanted to or not, and I've picked up some things along the way, and I feel comfortable with the basic programs." Marcus mentioned that his comfort level with computers and software applications had risen as a result of
his participation in the TLM. Particularly helpful was the feedback and support provided throughout the training sessions. "It was nice because I got immediate feedback rather than sitting there and doing the trial and error method, and getting frustrated on my own."

The hands-on small group for the professional development model was a beneficial characteristic of the training sessions for Marcus. Having the troubleshooters there was also significant. "You were able to ask questions because three or four proctors knew what they were doing and were ready to answer your questions, so that was a really good experience." Whereas most sessions met his developmental needs, one specific session did not meet his expectations. He did not think Session Seven was appropriate because it was not relevant or applicable to all participants. In fact, Marcus felt that students already use the program, Student Writing Center, to their satisfaction and that it could be eliminated from future training.

The TLM staff development, according to Marcus, has had an impact on his job performance. "Certainly I've already begun doing lesson plans on the computer and typing them, where I used to just hand write them, and I'm in the process of implementing all my students' data for GradeQuick so those are two things that I'm definitely getting involved in." Marcus' responses for future technology applications
referred to how he plans to have students utilize computers as a result of his newly gained knowledge:

I'd really like to see it in my class used for enrichment in terms of the reports, research, PowerPoint presentations for students, you know book reports but on the PowerPoint. I think it would be relatively easy for the kids to work in maybe their Literature Circles, maybe one of their centers or groups they can. One of the rotations will be to get on the computers and do an enrichment program where they're doing a PowerPoint presentation I'd like to be able to then put it on the CD-ROM, you know the VCR tape or presentation station, so we can view it for the rest of the class and do like sort of mini-book reports. That's my goal in the classroom.

In the training sessions, Marcus suggested the temperature of the room was not comfortable for learning and needed to be raised. He also commented on the noise level: "I guess it got a little loud in there sometimes for my train of thought, but again the acoustics aren't that great and I think that's going to happen when there's a lot of questions and a lot of colleagues together." He was happy with some of the changes which resulted from requests and comments during the 10-week series:

There was [sic] some changes made throughout. Well, I mean one major change I saw the first session--I felt
the presentation was difficult. I don't know if it was with the overhead or just in the back corner, and, then, by the next session that was already corrected and put on the big screen, and it made it a lot easier, I think, for everyone to see. So, just making sure that everyone can see the presenter, the acoustics in the room aren't that fantastic, but that would be the big thing. From the first session to the second session I saw a big change in being able to follow what the instructor was doing.

When asked about the impact the professional development series had on the school, Marcus responded, Well, I know that there's a bunch of people that, I don't know, I don't want to say were computer illiterate but certainly didn't have much computer skills are now actually teaching on our Professional Development Days some of the programs that we learned so I think there's an energy on the campus about using some of these programs to make teaching more efficient and effective for the students that I don't think was there before and I think that there's a willingness for teachers to learn a little bit--even more so.

Marcus attributed some of his perceived success in the TLM to the fact that it was stretched over a period of 8 weeks instead of clustered together. He thought that having a week between sessions helped him assimilate some of the
information before starting on a new concept. Unlike other interviewees, Marcus did not feel the reviews before each session were necessary. He suggested for future workshops that presenters be informed of participants' current computer skill knowledge so that presenters can start where it is most beneficial.

He liked the fact that he was among friends for the computer training. "It made for a comfortable setting and also made for a noncompetitive type setting. I don't think you felt apprehensive if you did have a question. You know you weren't going to hear it from the peanut gallery, so to speak, and it also made the atmosphere a little bit lighter than going to a normal workshop where you don't know anyone." Overall, he responded, "You didn't feel bad about either falling behind or going ahead. It was more of a relaxed atmosphere which I think helped everyone's learning styles. Whatever level they were at, they were able to get something out of the workshop."

Interview D: Ellen

Ellen is a teacher in the intermediate grades. She has 14 years of teaching experience and has taught at Southside Elementary since it opened, 12 years ago. Ellen grew up in Louisiana, and she characterized herself as having intermediate computer skills. Ellen appeared very nervous about being audiorecorded. She stopped the tape recorder on three different occasions and said, "Let me think about
Initially she rapidly shifted her eyes back and forth between the tape recorder and interviewer. The tape recorder appeared to distract her at the beginning of the interview, but after the third or fourth question, she began to feel more comfortable. The interview took place in a conference room with a large table and windows overlooking the planted courtyard. The atmosphere was relaxed and informal.

Ellen said that the school had previously held several computer workshops but that they "did not do much good." These workshops, she responded, "gave me the opportunity to be able to see what we can do and apply in the classroom." For example, she just learned how to use GradeQuick. "Right now I'm working on listing names for GradeQuick, so during the fourth 9 weeks I want to be able to use GradeQuick for my grading and get my feet wet with that."

"Ellen had a desire to know the reasons for each computer action. She wanted to know why as well as how to do things. "There was one presenter in particular who said just do this, do that, do this, do that, and it just kind of stumped me because I didn't know why and I really don't understand. I understand about Windows a little bit, and I understand about folders and holding information, but I need to know ahead of time where we're going, so that as I'm doing it, it helps me process the information better." This need is consistent with Joyce and Showers' (1980) levels of impact: concepts come before application.
Ellen credits her husband for helping her with computers. She also commented that she picked up valuable timesaving techniques from many of the sessions. Ellen wants to apply her new knowledge in the classroom, "to take information and give the children a different flavor, you know, a different teaching technique, using PowerPoint in the classroom." She spoke of collaboration with another teacher on the same grade and ability level, who also participated in the TLM. Ellen felt that the workshops adequately covered skills for all three identified levels of participants.

Additional workshops were requested by Ellen so that she could know the programs better and put them into practice. "It's hard to absorb everything, so if we could do some of the workshops again, and hear it again, and get some more practice with somebody there guiding us and helping us, and, I think it would sink in more where we could really put it into play the way we want to." She suggested using future technology funds for additional teacher training. Ellen exclaimed excitement over learning and using PowerPoint, GradeQuick, and the ability to import graphics from the Internet to other software applications. She continued, "Like I said, I think we need more of it and we need more of the same stuff."

The climate of the workshop was conducive to learning, according to Ellen. She commented, "I think the workshops
have been really good--you didn't feel under pressure."
There was opportunity for collaboration as well, "Mrs. Mumby and Mrs. Lambert [both intermediate participants] and I were just going over things, feeling enthused about it, feeling good about it. In fact Mrs. Mumby is helping me with the rest of the GradeQuick writing now." Ellen commented that since everyone knew each other in the workshop it made collaboration much easier. Additionally, Ellen cited a benefit from attending the workshops by the fact that she had to make time to work on the computer:

It's hard to say, well, let me stop what I'm doing. I'm gonna go into the computer room and play around with it. As much as you want to, in our reality sometimes with conferences and everything else, you're not really allowed the time, and then you're sitting there struggling with it trying to remember what to do next. So we could continuously, just every now and then, get somebody to come in and take you through it till you've got it. That helps.

Participants with Beginner Computer Skills

Interview E: Sally

Sally is a veteran teacher with 15 years' experience between urban and suburban schools. She has worked at Southside for the past 6 years. Sally's husband recently received a transfer and now commutes to his job in the Northeast. She has a gentle motherly spirit and a serene
presence. She was admittedly nervous about the interview. Computers intimidate her. Sally confessed that she really does not like to discuss technology all that much. Sally called her son the night before the interview to talk about computers. Her son knows four computer languages, and she thought it might help to speak with him.

Sally characterized herself as a beginner. During the interview I mistakenly referred to her as having intermediate skills. She responded, "Who me? No way! I am a beginner, not an intermediate." When asked about her lack of computer proficiency, she said, "Well I think I've always been afraid of using the computer a lot. It seems to come slower to me, but I think it is a mental thing." In further conversation, Sally attributed her lack of computer proficiency to her age and she grouped herself with another veteran teacher in the training series. "Myself and another older teacher in your workshop each said to each other, I think I'm the worst, and she said she thinks she's the worst."

When posed the question related to her performance at the conclusion of the workshop series, she then considered herself an "advanced beginner." Prior to the TLM series, Sally had observed Microsoft Word and used email, but all of the other software applications were new. Most of the skills taught were also new to Sally. She stressed the importance of taking good notes to be used for reference when she would
try the lessons at home. However, she did complain that because she took notes, and the intermediate and advanced students did not have to, she got behind a few times. She explained that because everything was new to her, the pace at times was a little quick, and she depended on an advanced participant to help her out. "I was sitting next to a person on the computer that was at a higher level than I was, so if I got lost I could ask her and I could get right back on task again and keep up." This comment is commensurate with Knowles' (1995) theory that adults themselves, with their rich knowledge base, are the greatest teaching resource.

Sally spoke of the issue of noise distractions. "I've taught 30 primary level students for 15 years, and I have raised 6 children of my own. There isn't much I can't tune out." One beneficial characteristic of the TLM design was the way sessions were spread over a number of weeks. "It gives you a chance to have some spare time to try things and to go home and really do what you've been shown during the workshops." Because the personal follow-through was so important to her progress, Sally suggested future workshops and small assignments between sessions so that people would have to follow up on what they had learned.

Collaboration was very important to Sally. She mentioned four people with whom she had worked on technology projects after school, since the inception of the workshop series. She believes that those who have the knowledge can
pass it down, and once she is good enough she wants to help
other people. "Tammy told me she is going to show me how to
do the GradeQuick 'cause I didn't go and work on that at
all. She said she'd be happy to work with me after school
one day--and that is a great way to learn." Sally continued,
"I'll learn from her and maybe I can show somebody else--
maybe I can go over to Nancy Joe who says she's worse than
me and I can show her."

The anxiety level Sally felt toward computer usage
prior to the implementation of the TLM has been replaced by
enthusiasm. "I have to honestly say that the workshop has
made me feel anxious now to want to learn to do more with
the computer and I'm not as afraid. I'm not afraid anymore
of making mistakes because you can undo everything. You
can't break it or anything." Much of her enthusiasm for
using the computer now was based on learning a few skills
such as cutting and pasting, and moving things around, and
customizing the screen. She explained, "It's neat to have
great colorful backgrounds that go with your theme or typing
up letters to parents with borders. Actually I feel more
enthused about using [the computer] now."

Sally has actually applied what she learned from the
TLM into her classroom. She described a PowerPoint lesson on
dinosaurs she conducted, replete with bullets, background,
and boarders. "The kids liked it." One of Sally's goals is
to be able to work sound into presentations because her
students really would like that. Sally said that she really wants to learn more about "browsing through the Internet 'cause there are things I'd like to get to." Consequently, she plans on taking a summer computer course on the Internet and email. She explained that she wanted to help students be able to do research for projects but, personally, she will be relocating to join her husband in the Northeast. She also wants to be able to communicate with all of her children, many of whom will remain in Florida.

Several issues were considered by the researcher and the focus group prior to implementation of the TLM. Two important issues were pace and sequence of information delivered. Sally felt that both were conducive to an "excellent hands-on workshop" and that "the presenters gave enough information for the beginners but also gave enough for the people who were advanced or whatever levels they were."

Sally concluded, "I think it is good for you to have workshops for the teachers in computers--especially for people like me who are afraid and feel they are computer illiterate. I think the one thing that I found after the workshop was I actually enjoyed and was thrilled to get back on the computer and be able to do something myself and having the workshop and then the paperwork to go back and just do it step by step so I kind of feel more excited about using the computer."
One important condition of the session, which surfaced through her interview, was the fact that she was happy to be going through a potentially intimidating process with friends instead of strangers. "I felt so comfortable knowing the people that were there with me so I could ask for their help, whereas when I took a computer technology class from the county you didn't have any helpers but you also didn't know the people around you and didn't feel comfortable to ask them if they could help you." She went on to say, "Having people around you that you knew was a big factor for me. I felt fine asking them if I didn't know how to do something, that they wouldn't be snobby about it or they wouldn't want to take time to help me 'cause they didn't really know who I was."

Interview F: Linda

Linda is an energetic person who was eager to share her experiences in the interview. She has taught for 18 years but has worked in the school system for a total of 23 years. She currently teaches in the primary grades and characterized herself prior to the TLM as a beginner because "I don't feel adequate using [the computer]. I felt apprehensive about [the training sessions] and I thought that [the TLM] would make me feel like I'm a real baby." Many responses like the previous one were filled with chuckles and even laughter. She sees herself as an intermediate user now. "I have a better understanding of the
programs and how they work—I've done more myself and I've actually used it more."

Linda found comfort in the support personnel, who were the troubleshooters. "They were very positive, no question was too little or too small for them, and I liked it that they seemed to enjoy helping. It made it more fun." She even commented that she looked forward to the weekly sessions because of the support given. Moreover, Linda liked the fact that the same troubleshooters who helped during the TLM were also available during the regular school day to "follow up on things." "They're just wonderful co-workers." Linda also found relevance in the review at the beginning of each session. She liked the fact that presenters would give some background before advancing into the new material. After the sessions, she said that she tried things at home. "I just felt empowered to go home and try it, try new things or try to do this for myself."

Previous workshops, both at the district and school level, did not leave Linda with a successful feeling about computer usage. She claimed that several one-shot computer workshops have been attempted in the past. She recalled leaving one of the 8-hour, 1-day workshops and thinking, "What was that all about?" She placed a great deal of importance on her own personal follow-up at home: "I went home and did my follow-up. I just started doing it and that's what they said in the workshop, trial and error,
trial and error." She said that after each session, "I went home and I practiced." In fact, she explained that after one particular session she felt overwhelmed and that too much information had been covered, but she reviewed her notes that night. "I was able to sort it out and I did okay."

Linda was tremendously enthusiastic about showing me the lesson plans that she had made on the computer. During Session Three, one of the participants demonstrated how she created a template to generate lesson plans more efficiently and quickly than handwriting them. On two occasions during the interview, Linda wanted to stop and pull them out of her folder to show me. She was excited but, perhaps more importantly, she was proud of her accomplishment. As we proceeded through the interview she seemingly became more excited about speaking on the subject of the TLM. She could not wait to tell me about the things she was now doing that she could not do before the TLM. "I've made a template for my lesson plans, I've started typing my lesson plans on the computer, I've done homework assignments, and I've typed letters to parents." Linda has several technology goals and said, "I'm in the process, I'm not doing it yet but thinking about doing a PowerPoint presentation on Japan, which is a social studies unit that we have to teach in kindergarten, and I've talked to the other kindergarten teachers about it and we're thinking about putting one together."
Collaboration with her cohorts was very important to Linda. She mentioned several people in her interview that she communicates with regularly regarding technology. Since the initiation of the TLM, Linda claimed, "A lot of teachers, have been very helpful after the training sessions, you know we've done a lot of buddying up." She continued, "I've gone to Carla and talked to her about technology, I've talked to Tammy and Stephanie, and Gina, and Candice, a lot of people. Just a few minutes I talked to Kerry."

A previous barrier to acquiring optimal computer skills before the TLM, according to Linda, was her own lack of patience and problem-solving ability. She said that when something went wrong, "I just kind of clammed up before, but now since I've had those sessions, I just feel more confident in using the computer and I'm actually using it."

Previously a barrier to the TLM was the pacing of some of the lessons.

Linda explained that she liked the handouts and writing notes about the presentation so she could attempt skills later that evening while everything was fresh. With several of the high skill level lessons later in the series, she felt the pace was a little too fast and she could not write down notes or she would get behind. "We didn't really have time to write them down because when you stopped and tried to write them down we'd get lost." Linda suggested that the
web page creation lesson be a class by itself for advanced users. That specific class was frustrating to her. "I wasn't ready for that." But she maintained her newly found confidence and responded, "I didn't let it bother me because it was so far out of reach and the pace was too fast for me but I'm like, I'll get that later."

Linda commented on the climate of camaraderie within the group of participants. Teachers would give little reminders and look forward to learning something new. She said, "We're gonna [sic] kind of miss it." Linda developed new relationships with teachers in the class as a result of the continuous collaboration. "I was telling you about Carla. I always thought that she just--she just seems so to herself, and one day I was talking about the template and she just offered to help me. She goes, I'll help you and I went down with what I already knew and she just helped me put it together really quickly." Through her work with Carla, Linda said, "I got to know her as a person and we got to talk more and she's really sweet." Relationships were also strengthened with administrators participating in the TLM. "I even got to know Mrs. Smith, the Assistant Principal, better, and I was like, you know, she's more human 'cause we were sitting down like conversing with her."

Within-Case Analysis

A phenomenological qualitative research study targets individuals' lived experiences and requires the pluralistic
analysis of data. Thematic narratives surfaced in within-case and cross-case methods of descriptive analysis, which resulted in themes and patterns germane to this study. Qualitative coding of data concepts was used to interpret and synthesize data. A compilation of data from the following sources was reviewed and analyzed: naturalistic inquiry through open-ended interviews, participant field notes, researcher field notes, lesson plans, and observations during TLM sessions.

Prior to implementation of the TLM, sample group members assessed their proficiency level on the technology committee survey. The Mankato Survey was used to verify relevant accuracy of participants' self-assessment. Proficiency levels are displayed in Table 2 and were used for within-case and cross-case analysis. The within-case analysis explores both similar and discrepant patterns of data among each of the three identified computer skill levels: beginner, intermediate, and advanced. Central to adult learning are conditional factors, which Knowles (1995) delineates, as displayed in Table 3, section 1. Professional development impact levels were established as a typography by Joyce and Showers (1980) to determine the impact of professional development on involved participants, as displayed in Table 3, section 2.
Table 3

TLM Constructs

<table>
<thead>
<tr>
<th>1. Adult Conditions of Learning</th>
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<tbody>
<tr>
<td>Collaboration</td>
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<td>Respect</td>
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<td>Trust</td>
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<td>Support</td>
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<td>Openness</td>
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<td>Pleasure</td>
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<th>2. Level of Impact</th>
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<tr>
<td>Awareness</td>
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<tr>
<td>Concepts</td>
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<td>Skills</td>
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<td>Application</td>
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Participants With Beginner Computer Skills

The initial analysis is comprised of descriptive data from the two sample group participants in the beginner level, Sally and Linda. Similarities and discrepancies in accounts and experiences of the TLM were analyzed as referenced to adult learning conditions (see Table 3, section 1) and level of impact of professional development (see Table 3, section 2).

Adult learning conditions. Participants in the beginner stage of computer skills (PWBCS) reported that numerous conditional factors of learning impacted their experiences during the TLM (see Table 4). Especially influential for the PWBCS was collaboration among other teachers. Both beginners sought out people with perceived greater skills than they possessed. Of notable importance was the fact that beginner stage participants consulted with only those individuals who had greater computer skills, and who were also participants in the TLM. Linda declared, "The stronger people in the group definitely did not mind helping those of us who needed help." No mention of collaboration among beginner stage computer user existed in any form of data collection outside of the participant group. However, there was a great deal of communication on the topic of technology among participants, and, as Linda confirmed, "A lot of teachers from the TLM
workshops have been very helpful after the training sessions, you know, we've done a lot of buddying up on our own."

Although data indicate beginner stage computer users found solace in collaboration and most often initiated collaborative communication, beginners did not always initiate collaborative activities (see Table 4).

Teachers like Linda were eager to participate with others. "Some teachers, we've talked about what has happened in the training sessions, we've talked about what we've learned, and if there wasn't a clear understanding of something, people have said I'll help you with this or that and I liked that." Sally perceived a hierarchical relationship among the skill groups which could work toward the benefit of the entire workshop group. "Tammy helped me with GradeQuick, and now I can go help Nancy Joe who says she is worse than me." Linda supported the collaborative nature of the experience and summarized the effect of collaboration: "It made us closer, I mean, I know some of the other teachers a lot better than I did before the workshops."

Both Linda and Sally felt somewhat inadequate and vulnerable in their involvement in the TLM. Linda claimed, "I feel like a real baby," and Sally commented, "I've always been afraid of using the computer--it has always seemed to
Table 4
Within-Case Analysis of TLM Impact of Knowles' (1995)

Learning Conditions on PWBCS

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWBCS Linda</th>
<th>PWBCS Sally</th>
</tr>
</thead>
</table>
| Collaboration | "A lot of teachers have been very helpful after the training sessions."
"We've done a lot of buddy ing up."
"Teachers have talked about what they've learned in the training sessions."
"If there wasn't a clear understanding of something, people have said, "I'll help you."
"I've gone to Carla and talked about things."
"I've spoken with a lot of people about the training sessions."
"As the [technology support personnel] set up the computers... I asked them questions."
"I've talked to the other kindergarten teachers about [putting together a PowerPoint unit on Japan] and we're thinking about putting one together."
"We kind of talked about what we've done."
"I've been to Carla's room and I was showing her what I've done and she was showing me what she's done."
"We were able to talk to each other and compare notes, and ask each other questions."
"We felt like we could go to [the support personnel] and ask them if we needed help."
"I talk to Tammy all the time, but I found [sic] even talking more to her."
"I think it was good for the school, you know, everybody kind of jumped into talking about it TLM."
"Everyone made it fun. We were able to talk to each other, compare notes, and ask each other questions."
"The stronger people in the group definitely did not mind helping those of us who needed help, and we didn't feel silly asking them anything." | "I was sitting next to a person on the computer that was at a higher level... if I got lost I could ask her and I could get right back on task again and keep up."
"Tammy told me she's going to show me how to do the GradeQuick."
"She said she'd be happy to work with me after school one day."
"She's gonna [sic] learn a lot [from teaching Sally] and then I'll learn from her."
"I can go over to Nancy Joe's who says she's worse than I am and show her."
"You had people there next to you at different [ability] levels and that helped."
"I felt so comfortable knowing the people that were there with me to ask for their help."
"You had people at different levels |

Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models
Regular Type = Positive Impact or no Change for Future Models
<table>
<thead>
<tr>
<th>Construct</th>
<th>PWBCS Linda</th>
<th>PWBCS Sally</th>
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</thead>
<tbody>
<tr>
<td>Respect</td>
<td>&quot;Teachers have been very helpful after the training sessions.&quot;&lt;br&gt;&quot;They were very positive, no question was too big or small.&quot;&lt;br&gt;&quot;[Support personnel] had a great disposition.&quot;&lt;br&gt;&quot;The stronger people in the group definitely did not mind helping those of us who needed help, and we didn't feel silly asking them anything.&quot;</td>
<td>&quot;I was sitting next to a person on the computer that was at a higher level... if I got lost I could ask her and I could get right back on task again and keep up.&quot;</td>
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<tr>
<td>Trust</td>
<td>&quot;I've been to Carla's room and I was showing her what I've done and she was showing me what she's done.&quot;&lt;br&gt;We were able to talk to each other and compare notes, and ask each other questions.&quot;&lt;br&gt;&quot;The stronger people in the group definitely did not mind helping those of us who needed help, and we didn't feel silly asking them anything.&quot;</td>
<td>&quot;I felt so comfortable knowing the people that were there with me to ask for their help.&quot;&lt;br&gt;&quot;I didn't feel like I was gonna [sic] be totally lost because I knew there was help there, so it gives you a lot more confidence - like a lifeline.&quot;</td>
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<tr>
<td>Pleasure</td>
<td>&quot;I liked that they [troubleshooters] seemed to enjoy helping... it made it fun and you know any time you do something that's fun it makes it better.&quot;&lt;br&gt;&quot;They [troubleshooters] were just wonderful co-workers.&quot;&lt;br&gt;&quot;It TLM was all good, it was really good.&quot;&lt;br&gt;&quot;It TLM was fun.&quot;&lt;br&gt;&quot;I was so enthused with this part of it, you know, the beginning part [first several training sessions] and what I had done and what I had absorbed.&quot;&lt;br&gt;&quot;Everyone seemed eager to be in the class.&quot;</td>
<td>&quot;I'm encouraged, and even when I get to Connecticut this Summer, I might take a computer class.&quot;&lt;br&gt;&quot;I thought it TLM was excellent, I think we should do it again.&quot;&lt;br&gt;&quot;After the workshop, I actually enjoyed and was thrilled to get back on the computer and be able to do something myself.&quot;&lt;br&gt;&quot;I feel more excited about using the computer.&quot;</td>
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Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models<br>Regular Type = Positive Impact or no Change for Future Models
Table 4 (Continued)

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<th>PWBCS</th>
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<td>Support</td>
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<tr>
<td>Linda</td>
<td>&quot;A lot of teachers have been very helpful after the training sessions.&quot;</td>
<td>&quot;I felt so comfortable knowing the people that were there with me to ask for their help.&quot;</td>
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<td>&quot;We've done a lot of buddy up.&quot;</td>
<td>&quot;I was sitting next to a person on the computer that was at a higher level... if I got lost I could ask her and I could get right back on task again and keep up.&quot;</td>
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<td>&quot;If there wasn't a clear understanding of something, people have said, &quot;I'll help you.&quot;</td>
<td>&quot;Tammy told me she's going to show me how to do the GradeQuick.&quot;</td>
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<td>&quot;As the [technology support personnel] set up the computers... I asked them questions.&quot;</td>
<td>&quot;She said she'd be happy to work with me after school one day.&quot;</td>
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<td>&quot;We felt like we could go to [the support personnel] and ask them if we needed help&quot;</td>
<td>&quot;She's gonna [sic] learn a lot [from teaching Sally] and then I'll learn from her.&quot;</td>
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<td>&quot;We were able to talk to each other and compare notes, and ask each other questions.&quot;</td>
<td>&quot;I can go over to Nancy Joe's who says she's worse than I am and show her.&quot;</td>
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<td></td>
<td>&quot;The troubleshooters would come around and help and try to keep us on task.&quot;</td>
<td>&quot;It was important to me to have a &quot;hands-on&quot; workshop with a few people there to help you.&quot;</td>
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<td>&quot;I liked that they [troubleshooters] seemed to enjoy helping.&quot;</td>
<td>&quot;The use of the overhead, and the packets that the people who came to do the workshops - they were excellent in bringing it down to a level where you could follow them.&quot;</td>
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<td>&quot;They [troubleshooters] had a good disposition.&quot;</td>
<td>&quot;The notes they [presenters] gave us were excellent.&quot;</td>
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<td></td>
<td>&quot;They've [troubleshooters] been in the classroom and even helped us.&quot;</td>
<td>&quot;I didn't feel like I was gonna [sic] be totally lost because I knew there was help there, so it gives you a lot more confidence - like a lifeline.&quot;</td>
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<td>&quot;I liked, the fact that there was a review at the beginning of the workshops.&quot;</td>
<td>&quot;Having people around you that you knew was a big factor for me. I felt fine asking them if I didn't know how to do something - that they wouldn't be snobby about it or they wouldn't want to take the time to help me because they didn't really know who I was.&quot;</td>
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<td></td>
<td>&quot;The stronger people in the group definitely did not mind helping those of us who needed help, and we didn't feel silly asking them anything.&quot;</td>
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Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models
Regular Type = Positive Impact or no Change for Future Models

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Table 4 (Continued)

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWBCS</th>
<th>PWBCS</th>
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</table>
| Openness  | "We felt like we could go to [the support personnel] and ask them if we needed help."  
"We were able to talk to each other and compare notes, and ask each other questions."  
"They were very positive, no question was too little or small for them [troubleshooters]."  
"I liked that they [troubleshooters] seemed to enjoy helping."  
"That’s what they said, trial and error, trial and error. And we kept doing trial and error even in the workshops too." | "I felt so comfortable knowing the people that were there with me to ask for their help."  
"I think that when you get into it and you’re not afraid of it, it becomes a little easier."  
"You were also given a little bit of time to explore yourself."  
"I think everyone felt comfortable and even the teachers like myself who might have been nervous about not being as advanced as others, I felt very comfortable - I felt I could learn something."  
"I felt I would ask for help, and it also gave me more enthusiasm to want to know the computer." |
| Humanness | "...even Mrs. Smith, the assistant principal, I mean, you know, she was there working and would say, did I do this? I was like [sic], you know, she’s more human because we were sitting down like [sic] conversing with her."  
"I liked that they [troubleshooters] seemed to enjoy helping."  
"They [troubleshooters] had a good disposition."  
"Everyone seemed eager to be in the class...in there learning, and it was kind of tight [limited space]." | "I felt so comfortable knowing the people that were there with me to ask for their help."  
"I didn’t feel like I was gonna [sic] be totally lost because I knew there was help there, so it gives you a lot more confidence - like a lifeline."  
"You could have had a larger lab but each person did have their own computer."  
"Having people around you that you knew was a big factor for me. I felt fine asking them if I didn’t know how to do something - that they wouldn’t be snobby about it or they wouldn’t want to take the time to help me because they didn’t really know who I was." |

Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models  
Regular Type = Positive Impact or no Change for Future Models
come slower to me." One potential development from the frequent collaboration between beginners and advanced was the presence of trust among the beginner users. During the interview session, Sally claimed, "Having people around you that you knew and trusted was a big factor for me. I felt fine asking them if I didn't know something, and I knew they wouldn't act snobby about it."

The element of trust made beginner participants feel more comfortable in the learning environment as well. Sally said, "I depended on the person sitting next to me that was at a higher level than I was. If I got lost I could ask her and I could get right back on task and keep up with everyone." Observations from the workshop series indicate that the trust and comfort levels of participants grew with each session. More questions and free dialogue were observed in the later training sessions.

A contributing factor to the skill development and participation levels of teachers involved in the training could be attributed to support provided during each session, as well as during the school day. Both Sally and Linda concluded that support was a major influence in terms of how comfortable they were during the workshops, and how they felt about their progress. They felt supported through the collaboration with their peers and the support from colleagues was reassuring to them. Linda reported, "When I asked people to help they were very positive; no questions
was too little or small for them." Support personnel were also cited as beneficial to the beginner user, and Sally reported, "One of the best things about the workshop was the troubleshooters that were available to help you." Sally commented, "I didn't feel like I was gonna [sic] be totally lost 'cause I knew there was help there, so it gives you a lot more confidence. They were kinda [sic] like a life line."

The level of openness during the training sessions was expressed by both Sally and Linda. They appreciated the fact that other participants did not make them feel "silly," as Sally had feared, or like "a real baby," as Linda fretted before the workshop series. The openness helped lead to a reduction of anxiety and a freedom for Sally. "People were there for me." She went on to say, "I have to honestly say that the workshop has made me feel anxious now to want to learn to do more with the computer, and I'm not as afraid of making mistakes." Linda felt that the people were open to assist in any way. "We didn't feel silly asking them or anything." However, Linda felt that the physical configuration and space of the room was limiting. "It was kind of tight in there."

Both Linda and Sally felt that they were able to apply much of the basic information, and this application occurred through the diligent help of their cohorts, which resulted in a feeling of accomplishment and pleasure during the
training. Pleasure was expressed by both of the beginner stage users throughout the interview process. They explained that they actually enjoyed the workshops after school. Linda exclaimed, "It was something that we kinda [sic] looked forward to. I think we're gonna [sic] miss it."

The display of humanness witnessed by Sally and Linda bears mentioning. Sally was concerned about the fact that she was so far behind the rest of the staff regarding technology. She found the training experience enjoyable and rewarding, with no evidence of punitive actions toward her. She attributed this to her knowing and enjoying her time with her cohorts. Sally explained her frustration with prior technology training workshops held at the district level. She trusted that "TLM participants [colleagues] wouldn't be snobby about my asking a silly question or they wouldn't refuse to take the time to help me 'cause they didn't really know who I was." These were honest feelings and honest concerns Sally had prior to the workshops series. Linda experienced similar feelings, but she revealed that through the open forum of learning she came to respect and appreciate Carla in a new light as being "very helpful and open." Linda also made the observation that Mrs. Smith, the assistant principal, "was sitting right next to me and she would have some of the same problems and she seemed more human 'cause we were sitting down, like, conversing with her."
Professional development level of impact. Awareness, according to Joyce and Showers (1980), is the first level of professional development. Through many examples during the 10-session series, intermediate and advanced level participants had an awareness level of computer usage and were capable of transferring the knowledge from one computer software application to another. Because the beginner stage users did not have the same general computer awareness of Windows concepts and basic computer functions, they did not readily have the ability to transfer concepts from one software program to another (see Table 5).

Self-assessment revealed that Linda did grow in the area of awareness through the professional development series. "I have become somewhat familiar with the computer." Due to her new awareness of computer concepts and applications and her skill development in those areas, Linda suggested, "I have worked hard and now would say I'm an intermediate." Building awareness is a key aspect of professional development, and this awareness can lead to skill development and personal growth. To support the importance of awareness, Linda admitted:

Once you have a clear understanding, I mean, you need to have a true understanding of the Windows and that whole word processing, you know, the desktop use of the computer and all that stuff--you have to have an
understanding of that before you talk about entering a class on working with the web.

Linda was diligent in developing her computer skills and said that she asked a lot of questions to satisfy her desire to become more aware of her potential and the computer. Her inquiry was evidenced by the amount of collaboration she engaged in and that she admitted during the interview. "As [technology support] set up the computers or they talked about what they were doing and how they were installing programs, I asked them some questions." Now Linda can measure her abilities and determine if she is ready for additional concepts. She spoke about the most difficult session, web page design: "I'm sure there were some people who were ready, but I just was not at that level." She optimistically predicted, however, "I'll get that later."

The other beginner, Sally, spoke of her self-assessed apprehension of working with computers. "I've always been afraid of using the computer." Her awareness level grew during the workshop series, and she developed a comfort regarding computer usage that was not there previously. "I'm not as afraid, I'm not as afraid anymore."

As a result of Sally's skill development and exposure to computer techniques, her heightened awareness led her to talk about the applications of skills: "It seems interesting and it's very productive. If you're typing something, it's
Within-Case Analysis of Joyce and Showers’ (1980) Levels of Impact of Professional Development on the TLM PWBCS

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWBCS</th>
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<tbody>
<tr>
<td>Awareness</td>
<td></td>
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<tr>
<td>Linda</td>
<td>&quot;Now [after the TLM] I'm like intermediate.&quot; &quot;I have a better understanding of the programs on the computer.&quot; &quot;I'm not doing it yet but thinking about doing a PowerPoint presentation on Japan.&quot; &quot;I was still apprehensive about using the computer I thought and my patience just wasn't there when something went wrong I just kind of clammed up but now since I've had those sessions I just feel more confident in using the computer and I am actually using it.&quot; &quot;I was so much enthused with this part of it, you know the beginning part [first several sessions] and what I had done and what I had absorbed.&quot; &quot;I think it was good for the school, you know, everybody kind of jumped into talking about it TLM.&quot;</td>
<td>Sally</td>
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Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models
      Regular Type = Positive Impact or no Change for Future Models
Table 5 (Continued)

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<thead>
<tr>
<th>Construct</th>
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<tbody>
<tr>
<td><strong>Concept</strong></td>
<td>Linda</td>
<td>Sally</td>
</tr>
<tr>
<td>&quot;I have a better understanding of the programs on the computer.&quot;</td>
<td>&quot;It was important to me to have a &quot;hands-on&quot; workshop with a few people there to help you.&quot;</td>
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<tr>
<td>&quot;When they showed me things this time [TLM] it made sense.&quot;</td>
<td>&quot;The use of the overhead, and the packets that the people who came to do the workshops- they were excellent in bringing it down to a level where you could follow them.&quot;</td>
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<tr>
<td>&quot;As the [technology support personnel] set up the computers or talked about what they were doing and how they were installing a program, I asked them questions and now I know how to install software programs also.&quot;</td>
<td>&quot;The teaching schedule was good because at least it gives you a chance to have time to try it at home.&quot;</td>
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<td>&quot;I liked, the fact that there was a review at the beginning of the workshops.&quot;</td>
<td>&quot;You were also given a little bit of time to explore yourself and try it again in some of the workshops, especially on the Internet, you could go and browse yourself.&quot;</td>
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<tr>
<td>&quot;The pacing on the Web, you know, it was good...but it was just a little too fast.&quot;</td>
<td>&quot;I liked the overhead presentations, I thought all the presenters were excellent, I thought that they gave enough information for the beginners but also gave enough for the people who were advanced to go on or intermediate or whatever levels there were at.&quot;</td>
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<tr>
<td>&quot;I realized every time I sit and do the class, even if the pace is fast, I was learning something.&quot;</td>
<td>&quot;I liked having a break between sessions. That way, you know, you don’t get overwhelmed by too much information.&quot;</td>
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<tr>
<td>&quot;We didn’t have time to write them [notes] down... when you tried to stop and write them down, we’d get lost.&quot;</td>
<td>&quot;Once you have a clear understanding, I mean you need to have a true understanding of the Windows and that whole word processing...before you talk about entering a class on working with the web.&quot;</td>
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<tr>
<td>&quot;We needed those sheets, you know, for every session.&quot;</td>
<td>&quot;I think the web workshop should be a workshop all in itself, I just don’t think it should be included because it’s so powerful.&quot;</td>
<td></td>
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<tr>
<td>&quot;...once you have a clear understanding, I mean you need to have a true understanding of the Windows and that whole word processing...before you talk about entering a class on working with the web.&quot;</td>
<td>&quot;I liked having a break between sessions. That way, you know, you don’t get overwhelmed by too much information.&quot;</td>
<td></td>
</tr>
<tr>
<td>Skills</td>
<td>Linda</td>
<td>Sally</td>
</tr>
<tr>
<td>&quot;One of the workshops I thought I got too much information.&quot;</td>
<td>&quot;I’ve done PowerPoint [now], and I know how to get into the Internet.&quot;</td>
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<tr>
<td>&quot;I’m sure some people were ready for the web workshop, but I just was not at that level.&quot;</td>
<td>&quot;I’ve done some worksheets for my lessons and I’ve gotten some background on them [via the Internet] so I’ve learned a little bit.&quot;</td>
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<tr>
<td>&quot;I was so enthused with this part of it, you know, the beginning part [first several training sessions] and what I had done and what I had absorbed.&quot;</td>
<td>&quot;[Technology] is very productive. It’s so easy to cut and paste and move things around.&quot;</td>
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<tr>
<td></td>
<td></td>
<td>&quot;I’ve learned some PowerPoint, GradeQuick, Internet, and the Encyclopedia.&quot;</td>
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Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models

Regular Type = Positive Impact or no Change for Future Models
Table 5 (Continued)

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<thead>
<tr>
<th>Construct</th>
<th>PWBCS</th>
<th>PWBCS</th>
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<tbody>
<tr>
<td>Linda</td>
<td></td>
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</tbody>
</table>
| Applications | "I’ve done more myself, I’ve actually used it more."
|           | "I just felt empowered to go home and try it. Try new things or try it for myself."
|           | "When I went home and did my follow-up, I just started doing it."
|           | "I typed [on the computer] my classroom assignments, I’ve typed my homework assignments, and letters to parents."
|           | "I’ve made a template for my lesson plans and do them on the computer now."
|           | "We’re using it [the computer] every minute possible in the classroom. We’re actually getting our hands on the computer more in the classroom."
| Sally     |       |       |
|           | "I’ve done some worksheets for my lessons and I’ve gotten some background on them [via the Internet] so I’ve learned a little bit."
|           | "I did do a dinosaur outline for my class with PowerPoint with the bullets and a dinosaur background border."

Note: User Assessment
- **Bold Type** = Negative Impact or a Suggested Change for Future Models
- **Regular Type** = Positive Impact or no Change for Future Models
so easy to cut and paste and move things around and it's neat to have great colorful backgrounds that go with your theme or typing up letters to parents."

The awareness level was adequately addressed through the many different software programs delivered through the 10 sessions. Sally drew an insightful comparison of herself and the intermediate and advanced users: "I probably do not know how to use maybe half of what they showed me without going back and doing it myself and reading the notes, whereas the ones who are intermediate and advanced right away know how to go on and proceed." As Sally's awareness level expanded, her enthusiasm appeared to increase as well. "Actually, I feel more enthused about using [the computer] now."

Concepts and organized knowledge are the second level of impact for professional development, according to Joyce and Showers (1980, 1983). Linda and Sally both gained insight into awareness of technology and computer usage. Linda attributed much of her concept development to collaboration and asking questions. She also attributed her increased comfort and awareness level to the fact that there was a review session prior to each of the learning sessions. "The fact that there was a review at the beginning of the workshops and then after the review, I just felt empowered to go home and try it."
Linda claimed that perseverance helped her absorb concepts as well: "... and that's what they said, trial and error, trial and error, and we kept doing trial and error even in the workshops." She liked the spacing between sessions because she became "overwhelmed" by previous week-long intensive workshops. The spacing which occurred in the TLM helped her "sort it out and I did okay." Conversely, the pace of the individual sessions were sometimes frustrating to her, and some of them "were fun, but a little too fast." She did not feel that each presenter knew the skill levels of the participants well enough. Linda suggested that with the more difficult topics, a guided practice session should be inserted between instructional sessions.

Sally attributed her concept and skill development to the "hands-on" approach of the training and the ability to sit beside an advanced user who could assist her. She felt that the little time before each session started helped because she could review what she had done last session and warm up. Sally also liked the freedom to practice in a guided environment following some of the sessions, such as the Internet session. "We were given a little time to explore for ourselves. We were given time to work on PowerPoint and do our own thing rather than just being shown the steps and not actually do it yourself, so that made a big difference." Sally also commented that she has an eye
condition which prevents her from seeing some things. For this reason, she felt the large projected image on the overhead screen was of significant benefit to her in being able to follow along and grasp concepts.

Sally made several comments regarding how conducive the workshop was to learning. "I felt comfortable and even the teachers like myself who might have been nervous about not being as advanced as the others felt very comfortable." The climate was very important to Sally as she correlated climate and her ability to learn new concepts through a supportive environment. She compared the supportive climate of the TLM to other computer training workshops. "With this series, you have hands-on computers with quite a few people there to help you, the use of the overhead, and the packets that people handed out. They were all excellent at bringing it down to a level where you could follow them." She mentioned the benefit of the troubleshooters and having a small group of participants instead of the whole staff.

Sally also commented on the spacing of the workshop series. "I think the teaching schedule was good because at least it gives you a chance to have some spare time to try it at home." Sally, like Linda, thought the workshops effectively addressed the beginning, intermediate, and advanced users needs. "I thought they gave enough information for the beginners, but also gave enough for the people who were advanced to go on or intermediate, whatever
levels they were at. You touched on a lot of things that teachers can use--PowerPoint, GradeQuick, Internet, and the encyclopedia." One thing that seemed to hinder Sally was the lack of preprinted notes in a few of the sessions because she "got lost while taking notes."

Skill development was an important topic of Sally's interview. However, skill development did not receive as much discussion regarding her experiences. Much of the time her comments on computer skills were related to collaborative ventures outside of the workshop. She did mention the use of the Internet and a few software programs, such as PowerPoint and GradeQuick. Sally picked up several skills, of which she shared examples. "If you're typing something it's so easy to cut and past and move things around and it's neat to have great colorful backgrounds that go with your theme or typing up letters to parents with borders." For Sally, the most important part of her skill development was to get assistance from advanced users and practice at home.

Skill development for Linda was a serious quest. "I feel I have worked very hard." Linda linked the training environment to skill acquisition on several occasions. She consulted other teachers and support personnel to advance her proficiency level. Linda knew that skill development was essential for application, and therefore she, like Sally, placed a great deal of importance on practicing the skills.
learned on her home computer. She was committed to practice every night after a workshop session. "I went home and I practiced." Consequently, the handouts that provided a written tutorial for her were desired and used through her "trial and error" sessions at home.

Support of and collaboration with her peers was of paramount importance to Linda. She garnered assistance from the enthusiastic technology support personnel. "I mean, it's after school and we go to it. It wasn't a chore because [troubleshooters] have just had a good disposition." Linda did not have a great deal of comments regarding specific skill development. She, like Sally, appreciated the small group size. Linda emphasized that this is just the beginning, and that she "needs lots more" training to get where she wants to be.

Application of concepts and skills is the most acute demonstration of knowledge acquisition, and both Linda and Sally spoke of planned application into their professional responsibilities. For example, Sally did attempt a dinosaur presentation with PowerPoint. She said, "I did do a dinosaur outline for my class with PowerPoint with the bullets and a dinosaur background border and also got myself a picture of the dinosaur to put on that sheet, and the kids liked it." Sally plans to add sound to it when she finds time to have someone assist her.
The extent of Linda's application was preparing her lesson plans on a template she made with Carla's assistance. Linda was extremely excited about showing me her new computerized lesson plans. Linda also has plans for future applications. Both Linda and Sally recognized the need for further training in technology concepts and skills to reach the proficiency levels they desire.

Participants with Intermediate Computer Skills

Adult learning conditions. Ellen and Marcus classified themselves as intermediate computer users. Marcus consistently demonstrated slightly higher proficiency levels during the workshop series. Ellen was absent for one of the PowerPoint sessions and freely asked questions during the TLM experience.

Collaboration was an issue which surfaced as important to both participants (see Table 6). Marcus spoke of limited communication outside the workshop. "I worked a little bit with two people that were in the workshop. We did some feedback back and forth, one more advanced than me and one that I've been proud to say needed a little bit of my help." He also quickly collaborated with his neighbor, Amy, during the training sessions. They worked ahead during a few sessions and appeared to have a competitive and fun-natured relationship. Ellen collaborated with two individuals on her own ability level. Ellen said, "I missed some good information, but Mrs. Mumby said that she would sit down and
### Table 6
Within-Case Analysis of the TLM Impact of Knowles' (1995) Learning Conditions on PWICS

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWICS</th>
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<tbody>
<tr>
<td><strong>Collaboration</strong></td>
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</table>
| Ellen | "Mrs. Mumby said she would sit down and go through it [PowerPoint] with me." | "I worked a little bit with two people that were in the workshop."
| | "Me and Mrs. Mumby and Mrs. Lambert - we go over things and felt enthused about it [use of technology]. Feel good about it." | "we did some feedback back and forth."
| Marcus | "[going through the TLM with friends] made it friendlier, more enjoyable and fun and easier to collaborate." | |
| **Respect** | | |
| Ellen | "Me and Mrs. Mumby and Mrs. Lambert - we go over things and felt enthused about it [use of technology]. Feel good about it." | "I know that there’s a bunch of people that, I don’t know, I don’t want to say were computer illiterate but certainly didn’t have much computer skills are now actually teaching on our Professional Development Days some of the programs that we learned, so, I think there’s an energy on the campus"
| Marcus | | |
| **Trust** | | |
| Ellen | "I really depended on my friends to help out on both sides of me if I got stuck." | "The workshop made for a comfortable setting and a noncompetitive type of setting."
| | | "I don’t think you felt apprehensive if you did have a question, you know you weren’t going to hear it from the peanut gallery."
| **Support** | | |
| Ellen | "Me and Mrs. Mumby and Mrs. Lambert - we go over things and felt enthused about it [use of technology]. Feel good about it." | "The person at the head or running the show was able to go on so other people weren’t getting frustrated. It took pressure off of them because, if you got stuck on a point you didn’t stop instruction."
| | | "This session [session six] was the best yet. [It was difficult] Viewing the video tape will be helpful with this one."
| | "I had someone right beside me and I was able to look at their screen and see what they were doing. I think the extra people were nice extra reinforcements." | "It was a small group and it gave me the opportunity to work on the computers right there in front of us. You sat there and they had it on the big screen and you sort of took notes and followed along."
| | "If we could do some of the workshops again, and hear it again and get some more practice with somebody there guiding us and helping us, I think it would sink in more." | |

Note: User Assessment **Bold Type** = Negative Impact or a Suggested Change for Future Models
**Regular Type** = Positive Impact or no Change for Future Models

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Table 6 (Continued)

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWICS Ellen</th>
<th>PWICS Marcus</th>
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</thead>
<tbody>
<tr>
<td>Openness</td>
<td>&quot;Me and Mrs. Mumby and Mrs. Lambert - we go over things and fell enthused about it [use of technology]. Feel good about it. &quot;The workshop made for a comfortable setting and a noncompetitive type of setting.&quot; &quot;I don't think you felt apprehensive if you did have a question, you know you weren't going to hear it from the peanut gallery.&quot;</td>
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<tr>
<td>Pleasure</td>
<td>&quot;Me and Mrs. Mumby and Mrs. Lambert - we go over things and fell enthused about it [use of technology]. Feel good about it. &quot;Everybody was having a good time and learning a lot. &quot;It was fun, it wasn't like I didn't look forward to going to them, I had a really nice time.&quot; &quot;[going through the TLM with friends] made it friendlier, more enjoyable and fun and easier to collaborate.&quot; &quot;I had a nice time.&quot; &quot;The atmosphere [of the TLM] was lighter than going to a normal workshop where you don't know anyone. Being around friends made it fun.&quot;</td>
<td></td>
</tr>
<tr>
<td>Humanness</td>
<td>&quot;[going through the TLM with friends] made it friendlier, more enjoyable and fun and easier to collaborate.&quot; &quot;The climate was a little loud [session four] and it is becoming more challenging so I prefer it more quiet to practice.&quot; &quot;The workshop made for a comfortable setting and a noncompetitive type of setting.&quot; &quot;It was a little chilly in here today.&quot;</td>
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Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models Regular Type = Positive Impact or no Change for Future Models
help me go through it." She commented that some of the positive feelings she experienced during the TLM were due to the combined communicative effect. "Yeah, with Mrs. Mumby and Mrs. Lambert--we go over things and feel enthused about it, feel good about it." Ellen also thought that knowing people in the training made it much easier for collaboration to occur.

Ellen possessed mutual respect with her friends, and she was reliant upon her peer participants for assistance. "I really depended on my friends to help out on both sides of me if I got stuck." Marcus' response to the respect level of participants in the TLM was very interesting. He exhibited a degree of respect for the beginner computer users in the TLM. Marcus appreciated and respected the efforts made by participants with lesser skills. He commented, "I know that there's a bunch of people that, I don't know, I don't want to say were computer illiterate but certainly didn't have much computer skills. They're now actually teaching on our Professional Development Days some of the programs that we learned, so I think there's an energy on the campus."

Trust played a role in the training series even for the intermediate users. According to Marcus, a certain level of trust existed in the program, and subsequently participants were willing to take more risks because of their comfort level. Marcus spoke to this issue, whereby all of the
accommodations "made for a comfortable setting and a noncompetitive type of setting." He continued, "I don't think you felt apprehensive if you did have a question, you know, you weren't going to hear it from the peanut gallery."

The degree of support provided to participants was appreciated by Ellen and Marcus. They felt that the support provided to beginners helped them in the long run, because the presenter could continue without stopping, while the troubleshooter handled the question. Marcus reported, "The person at the head or running the show was able to go on so other people weren't getting frustrated. It took pressure off of them because, if you got stuck on a point you didn't stop instruction." Ellen confessed that many times instead of utilizing the troubleshooters for assistance, "I had someone right beside me, and I was able to look at their screen and see what they were doing. I think the extra people were nice extra reinforcements." It appeared that Ellen preferred the support of her peers to the support of the troubleshooters.

Knowles' (1995) final condition of "humanness" was referenced a few times by the intermediate respondents. Marcus complained about the cold temperature and brought up the issue of excessive noise, whereas Ellen expressed her feeling of comfort and enjoyment because she was able to spend time with her friends. Both intermediate participants expressed enthusiasm, pleasure, and openness toward
computers with respect to the TLM. Ellen remarked, "Everybody was having a good time and learning a lot. It was fun. It wasn't like I didn't look forward to going to them. I had a really nice time." She later commented about the training sessions that she was "enthused about it, feeling good about it." She too liked the fact that the TLM was designed around allowing cohorts to communicate about technology and thought. "It made it friendlier, more enjoyable and fun and easier to collaborate."

Professional development level of impact. Both of the intermediate users had a general sense of awareness of computer technology. Marcus had more experience using computers and appeared to have an easier time adapting to new software applications from session to session. Ellen has been at the school for 12 years and she recollected that several staff workshops have been conducted on the topic of computers. Therefore, she had an awareness of some of the software programs available to her as a teacher but was not as familiar with their individual nuances as was Marcus (see Table 7).

Ellen commented that she wanted the presenters to explain the rationale for doing things instead of instructing the class to "do this, do that." Ellen admitted, "At the beginning there were some positive things on the first workshop, some things that I didn't realize that were really basic but I had never been exposed to." Neither
### Table 7

**Within-Case Analysis of Joyce and Showers' (1980) Levels of Impact of Professional Development on the TLM for PWICS**

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<tr>
<th>Construct</th>
<th>PWICS</th>
<th>PWICS</th>
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<tbody>
<tr>
<td>Ellen</td>
<td>Marcus</td>
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</tr>
<tr>
<td>Awareness</td>
<td>&quot;at the beginning there was some positive things on the first workshop, some things that I didn't' realize that were really basic but I had never been exposed to.&quot; &quot;There's [sic] a lot of things that I wouldn't have known about.&quot; &quot;I didn't realize that I could highlight it and copy it or cut it and all that good stuff, so I did that at home and that's been very helpful and made things go much faster.&quot;</td>
<td>&quot;I've had no formal training. I've picked up some things along the way so I feel comfortable with the basic programs.&quot;</td>
</tr>
<tr>
<td>Concepts</td>
<td>&quot;There was one [presenter] that was just do this, do that, do this, do that, and it just kind of stumped me because I did not know why and I really don't' understand.&quot; &quot;It makes it so much easier... to say this is what we're gonna do and take us through some steps before we even touch the computer and give us an overview... to give us a reason for doing this... if we have an idea what process that's happening, it will help us be able to better process the information.&quot; &quot;If we could do some of the workshops again, and hear it again and get some more practice with somebody there guiding us and helping us, I think it would sink in more.&quot;</td>
<td>&quot;Breakout sessions for the advanced users [session nine and ten] would be appropriate so they can try something more challenging.&quot; &quot;From the first session to the second session I saw a big change in being able to follow what the instructor was doing.&quot; &quot;I felt like we were repeating ourselves on some of the presentations. I appreciate the fact that they did that, in the sense that if someone didn't know those skills... but I think we could have skipped the reviews at the beginning of each session.&quot; &quot;I think having a break from the computer was helpful, being able to go back and try it in your classroom or in the computer lab on some free time and then coming back with some questions was good. I don't think on a daily basis you'd have the opportunity to get a little bit of practice time in.&quot;</td>
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*Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models
Regular Type = Positive Impact or no Change for Future Models*
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<thead>
<tr>
<th>Construct</th>
<th>PWICS Ellen</th>
<th>PWICS Marcus</th>
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</thead>
</table>
| Skills    | "I understand about Windows a little bit, and I understand about folders and holding information but I need to know ahead of time where we're going, so that I'm doing it. It helps me process the information better."  
"I didn't realize that I could highlight it and copy it or cut it and all that good stuff, so I did that at home and that's been very helpful and made things go much faster."  
"It was great to learn how to download graphics and pictures!" | "Being able to actually do it hands on was a huge difference and I think it helped me learn the program maneuvers a lot easier"  
"chronologically in terms of the difficulty of the programs and learning it went from the really simple to the more complex programs, and, so I think the teachers were able to build on that, you know build on their skills." |
| Application | "The design, TLM that was good. I liked being able to put the graphics and everything in what we were doing and use it."  
"The majority of the presentations were useful and it was something that we can apply into the classroom, use on our own, and help the children apply [technology] to their work." | "I know that there's a bunch of people that, I don't know, I don't want to say were computer illiterate but certainly didn't have much computer skills and are now actually teaching [software programs] on our Professional Development Days."  
"Certainly I've already begun doing lesson plans on the computer and typing them, where I used to just hand write them, and I'm in the process of inputting all of my students' data for GradeQuick." |

Note: User Assessment  
**Bold Type** = Negative Impact or a Suggested Change for Future Models  
**Regular Type** = Positive Impact or no Change for Future Models
Marcus nor Ellen were aware of the complete listing of software programs and computer applications available to them. In fact, Ellen admitted after the workshop series, "There's [sic] a lot of things that I wouldn't have known."

Marcus' lack of awareness may have resulted from no formal training. "I've had no formal training. I've picked up some things along the way so I feel comfortable with the basic programs." Marcus commented on the topic of global awareness of all participants in the TLM. "I know that there's a bunch of people that, I don't know, I don't want to say were computer illiterate but certainly didn't have much computer skills and are now actually teaching [software programs] on our Professional Development Days."

Ellen cited clear explanations, handouts and rationale for completing various tasks during a presentation as the most important issues to her. She felt that she could grasp concepts easier if an explanation preceded the instruction and hands-on instruction. Ellen stated, "There was one [presenter] that said just do this, do that, do this, do that, and it just kind of stumped me because I did not know why and I really don't understand. I understand about Windows a little bit, and I understand about folders and holding information but I need to know ahead of time where we're going, so that I'm doing it. It helps me process the information better."
Clearly, Ellen's primary impact stage was at the concept level, and those workshops which catered to the participants through handouts and instruction prior to the hands-on time were beneficial for Ellen. She declared, "It makes it so much easier . . . to say this is what we're gonna do and take us through some steps before we even touch the computer and give us an overview . . . to give us a reason for doing this . . . if we have an idea what process that's happening, it will help us be able to better process the information.

"Whereas Ellen appreciated review time at the onset of each session, Marcus' opinion differed greatly. "I felt like we were repeating ourselves on some of the presentations. I appreciate the fact that they did that, in the sense that if someone didn't know those skills . . . but I think we could have skipped the reviews at the beginning of each session."

Marcus seemed to adapt and assimilate concepts more quickly than did Ellen. He spoke of environmental issues which could help the entire group and himself. He commented on the loudness of the room at times as well as the temperature. Moreover, he was critical of the first session layout, in which the makeshift projector was used. Marcus had a difficult time following along with the presenter at the beginning of the sessions, but once the problem was addressed he commented, "From the first session to the
second session I saw a big change in being able to follow what the instructor was doing."

A portion of the interview discussion pertained to skill development for Marcus. He once again contributed a portion of the perceived success of the TLM to environmental or climate factors. "First of all, it was a small group, and it gave me the opportunity to work on the computers right there in front of us. You sat there and they had it on the big screen and you sort of took notes and followed along." He continued, "Being able to actually do it hands-on was a huge difference, and I think it helped me learn the program maneuvers a lot easier."

Marcus was critical of two sessions; Student Writing Center and FIRN. He concluded that the Student Writing Center was too "basic" and that the students are accustomed to working with the program now. Therefore, the training time could have been allocated to another topic or software program. Conversely, he assessed the FIRN training as replete with good information but "too fast" to comprehend all of the "little gadgets and specialties" within FIRN. Finally, Marcus spoke positively regarding the sequence of the training sessions. "Chronologically in terms of the difficulty of the programs and learning it went from the really simple to the more complex programs, and so I think the teachers were able to build on that, you know, build on their skills."
Even though Ellen concentrated heavily on a conceptual framework to promote computer proficiency, she did speak on the subject of specific skill development during our interview. Her discussion of software programs mentioned PowerPoint, GradeQuick, and the Internet. Ellen enjoyed learning about tips and techniques, such as cutting and pasting that could save her time. She commented, "I didn't realize that I could highlight it and copy it or cut it and all that good stuff, so I did that at home and that's been very helpful and made things go much faster.

Ellen's skill development was impacted by the additional support from peers and support personnel. As a result of her experiences during the TLM, Ellen suggested, "If we could do some of the workshops again, and hear it again and get some more practice with somebody there guiding us and helping us, I think it would sink in more."

Both Ellen and Marcus applied skills and concepts gained through the TLM. Ellen used practice and application in synonymous fashion, and she spoke in general terms of application. She spoke enthusiastically of applying many of the new software programs. "[PowerPoint] looks really awesome to be able to take that information and give the children a different flavor, you know, a different teaching technique, using PowerPoint in the classroom." She said also that she "definitely" plans to use GradeQuick because it looks easier and quicker than performing the task manually.
Marcus reported that he has already applied many newly acquired skills. "Certainly I've already begun doing lesson plans on the computer and typing them, where I used to just handwrite them. I'm in the process of inputting all of my students' data for GradeQuick." Moreover, he has specific intentions for the future based upon his new knowledge. He stated, "I'd like to do some group PowerPoint projects with student reports after FCAT is over." He said, " I'd really like to see [computer technology] in my class used for enrichment in terms of reports, research, PowerPoint presentations, and book reports."

Marcus teaches two classes of reading and was excited about the implications of the computer in the classroom. "We're using the Balanced Literacy Program. I can implement it as a center, and I think it would be relatively easy for the kids to work in maybe their Literature Circles too." Ultimately Marcus would like to make copies of student work and "put them on CD ROM so we can view it for the rest of the class for like [sic] sort of a mini-book report, and that's my goal in the classroom."

Marcus attributed much of the participants' abilities to absorb information to the scheduling of workshops. "I think having a break from the computer was helpful. Being able to go back and try it in your classroom or in the computer lab on some free time and then coming back with some questions was good. I don't think on a daily basis
you'd have the opportunity to get a little bit of practice time in."

Participants with Advanced Computer Skills

Adult learning conditions. Carla and Amy were both identified as advanced computer users. Amy gained her computer skills through collegiate class work and self-taught computer exploration. Carla obtained her computer skills through self-taught methods and a lot of support from her teenage children. Both teachers were involved in assisting other members of the professional development group. Amy enjoyed having someone next to her in the training sessions who was at approximately the same proficiency level as she. "It was kind of neat to have somebody almost at the same level next to me so we could feed off of [sic] one another."

Carla too enjoyed partnering with a peer of similar ability levels. She collaborated with Mindy, an advanced computer user. "Mindy and I bounce a lot of stuff off of [sic] each other." Most of Carla and Amy's experiences with collaboration, however, involved the advanced users as supportive coaches for the beginner users (see Table 8). Carla even arranged to go to other participant's homes to help them with their computer projects. Therefore, the advanced users had an appreciation for the support personnel. They could help offset the demands made of Carla and Amy.
Table 8
Within-Case Analysis of the TLM Impact of Knowles' (1995) Learning Conditions on PWACS

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWACS</th>
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<tbody>
<tr>
<td>Collaboration</td>
<td>Amy</td>
<td>Carla</td>
</tr>
<tr>
<td>&quot;It was kind of neat to have somebody almost at the same level next to me so we could feed off [sic] of one another.&quot; &quot;Next time we should ask people with higher ability to help with the lower classes cause then that reinforces what they know too.&quot; &quot;Sally and I are working on a PowerPoint presentation for Curriculum Night for next year. We will start collecting pictures and things to show the parents what we do in second grade.&quot;</td>
<td>&quot;Mindy and I bounce a lot of stuff off of [sic] each other.&quot; &quot;I've been helping a lot of people set up their lesson plans because it's easier if you walk them through one by one.&quot; &quot;Some of the people I've helped with lesson plans are just so fired up about what they're doing and I think that's the first step - if you can get them turned on.&quot; &quot;Laurie was another one that I had to show how to make a table and now look at her, and she's training the staff on GradeQuick a few months later.&quot; &quot;Mindy [another advanced computer user] and I are constantly feeding into Nancy Joe and trying to help her when we can.&quot;</td>
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<tr>
<td>Respect</td>
<td>&quot;I thought it was wonderful when Sally was so excited, I guess just cause she's my example for everything.&quot;</td>
<td>&quot;Linda who has really made a lot of progress.&quot; &quot;Cathy [Technology Support Assistant] has just been a godsend to this school because I mean you tell her I need something and man she's right back in your room with it.&quot;</td>
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<tr>
<td>Trust</td>
<td>&quot;I think if I would not have been sitting by Sally or Marcus, since I know both of them, and by somebody else that I don't talk to very often, I probably would have been a lot more quite and more shy and just stayed to myself - so I think I learned more having those people around me.&quot;</td>
<td>&quot;Here you're kind of with your peers and then everybody knows everyone and there is trust or a comfort zone.&quot;</td>
</tr>
<tr>
<td>Support</td>
<td>&quot;It was kind of neat to have somebody almost at the same level next to me so we could feed off [sic] of one another.&quot; &quot;I think the extra support was great to keep everybody moving along and keep us moving forward.&quot; &quot;With the video camera, I think I felt I had to be quiet - I knew everything I would say would be recorded.&quot; &quot;I think I learned more having [friends] around me.&quot;</td>
<td>&quot;Mindy [another advanced computer user] and I are constantly feeding into Nancy Joe and trying to help her when we can.&quot; &quot;Cathy [Technical Support Assistant] has just been a godsend to this school because I mean you tell her I need something and man she's right back in your room with it.&quot;</td>
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Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models
Regular Type = Positive Impact or no Change for Future Models

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<table>
<thead>
<tr>
<th>Construct</th>
<th>PWACS</th>
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<tr>
<td>Amy</td>
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<td>Carla</td>
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<tr>
<td>Openness</td>
<td>&quot;I think if I would not have been sitting by Sally or Marcus, since I know both of them, and by somebody else that I don’t talk to very often, I probably would have been a lot more quite and more shy and just stayed to myself - so I think I learned more having those people around me.&quot;</td>
<td>&quot;In a room where you don’t know anyone, your not gonna [sic] ask some questions where you’re gonna [sic] look stupid, whereas, here you’re kind of with your peers and then everybody knows everyone and there is trust or a comfort zone.&quot;</td>
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<tr>
<td>Pleasure</td>
<td>&quot;I really enjoy learning about [technology] but I wish we could move faster.&quot;</td>
<td>&quot;I kind of felt like I was wasting time and the school’s money when I’m sitting there and it’s kind of a lot of review for me.&quot;</td>
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<tr>
<td>Humanness</td>
<td>&quot;I think I learned more having [friends] around me.&quot;</td>
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<td></td>
<td>&quot;I noticed that it was quieter with the lights off and I liked that.&quot;</td>
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<tr>
<td></td>
<td>&quot;It was too cold in there.&quot;</td>
<td>&quot;Here you’re kind of with your peers and then everybody knows everyone and there is trust or a comfort zone.&quot;</td>
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<td></td>
<td>&quot;I think when you get to that time of day [after school] you’ve got a lot of people that are tired, it’s a little bit harder to focus.&quot;</td>
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Note: User Assessment  | Bold Type = Negative Impact or a Suggested Change for Future Models  | Regular Type = Positive Impact or no Change for Future Models
Amy enjoyed collaborating with people in the lower groups, especially Sally, one of her mentors during Amy's first year of teaching. "I thought it was wonderful when Sally was so excited, I guess just cause she's my example for everything." Amy respected Sally for her efforts late in her career and drew inspiration from the experience. Amy proposed doing a PowerPoint presentation with Sally at curriculum night during the next school year for the parents. "It would be so much easier to do it together--it takes a lot of pressure off of you because they are not looking at you the whole time."

Carla is considered by many staff members as the teacher to go to if they have any technology questions. Carla said, "I've been helping a lot of people set up their lesson plans because it's easier if you walk them through one by one." She feels like the workshops have had a very positive impact on the school climate and she commented, "Some of the people I've helped with lesson plans are just so fired up about what they're doing and I think that's the first step--if you can get them turned on." Some of the people Carla has helped have made rapid advances in their skills. Carla explained, "Laurie was another one that I had to show how to make a table and now look at her--she's training the staff on GradeQuick a few months later."

Carla also expressed respect for the perseverance of Linda who "really made a lot of progress." Carla professed
that she sees it as a continuous process to support new computer users. "Mindy [another advanced computer user] and I are constantly feeding into Nancy Joe and trying to help her when we can."

Carla explained that she committed to help several other staff members, but had not had the time yet. Collaboration also impacted the school. Carla and Mindy were scheduled to be guest presenters at the district technology fair shortly after the conclusion of the TLM.

Carla recognized an element of trust (see Table 8) on behalf of the beginner level computer users. She thought the fact that everyone was a part of the team made people more trusting. Carla felt that participants who had questions would not ask in "a room where you don't know anyone. You're not gonna [sic] ask some questions where you're gonna [sic] look stupid, whereas here you're kind of with your peers and then everybody knows everyone and there is trust or a comfort zone."

Both Carla and Amy recognized the importance of support for computer users during the technology training. However, their appreciation of the troubleshooters and other support mechanisms within the design of the training series was focused on the accelerated pace and elimination of interruptions. Amy said, "I think the extra support was great to keep everybody moving along and keep us moving forward." Carla and Amy both acted as great supportive
resources for other people in the TLM, but Carla was the only advanced user who depended on Cathy, the technology support person at the school. "Cathy has just been a godsend to this school because, I mean, you tell her I need something, and man, she's right back in your room with it."

Amy enjoyed helping other people and suggested for future technology training to have the advanced computer users as the troubleshooters. "Ask people with higher ability to help with the lower classes 'cause then that reinforces what they know too." One component originally initiated to support and comfort teachers in the training session was the availability of a video camera for those who may have forgotten some of the skills addressed in a particular software session. Ironically, Amy considered the camera more of a threat than supportive device. "I think I felt I had to be quiet--I knew everything I would say would be recorded."

For Amy, the openness and casual atmosphere of the training session experiences were conducive to learning. Since this was Amy's first year at Southside she did not know many people in the school. She said that she appreciated the fact that participants were familiar with each other. "I think if I would not have been sitting by Sally or Marcus, since I know both of them, and by somebody else that I don't talk to very often, I probably would have
been a lot more quite and more shy and just stayed to myself. So I think I learned more having those people around me." Amy confided that she would have been a lot happier if it had not been so cold in the computer lab.

Carla had a good experience with the TLM, but since she was so advanced, she was held back quite a lot, and this potentially diminished her enjoyment level. She also did not like the time of day the sessions were conducted. "I think when you get to that time of day you've got a lot of people that are tired. It's a little bit harder to focus." However, Carla explained that she felt empowered by being instructed to move ahead because she was already proficient at the skill levels being taught at the time. Learning conditions were not of individual concern for the advanced computer users as much as a concern for the group as a whole. Carla and Amy shared feelings of trust and support but were seemingly more concerned with the lesser skilled participants in terms of the learning conditions of the study.

**Professional development level of impact.** Carla has been teaching at Southside Elementary for 4 years and, as an advanced user, was aware of the software available for faculty and students at the school. Amy, however, was not quite as familiar with each software title available. Consequently, Amy's awareness of the products available to her was enhanced during the training sessions. She explained
some of her motivation to become more aware of computer
technology. "Technology is the way of our future. We have to
get into it and if [students] ask me questions, I need to be
knowledgeable about it. I can't say I don't know." Carla
mentioned during her interview that a derivative of the TLM
is the fact that the rest of the workshop participants
"realize how much they are gonna [sic] have to expand their
knowledge about computers." Both Amy and Carla had an
excellent sense of technology awareness prior to the TLM.

The advent of Windows has made computers easier to use
and concepts more easily transferred from one program to the
next. Amy and Carla have fundamental knowledge about
computer programs and concepts (see Table 9). However,
interesting comments were made by the participants during
our interviews. Amy explained her opinion of the review
sessions. "There was almost always a review, and each
presenter was different, but we always had reviews on
everything, so for the beginners it was great."

Amy liked the fact that the beginners could see "the
connection between programs," such as the minimize bar. Amy
liked the time we had sessions on consecutive days but
thought that it was probably "overwhelming" for the
beginners and that the group was better off having sessions
a week apart. Carla also found the spacing of sessions
appropriate for beginners. "I liked the format, and I think
if you're working with beginners, people who aren't really
### Table 9

**Within-Case Analysis of Joyce and Showers’ (1980) Levels of Impact of Professional Development on the TLM PWBCS**

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWACS</th>
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<tbody>
<tr>
<td></td>
<td>Amy</td>
<td>Carla</td>
</tr>
<tr>
<td>Awareness</td>
<td>&quot;Technology is the way of our future, we have to get into it and if [students] ask me questions, I need to be knowledgeable about it, I can't say I don't know.&quot; &quot;Mindy did a great job showing everyone how to make a template for their lesson plans. I realize I spend too much time on that stuff.&quot;</td>
<td>&quot;I think the beginners realize how much they are gonna[sic] have to expand their knowledge about computers.&quot; &quot;I kind of felt like I was wasting time and the school’s money when I’m sitting there and it’s kind of a lot of review for me.&quot;</td>
</tr>
<tr>
<td>Concepts</td>
<td>&quot;Next time we should ask people with higher ability to help with the lower classes cause then that reinforces what they know too.&quot; &quot;There was almost always a review and each presenter was different but we always had reviews on everything so for the beginners it was great.&quot; &quot;I thought it was good for the beginners to see the connection between programs&quot; &quot;I liked the format and I think if you’re working with beginners of people who aren’t really comfortable with their skills, I thought the format was great.&quot; &quot;Today we learned how to start a web page. I really enjoy learning about [technology] but I wish we could move faster.&quot;</td>
<td>&quot;I think when you get to that time of day [after school] you’ve got a lot of people that are tired, it’s a little bit harder to focus.&quot; &quot;I would have the sessions based on ability. I would have a beginner session, which I felt like this was probably more focused toward, and then maybe an advanced session for people who are a little more comfortable with computer skills.&quot;</td>
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<tr>
<td>Skills</td>
<td>&quot;This was a great session [session five, GradeQuick] and I feel like I am walking away with great knowledge. I wish that we could have more time.&quot; &quot;Today we learned about Student Writing Center. Everyone seemed to like it but it was a review for me. This is a great time for me to learn new things as others learn the basics.&quot; &quot;Split us up according to [ability] levels so the presenters can teach us even more.&quot;</td>
<td>&quot;I learned a lot of new little techniques from the web design session, but I’m still not comfortable.&quot; &quot;I would have the sessions based on ability.&quot;</td>
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**Note:** User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models  
Regular Type = Positive Impact or no Change for Future Models
Table 9 (Continued)

<table>
<thead>
<tr>
<th>Construct</th>
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<tr>
<td>Amy</td>
<td>&quot;We’re making an impact by saying we learned this great thing [i.e. PowerPoint] and how we now make presentations to use for teaching.&quot; &quot;Sally and I are working on a PowerPoint presentation for Curriculum Night next year. We are collecting pictures and things to show parents what we do in second grade.&quot;</td>
<td>Carla &quot;I would suggest having time where you have instructional time followed by a practice session rather than another information session so we could just have a little more time to practice.&quot;</td>
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</tbody>
</table>

Note: User Assessment Bold Type = Negative Impact or a Suggested Change for Future Models
Regular Type = Positive Impact or no Change for Future Models
comfortable with their skills, I thought the format was great." For advanced users she suggested an intensive session with consecutive days.

The first three sessions were classified as refreshers for both Amy and Carla. Amy enjoyed the review sessions, as did Carla, but she confessed, "I kind of felt like I was wasting time and the school's money when I'm sitting there and it's kind of a lot of review for me." Carla did find that some of the sessions later in the sequence had something to offer her. "I learned a lot of new little techniques from the web design session, but I'm still not comfortable." Amy too enjoyed the sessions on GradeQuick and web page design but complained, "Today we learned how to start a web page. I really enjoy learning about this but I wish we could move faster."

Approximately half of the sessions had been completed before Carla felt like she gained many new skills. She suggested, "I would have the sessions based on ability. I would have a beginner session, which I felt like this was probably more focused toward, and then maybe an advanced session for people who are a little more comfortable with computer skills." Amy was of the same opinion and she recommended, "Split us up according to [ability] levels so the presenters can teach us even more."

With a sound conceptual and skill knowledge base, the advanced users were intent on putting newly learned programs
into practice. Application is the final stage of the Joyce and Showers' (1980) impact of staff development typography. Essential to Carla's ability to apply was her opportunity to practice the new skills. Carla said that if another session was planned she would suggest "having time where you have instructional time followed by a practice session rather than another information session so we could just have a little more time to practice." Carla currently creates her lesson plans on the computer and plans, this Spring, to provide technology inservice training with Mindy to teachers in the school district. Carla has taught lessons with PowerPoint. Next year, she and Mindy plan to use PowerPoint to give presentations to parents during Curriculum Night.

Amy recently converted her lesson plans to computer-generated lesson plans. She is working on creating a classroom web page to communicate with parents and students from their home computers. She also uses the computer for research and science lessons. Amy and her mentor teacher, Sally, plan to use PowerPoint for a Curriculum Night presentation to parents. "Sally and I are working on a PowerPoint presentation for Curriculum Night for next year. We will start collecting pictures and things to show the parents what we do in second grade." She is of the opinion that the workshop has been good for the school. "We're making an impact by saying we learned this great thing and how we now make presentations to use for teaching."
Application for the advanced users not only resulted in building on their own continued knowledge base but also in their teaching other members in the workshop series.

Cross-Case Analysis

The cross-case method of qualitative analysis in this study specifically identified the similarities and differences among the three ability groups as revealed in interviews, participant field notes, researcher field notes, observations during training sessions, and lesson plans. Constructs of the study were examined, and a user's assessment accompanying each table was utilized. These identified positive conditions and procedural TLM issues, as well as those which indicated program design problems and suggested changes for future Technology Learning Models. Discrepant and similar patterns emerged through analysis of data between the ability groups. Data were referenced to Knowles' (1995) adult conditions of learning (see Table 3, section 1) and Joyce and Showers' (1980) levels of professional development impact on participants (see Table 3, section 2).

Adult Learning Conditions

The importance of the Technology Learning Model's conditions of learning was unique for every ability level (see Table 10) and each individual participant (see Table 11). Similarities were detected through frequency coding and analysis of descriptive data. For example, the most relevant
### Table 10

Cross-Case Group Analysis of the TLM Impact of Knowles' (1995) Seven Essential Conditions of Learning

<table>
<thead>
<tr>
<th>Construct</th>
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<th>PWICW</th>
<th>PWACS</th>
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<td>Respect</td>
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<td>Openness</td>
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<td>Pleasure</td>
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<td>Humanness</td>
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<td>+/-</td>
<td>+/-</td>
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Note: User Assessment

- **+** = TLM Participants had mostly positive experiences with this construct
- **-** = TLM Participants had mostly negative experiences with this construct
- **+/-** = TLM Participants had positive and negative experiences with this construct
Table 11
Cross-Case Individual Analysis of the TLM Impact of Knowles’ (1995) Seven Essential Conditions of Learning

<table>
<thead>
<tr>
<th>Name</th>
<th>Collaboration</th>
<th>Respect</th>
<th>Trust</th>
<th>Support</th>
<th>Openness</th>
<th>Pleasure</th>
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Note. User Assessment:
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- weave = significant evidence/importance
- diagonal = minimal evidence/importance
- no shade = little or no evidence/importance
conditions, according to the PWBCS, were collaboration, support, and trust. During the interview session, Sally mentioned having vulnerable and inadequate feelings regarding her computer knowledge before the TLM implementation. "I've always been afraid of using the computer a lot. It seems to come slower to me." Linda was afraid that her experience in the TLM would make her "feel like a real baby."

Because of their apprehension, they mentioned the presence of strong user support as a critical factor to their success. Specifically appreciated were the handouts and troubleshooters. Sally depended on the troubleshooters to be there. "They were kind of like a lifeline."

Conversely, support was not personally an essential component of the training series for the intermediate and especially the advanced users. However, all of the intermediate and advanced users credited the support of the troubleshooters with keeping the workshops moving forward. Without the troubleshooters, participants would have reached high frustration levels. Marcus said, "The person at the head or running the show was able to go on so other people weren't getting frustrated." He continued, "I think that was a positive experience for everyone else who was maybe advanced or intermediate and didn't need the help and could move on." None of the intermediate or advanced users commented on whether the handouts were beneficial, as noted
by the beginners. Moreover, the support spoken of during the intermediate and advanced participant interview sessions was related to how this support in fact assisted the beginners, and therefore indirectly benefitted both intermediate and advanced users.

Emanating from extensive support, beginner level participants enjoyed the trust level and openness of the learning atmosphere. They appreciated the ability to ask questions without feeling embarrassment or shame. "I felt I could learn something. I felt I could ask for help and it also gave me more enthusiasm to want to know more about the computer," Said Sally. They both eagerly admitted during the interview session and in their field notes that they enjoyed the process. Linda even said, "I think we're gonna kinda [sic] miss going every Wednesday."

Marcus was the only individual, from the two more proficient groups, who mentioned an environment where participants felt comfortable to the point they trusted people not to denigrate someone who asked questions. He said he did not feel like he would "hear it from the peanut gallery" if he asked questions.

Other respondents in the intermediate and advanced groups communicated a sense of comfort. To the beginners, equal to, if not more important, than this comfort as support was the effect of collaboration on their skill development. Most of the collaboration occurred after the
school day and on weekends at participant's homes. Linda especially made an effort to communicate and work on projects with her peers in the TLM. She consulted with eight different individuals to expand her understanding of technology. All but two of those collaborative activities occurred with an advanced user, and most of the time Linda initiated the activity. In one instance she said, "I've been to Carla's classroom, and I was showing her what I had done and she was helping me and she had made a little sheet where she had step-by-step instructions how to make a template."

Sally followed the same pattern of seeking assistance from more advanced users. She became dependent on Amy for assistance, within the training sessions, and afterwards.

Unlike the beginners, intermediate users generally stayed within their own ability groupings to collaborate. Ellen cited two other intermediate users within the workshop group whom she consulted for help outside the confines of training. Marcus, on the other hand, cited two instances where he assisted a beginner and an advanced user. "I worked with two people that were in the workshop. We did some feedback back and forth, one more advanced than me, and one that I've been proud to say needed a little bit of my help."

Advanced users did collaborate, but Amy only worked with two other people who were less than advanced users, and they sought her assistance. Carla collaborated with seven
different people in the training series. All of her collaborators were participants in the TLM, and all but one of the individuals solicited her talents. Carla did reach out to work with one other participant. Mindy, who was characterized as an advanced user. Carla said that she liked to "bounce things off her." Carla and Mindy are currently working on a two-person presentation at the district technology fair.

Consequently, collaboration was mentioned by advanced users but was not as important to their own growth as to beginners, and the group as a whole. Collaboration was a contribution made by Amy and Carla, which strengthened the potential for other participants to grow in concepts and skills.

PWBCS had no negative comments regarding the conditions of learning. However, PWICS and PWACS had suggestions for a more conducive climate. Both PWICS and PWACS participants complained about the cool room temperature. Another concern surfaced in the support category, since the video camera actually hindered a PWACS from normal discussion. "I felt I had to be quiet--I knew everything I would say would be tape recorded." Another potential problem was cited by a PWACS as the limited space in the computer room, which could have hindered the troubleshooters from quickly providing assistance.
The analysis of Knowles' (1995) condition of respect also surfaced as an interesting piece of data. Sally did not specifically mention respect in her interview. However, responses regarding collaboration with Amy provided implied a high level of respect for her advanced peer. Linda referred to her new friendship with Carla with a degree of respect for her abilities. However, it was Marcus, Amy, and Carla who developed a certainty of respect for the beginners because of their work ethic, positive attitude, and the fact that they actively pursued assistance during the training sessions, as well as afterschool and weekend collaboration.

Amy even expressed pride in her mentor teacher for her desire to want to know more about computers toward the end of her career. "I thought it was wonderful when Sue was so excited. I guess she's my example for everything and because she's toward the end of her teaching career and she's loving every minute of it and wanting to do this. I thought it was great." Carla spoke with admiration of several participants like Linda, who "really worked hard."

Learning conditions were extremely important for the beginning participants in the study, although intermediate and advanced users did not indicate learning conditions as playing a significant role to their skill development. Rather, advanced users attributed supportive learning conditions as important for the "beginners" on several occasions. It was clear that the advanced users expressed
their respect and support for beginners through assistance and collaboration.

One theme congruent with each ability level was that all participants appreciated the fact that they were among friends in the TLM. Comparisons were made to district workshops, which were as informative, but did not have the same kind of feeling. Sally described this feeling: "Having people around you that you knew was a big factor for me. I felt fine asking them if I didn't know how to do something that they wouldn't be snobby about it or they wouldn't want to take time to help me 'cause they didn't really know who I was."

The amount of comfort felt by the end of the training session can not be overstated. Participants were joking and having fun through the security that they were save from ridicule. All participants in each ability level arrived at similar conclusions. Moreover, each of them recognized the necessity for technology training, but suggestions varied for future technology professional development designs (see bold print in Tables 4, 6, 8).

Professional Development Level of Impact

A cross-case analysis was performed to distinguish similarities and differences between ability groups when referenced to level of impact of professional development (see Table 12). The understanding of awareness is essential for staff development participants to progress to conceptual

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Table 12
Cross-Case Group Analysis of Joyce & Showers' (1980) Impact Levels of the TLM Professional Development

<table>
<thead>
<tr>
<th>Construct</th>
<th>PWBCS</th>
<th>PWICS</th>
<th>PWACS</th>
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<tbody>
<tr>
<td>Awareness</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
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<tr>
<td>Concepts</td>
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<td>Skills</td>
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<tr>
<td>Application</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
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</table>

Note: User Assessment

+ = TLM Participants had mostly positive experiences with this construct

- = TLM Participants had mostly negative experiences with this construct

+/- = TLM Participants had positive and negative experiences with this construct
and skill-based levels and advance into the ultimate level of application (Joyce & Showers, 1980).

Intriguing discrepancies in all three ability groups surfaced through data analysis. Individual differences of the level of impact emerged as well (see Table 13). All of the beginner and intermediate users felt that instruction of the TLM adequately covered all ability levels. Sally confidently stated, "I thought that they gave enough information for the beginners, but also gave enough for the people who were advanced to go on, or intermediate, whatever levels they were at. You touched on a lot of things that teachers can use." Ellen responded similarly. "I think anybody just beginning, it had to be just as useful for them as it was for me, and the advanced users too." Marcus demonstrated commensurate views on the success of meeting participant ability levels. "Whatever level they were at, they were able to get something out of the workshops."

Amy and Carla had differing opinions regarding this issue. Carla felt as though it was good and that she did learn things, but that it was especially good for beginner users. Amy, like Carla, was at times frustrated with the pace and lack of intensity of delivery. She admitted, "Sometimes I found us kind of stuck, and I think that there was so much more we could have done... that was a frustrating point for me." Carla, too, was at times frustrated with the slow pace, and did not agree with the
Table 13

Cross-Case Individual Analysis of Joyce and Showers' (1980)

Impact Levels of the TLM Professional Development

<table>
<thead>
<tr>
<th>Name</th>
<th>Awareness</th>
<th>Concepts</th>
<th>Skills</th>
<th>Application</th>
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beginners or advanced group. She declared, "This was a lot of review for me. I felt this was probably more focused toward beginners and the format was great for them." Both suggested dividing the next series of technology training sessions into ability levels. Amy recognized the value and influence of the advanced users on the beginners and advised that advanced users be involved as troubleshooters or presenters at the next beginners' workshop.

Ironically, the beginners too expressed dissatisfaction at times with the pace of instruction, which they perceived as too rapid. Even the troubleshooters could not span the gap between the proficient and the novice. Therefore, it seemed that one group was displeased with the pace of instruction at any given point in time. If it were not for the fact that Amy was new to the school and was not completely familiar with the software programs, the advanced users would have been solely in the highest two construction of skills and application.

Concepts are those principles which, when applied, can lead to transference of knowledge from one program to the next. Sally and Linda emerged from the awareness stage into the concepts stage during the TLM. Ellen, however, was intent on learning concepts through explanations and rationale of the instructors. She wanted to know the "reasons" for doing what she was directed to do. All of the participants commended the presenters for excellent
instructional sessions. Ellen praised one of them for being "clear and thorough and telling us how and why and what we're gonna [sic] do and where we are going and that helps me a lot." She stated the importance of knowing how to use the computer. "With where we are going with technology today, it's helping us definitely keep up with the times and helping us to take the children where they need to be for their future." Carla and Amy were beyond the concept level.

An interesting discrepancy occurred with the issue of review sessions. Beginners found comfort and support through the review of software programs and techniques prior to each session. Ellen and Amy even professed to enjoy the review sessions. However, Marcus disagreed. "I felt we were repeating a lot of concepts and wasting time." He went on to add, "Maybe the beginners needed the review sessions."

Carla, too, was frustrated with the slow pace and did not need to review concepts she was already familiar with. Her suggestion on dividing the sessions according to ability would go a long way to correct the problem.

Yet another discrepancy between the PWBCS and the PWACS was the stark contrast in beliefs regarding the intervals between sessions. Both beginners and intermediates responded positively toward the weekly intervals between training sessions. Linda commented, "Maybe back-to-back would be okay, but I think it's easy to get overwhelmed when that happens." Linda, Sally, Marcus, and Ellen liked the fact
that they could go home and practice the skills that were learned before going to another lesson. Sally said, "The teaching schedule was good because it gives you time to try it at home. Unless you go home and really did what you've been shown during the workshops, you don't know what to do."

Amy and Carla's opinions differed from the other two groups. Amy thought the schedule was good for the beginners so they could have time to practice, but she could have handled more information. She expressed support for Sessions Three, Four, and Five, in which, three training sessions occurred instead of two in the 1-week window of time. Carla said that the format was great for the beginners, but she would change it for the advanced users. Carla would prefer a week-long intensive workshop with high-level skills taught and practice time to follow each new lesson.

Skill development is a prerequisite for the application level. Several participants spoke of skill development, and this was not exclusive to the intermediate and advanced users. Linda discussed a variety of software programs and skill-related job performance tasks. For example, after the third week of training, both Linda and Marcus developed their skills in Microsoft Word to create lesson plans. Through application, they submitted computer-generated lesson plans from the fourth training session on. Amy and Carla's collaborative efforts helped them enhance their already developed skills in GradeQuick and PowerPoint.
Application is the highest level of assimilation, and Amy and Carla were poised to apply new information. After the Internet session, Carla commented in her field notes, "I can't wait to use this wonderful teaching tool in my classroom." Carla will be sharing Internet tips for the classroom with the Southside staff and at the district technology fair. The two sessions on Dreamweaver, the web page instruction sessions, did not include moving graphics. However, Amy is working on a classroom web page with animation. The level of application is different for other users. Skill applications are not as involved in the PWBCS as the PWACS but nonetheless, impressive for their entry ability level.

Linda, Marcus, Carla, and Amy had not submitted computer-generated lesson plans prior to the TLM, but these four sample participants were using Microsoft Word to create lesson plan templates and submit computer-generated lesson plans by the conclusion of the TLM. The fact that 67% of the sample group now use technology for this professional task is one of behavioral and applicative importance.

Marcus envisions applications for student book reports, student research, and PowerPoint presentations created by students. He also plans to use the computer for Balanced Literacy circles and centers. The two beginners also have worked on specific projects. Sally created a PowerPoint outline for her classroom instruction, and Linda is working
on a PowerPoint presentation on Japan with the rest of her grade level. It is the goal of each participant to achieve the application level so that they, and their students, benefit from their new knowledge. Each participant had suggestions as to how the TLM could have better met their needs and how professional development can best advance participants to the application level (see bold print in Tables 5, 7, 9).

Technology training for educators will continue to be a necessary staff development priority. Considerations for future training models will need to be made for optimal technology professional gains to be experienced. Discussions, recommendations, and implications of this study are discussed in Chapter V.
CHAPTER V
DISCUSSION

This chapter presents a summary and discussion of pertinent facts and implications of the Technology Learning Model study. Additionally, recommendations were generated through the triangulation and analysis of data. Moreover, TLM research questions are addressed. The first research question was: How will participants with varying computer skill levels respond to the Technology Learning Model? The second research question was: How does the Technology Learning Model affect participant's attitude's toward integration of computer technology into professional responsibilities?

Through multiple data sources and the applications of Knowles' (1995) conditions of learning and Joyce and Showers' (1980) professional development levels of impact, patterns of information emerged as themes. A qualitative research design was especially appropriate, whereby experiential descriptive data was gathered to address attitudes and behaviors of participants regarding the TLM.

If participants in the TLM were posed the question, Did the TLM meet your individual needs as a learner? responses to this question would vary according to the construct in question and to the degree of their overall learning experiences in the TLM. However, one dominant theme emerged from the triangulation of data: Collaboration was identified
by respondents as the most single prominent learning condition associated with the TLM.

Collaboration was a source of enjoyment, collegiality, support, and learning for participants. Linda commented, "Everyone made it fun. We were able to talk to each other, compare notes, and even ask each other questions."

Collaborative activities between participants largely occurred outside the TLM. Sally appreciatively spoke about Tammy's offer to help her. "Tammy said she'd be happy to work with me [on PowerPoint] after school one day."

Throughout the 10 training sessions, individuals such as Tammy and Sally arranged meetings in classrooms after school and at home to discuss computer software programs and individual projects.

Although open communication and open dialogue was encouraged during the TLM, teachers took the initiative to get together to work on projects and to develop their computer skills. Embedded within the dominant collaborative theme are patterns of behavior in the sample subgroups. Overwhelmingly, PWBCS initiated collaboration with those individuals who demonstrated more advanced computer skills than they possessed. PWACS happily responded to the requests of PWICS and PWBCS for assistance. PWICS remained approximately on their own proficiency level for collaboration, with no discernable pattern of collaborative behavior.
Producing conditions favorable for adult learning was a primary consideration of the TLM. Collaboration outside the confines of the TLM was incidental to the design of the TLM and were initiated by participants. It is of particular interest that perhaps the most significant gains in computer proficiency related to the TLM were attributed to Knowles' (1995) condition of collaboration, which occurred within and outside of the TLM. PWBCS collaborated with higher skilled participants and reinforced their skills and applied their new knowledge.

The degree of activity outside the TLM was an unforeseen phenomenon by the researcher. Yet, Knowles (1995) would consider this a logical occurrence of effective adult learning: "adults are themselves the richest learning resource for one another for many kinds of learning" (p. 3). Ironically, participants gravitated toward peer assistance on their own initiative. Work by Joyce and Showers (1988) indicates the value of peer coaching when related to professional development, and it became evident through data analysis that PWACS attained satisfaction and fulfillment through helping colleagues with lesser skills.

The PWBCS and PWICS endorsed the TLM as a great success because they were able to move through the skill and application levels of impact (Joyce & Showers, 1980) with many software programs. Proficiency levels of PWBCS and PWICS were impacted and demonstrated in class preparations,
lesson plans, and technology plans for the future. In retrospect, their perceived achievement was largely due to the support and collaborative relationship with the PWACS.

It was essential to the success of the PWBCS and PWICS for the PWACS to participate in the training series to readily assist, support, and to collaborate with participants with lesser computer skills. Consequently, the majority of individuals involved in the TLM found the experience gratifying and meaningful.

However, learning expectations of the PWACS were for the most part unfulfilled, due to the slow pace and instruction. Consequently, results of this study support the notion of ability assessment prior to technology training (McKenzie, 1993) to design professional development to support participant needs. Future technology professional development should be geared to meet the needs of every ability group. Therefore, as was suggested by a PWACS, advanced users should troubleshoot training sessions to assist PWBCS and PWICS just as they did during the TLM. High-level ability classes could better provide for the advanced learning needs of PWACS.

The condition of support was second in relevance only to collaboration. Not surprisingly, PWACS did not need the supportive characteristics of the TLM, as their comfort with computer technology had long since been established. However, for reasons much different than PWBCS, they too
appreciated the support of the troubleshooters. The PWACS commented several times that the troubleshooters "kept instruction moving along."

All of the sample participants agreed that going through the series with friends and coworkers made the experience more enjoyable and gratifying. Respondents across the spectrum of ability thought they learned more as a result of their familiarity and comfort with the people surrounding them. Familiarity of the physical surroundings and fellow participants was an extremely important factor in this study, in relation to how each of Knowles' (1995) learning conditions was received and fostered. Participants' collaborative initiatives were the result of a growing level of trust and comfort, which was developed over time.

Limitations of the Study

This phenomenological study revealed insight into professional development levels of impact and conditions of learning, but, as in most qualitative studies, the sample size was limited. This research study was limited to six individuals who self-reported their computer proficiency levels, and this number is well within acceptable parameters for a qualitative study. The self-reporting of computer proficiency initiated by the technology committee was cross-referenced with the Mankato Survey of Professional Technology Use Ability to ensure consistent ability groupings.
Naturalistic inquiry was conducted through open-ended interviews in a relaxed setting on a teacher work day. Respondents and the researcher were casually dressed due to the teacher work day, and the meeting location was a vacant conference room overlooking the courtyard. Responses to interview questions are considered self-reporting and have the potential for containing bias, overstatements, and omissions of important information. To offset these possibilities, member checks were performed to verify the intent of the respondent. A unique form of member checking was accomplished through the comparison of participant transcribed interviews with each participant's field notes, and discrepancies led to requestioning. Additionally, sample members were requestioned as respondents revealed new pertinent information through the interview process.

Another limitation was the sample group membership. Each of the six sample participants work at the same school and volunteered for participation in the TLM. Participants voluntarily registered to participate in the TLM on a first-come, first-serve basis. Teachers over the predetermined amount were turned away due to limited space in the computer lab. Moreover, teachers resistant to technology change would not have registered for the TLM but may have given different responses resulting in discrepant data.

The sample group was ethnically representative of the entire staff and included representation from primary and
intermediate grades, as well as new and tenured teachers.

Perhaps the most pivotal limitation was researcher influence and subjectivity. Since the researcher was the administrator of the school, he had an inevitable impact on the study. Yet, because the researcher is also an integral part of the school setting and naturally facilitates workshops and interacts with staff daily, reflexivity was easily established (Maxwell, 1996).

To minimize the influence of the researcher's role in the TLM sessions, several considerations were made. First, communication to TLM participants was conducted through the school technology committee and not the researcher. Second, the researcher was part of the troubleshooting team which provides support for all participants. Third, the researcher purposefully was not present during any of the sessions so respondents could be candid about all presentations and presenters.

Finally, a key point of this study, which could be seen as a limitation, was that the TLM was proposed to the staff by the school technology committee as a pilot model for the 2001 summer technology inservice program. The summer inservice will be coordinated with one other school, and informants were asked to provide information which would assess this TLM in preparation for the larger summer inservice. Most TLM participants will also register for the
summer series and have a vested interest as to the quality and design of the summer training.

Therefore, members of the sample group had a responsibility to inform the researcher what characteristics were not successful, which attributes needed to be continued, and what changes needed to be made. Consequent to efforts to reduce bias, reactivity of participants to the researcher's position was negated.

Validity

Descriptive validity, according to Maxwell (1996), refers to the factual accuracy of the events or accounts as recorded by the researcher. The most widely accepted method of satisfying the requirements of validity is though the triangulation of data. One of the best tools to capture the essence of the data is a video camera. The video camera not only connects the researcher with audio but with visual detailed data as well. Audio recordings are also beneficial to collect data through open-ended interview questions. Both video and audio recordings were used as data collection aids in this study.

Interpretation is required to code much of the qualitative data, and interpretive validity is paramount. This form of validity is associated with capturing the meaning behind statements and actions. Interpretation takes into account feelings, attitudes, and behaviors of respondents. Field notes, memos, and member checks are
excellent methods of collecting data to ensure interpretive validity and were incorporated into the instrumentation of the TLM study.

Triangulation of data for this study was performed through researcher observations, open-ended audiotaped interviews, and participant generated field notes after each training session. Video tapes from each training session were used to confirm accounts.

Interviews were transcribed and coded by the researcher. Transcribed interviews were then coded again to verify data for within-case and cross-case analysis. Observation notes were cross-referenced to interview responses, and participant field notes provided confirmability to statements made during interviews. Discrepancies were detected from participant field notes and later clarified. Member checks were also conducted to verify accounts and clarify possible misinterpretations.

A threat to the validity of a study in general could result from the omission of discrepant data or alternative explanations, which Maxwell (1996) calls theoretical validity. Alternative data was taken into account in this qualitative study.

Exhaustive measures were taken in this study to ensure validity and to negate researcher biases which exist in qualitative studies. Coded data, interview transcripts, video tapes, participant diskettes containing field notes,
and researcher observation notes were used to triangulate data and preserve the integrity of the study.

Implications of the Study

Consequently, an interesting phenomenon occurred which may support the addition of a new stage in Joyce and Showers' (1980) typology. Beyond the application stage, there appears to be a level of transference which the PWACS enjoyed and reached fulfillment from. In fact, Amy said, "Next time we should ask people with higher ability to help with the lower classes 'cause then that reinforces what they know too." Carla was extremely excited when she discussed the impact of collaboration on the motivation of individuals. "Some of the people I've helped with lesson plans are just so fired up about what they are doing and I think that's the first step--if you can get them turned on."

Interestingly, a level of self-actualization of PWACS was seemingly achieved through their assistance of lower proficiency participants. Their willingness to help led to a level of transference of information beyond application, whereby PWACS imparted knowledge to their colleagues. The transference level and the phenomena which emerged from the data certainly warrants further research. It is the researcher's assertion that a level of transference can best be replicated in an environment founded on the principles outlined by Knowles (1995). Constructs such as trust,
respect, support, and collaboration must be present to analyze the transference level.

Recommendations for Further Research

This phenomenological study of the Technology Learning Model at Southside Elementary represented a professional development approach to technology training for teachers. Based on findings of this study, the following areas warrant continued research, technology training for teachers, change in schools, and the principal's role in technology integration.

1. A study should be conducted to address technology training for teachers through the Joyce and Showers (1988) Peer Coaching Model.

2. This study was conducted for 10 sessions over an 8-week period of time. A longitudinal study with similar constructs may reveal interesting data.

3. Close duplication of this study with individualized training sessions for each identified ability group may also reveal interesting data.

4. Further longitudinal research at Southside Elementary on the impact of student achievement as a result of the TLM would provide research on the transferability of professional development into student achievement.

5. This study was limited to Southside Elementary. The inclusion of multiple schools using a training design similar to the TLM may yield interesting results.
6. Examination should be undertaken of Joyce and Showers' (1980) levels of professional development impact, with attention to a higher levels of impact beyond that of the application level.

Conclusion

The Technology Learning Model was conceived as a result of past failure. New paradigms must be adopted by school administrators if teachers are to reach their fullest potential through professional development. Knowles' (1995) assertions regarding learning conditions must not be taken lightly. According to Barth (1990),

The literature suggests that a number of outcomes may be associated with collegiality. Decisions tend to be better, Implementation of decisions is better. There is a higher level of morale and trust among adults. Adult learning is energized and more likely to be sustained. (p. 31)

Collaboration was a theme that emerged as the key to perceived success among participants in the TLM. Characteristics such as trust, respect, and support were enhanced through collaborative activities. As a result, a synergistic presence in the TLM revealed the possibility of a higher level of impact than previously noted in the Joyce and Showers (1980) typology. This potential higher level exceeded the application level and was observed as the PWACS aspired to assist others in the TLM and evolved into
technology mentors. PWACS appeared to "feed upon" this concept, as Amy declared in the interview session.

One could conceptually hypothesize the phenomenon as a self-actualization level of technology staff development. At the conclusion of the TLM, three participants provided training to the entire teaching staff of Southside on software programs and hardware devices they had experienced in the TLM. Within a month of the last TLM session, two PWACS even presented at the district technology fair to 60 teachers from a variety of other schools in the county. Interest is high for yet another TLM during the summer of 2001, and two PWACS have already volunteered to teach sessions.

Thus, the implementation of the TLM has had and continues to have ramifications of high interest, collaboration, and increased participant initiatives and activities. In view of the success of the TLM and these extensive activities, the researcher plans to facilitate future technology inservice for teachers. It is his desire to share findings from this study with educators in his school district and others throughout the state at the next Florida Educators Technology Conference.
References


International Society for Technology and Education. (ISTE). (1993). Curriculum guidelines for accreditation of educational computing and technology programs. Eugene, OR:


Appendix A

School-Based Technology Survey
November 27, 2000

The following people have submitted applications for technology inservice:


Please complete this survey and submit to Technology Chair, Jeanne Walsh by Tuesday, November 28th.

Where would you feel comfortable beginning? Please circle one

1. Basic skills and terminology (closing applications, using the menu bar, create new files and folders, access existing files, insert and eject diskettes)
2. Intermediate skills (word processing, multimedia development, learning new software programs)
3. Advanced skills (creating link buttons, importing graphics, creating text fields, importing sound, and creating animation.)

General computer skills please circle 3 topics you would be interested in learning more about.

Desktop management
Plug and Play - Hooking up VCR, laser disc player, LCD panel, visual presenter, video camera, digital camera, etc.
Installing software
Creating a data base for students
Video production
Trouble shooting common problems

Internet please circle topics you would be interested in learning more about

Surfing the net
Search engines
Web Page creation

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Software Applications please circle 5 topics you would be interested in learning more about.

PowerPoint
Word or Word Perfect (word processing)
Hyperstudio (stack development)
CCC
STAR
Student Writing Center
GradeQuick
Excel (Spreadsheets and graphs)
Printshop
Avid Cinema
EBS
Educational Games
Book Publishing

Please include below any topics or software programs in which you have an interest that were not mentioned.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Participants in the technology staff development model: Please sign below if you are interested in checking out a computer for home use.
Appendix B

Mankato Survey of Professional Technology Use, Ability and Accessibility Version 1.0

The Mankato Survey database was created and tested in February 1997 by the district media staff at Mankato Public Schools, I.S.D. 77, Mankato, Minnesota. The form borrows heavily from a variety of print surveys, and to the authors of those surveys, a big thanks. You will need a copy of FileMaker Pro 6.0 for either the Macintosh or Windows to use the form.

If you have questions or comments or would like the password so you can modify this form, contact Doug Johnson at [email] or [email]. The latest version of this form can be downloaded from: <http://www.isd77.k12.mn.us/resources/surveydatabase.html>

Download Survey sit (FileMaker Pro version)
Mankato Survey in .pdf (Requires Adobe Acrobat Reader 3.0)

This template may be freely used and distributed without charge as long as the information screen accompanies it, but may not be sold or repackaged without the author's permission.

Instructions:
A staff member logs on as "staff." He/she is presented with a blank form which can be filled in by clicking on the blank screens and choosing the appropriate response. All forms are either counted or averaged. The "?" is equivalent to a blank box. A final layout which can be printed shows the summaries of all surveys taken. A "find" on any of the top fields will result in a summary by specific type (responses of all elementary teachers or responses of all secretaries, for example.)

All categories have rubrics associated with them which define the numerical responses.
This form works well when shared over a network.

Mail questions or comments about this page to Doug Johnson

This page <http://www.isd77.k12.mn.us/resources/surveydatabase.html> last updated February 17, 1997

You are visitor 405748 since February 6, 1997.

Return to the Mankato Public School's homepage.
**District or building assessments:**
Buildings and districts need to determine overall staff levels of technology competence. While this does not need to be done on an annual basis, such assessment should be done as part of formulating a long range technology plan, staff development plan, or strategic plan. Such studies should also be a part of a whole school evaluation effort such as an accreditation study.

**Method to determine program effectiveness**
The most common and fastest method of establishing baseline data for future planning is a survey. Good surveys have:
- a specific set of questions to be answered
- descriptive indicators of numerical scales
- a rapid means of compiling and reporting data

An example of a professional technology use survey follows. It should not be used in its entirety, but parts of it selected on the basis of the kinds of questions that need to be answered:
- What skills do teachers in our district still lack?
- Is equipment available in adequate quantities for effective teacher use?
- How much is the current equipment being used?
- What training opportunities do our teachers like best?
- What are our teachers' attitudes toward technology use in the district?

The survey was developed to be accessed on-line as a networked *FileMaker Pro* database. A copy of the database can be downloaded from <http://www.isd77.k12.mn.us/resources/surveydatabase.html> at no charge. You must have *FileMaker Pro 3.0* or better for either Macintosh or Windows.
Please answer all the following questions to the best of your ability.

**General Information**

Location __________________________ (name of building)

**Primary job function**
- classroom teacher
- special teacher (music, art, pe)
- media specialist
- guidance counselor/social worker
- special education teacher
- instructional aide
- office secretary or clerk
- media center or computer support
- technical support
- food service
- custodial/maintenance
- principal/assistant principal
- district level administrator/supervisor

**Primary level of instructional responsibility**
- elementary school
- middle school
- high school
- district

**Gender**
- Female
- Male

**School computer platform (primary use)**
- Windows
- DOS
- Apple II
- Macintosh
- Other
- None

**Home computer platform (primary use)**
- Windows
- DOS
- Apple II
- Macintosh
- Other
- None

**I have home Internet access**
- Yes
- No
Applications

Please rate each of the following from 5 (High) to 1 (Low) for you as a staff member of the school. If you are unsure you may put a ? in the box or leave it blank.

<table>
<thead>
<tr>
<th>Applications</th>
<th>Availability (5-1)</th>
<th>Proficiency (5-1)</th>
<th>Importance (5-1)</th>
<th>Frequency (5-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet (web, newsgroups, gophers, telnet, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database</td>
<td></td>
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<tr>
<td>Spreadsheet</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Research technologies (card catalog, CD-ROM encyclopedia, magazine indexes)</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Presentation software</td>
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<tr>
<td>Electronic calendar / scheduler</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Graphics (painting, drawing, Printshop etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment (grade books, progress reports, portfolios)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimedia (HyperStudio)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional software</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic Individualized Education Plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory database</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finance and ordering database</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Curriculum database</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Teacher utilities (test generators, crossword puzzle makers, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Integration of technology into the curriculum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software evaluation</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Availability
5 = Available 100% of the time it's needed.
4 = Generally available when needed.
3 = Often delays caused by a shortage at my site.
2 = The building does not have this.
1 = The district does not own this.

Proficiency
5 = I am good enough to teach this to others.
4 = I need little additional help or additional training.
3 = I need to improve my skills or learn more features.
2 = I need more training just to learn the basics.
1 = I've never used this.

Importance
5 = I would not be able to effectively do my job without this.
4 = This makes my job easier and me much more effective.
3 = On occasion, this is important.
2 = Rarely helpful. I can do my job just fine without it.
1 = This is completely unneeded.

Frequency
5 = at least once a day
4 = at least once a week
3 = at least once a month
2 = at least once a year
1 = very rarely or never
Frequency of Use

<table>
<thead>
<tr>
<th>Item (5-1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td></td>
</tr>
<tr>
<td>CD-ROM drive</td>
<td></td>
</tr>
<tr>
<td>Laserdisc player</td>
<td></td>
</tr>
<tr>
<td>Fax</td>
<td></td>
</tr>
<tr>
<td>Video teleconference</td>
<td></td>
</tr>
<tr>
<td>Voice mail</td>
<td></td>
</tr>
<tr>
<td>Camcorder</td>
<td></td>
</tr>
<tr>
<td>VCR/Cable TV</td>
<td></td>
</tr>
<tr>
<td>Digital camera</td>
<td></td>
</tr>
<tr>
<td>Laser printer</td>
<td></td>
</tr>
<tr>
<td>LCD panel or projector</td>
<td></td>
</tr>
</tbody>
</table>

Frequency

5 = at least once a day
4 = at least once a week
3 = at least once a month
2 = at least once a year
1 = very rarely or never

Location

<table>
<thead>
<tr>
<th>Location</th>
<th>School computer lab</th>
<th>Classroom</th>
<th>Home</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>How frequently do you use a computer in each of these locations (1-5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How frequently do your students use a computer in each of these locations? (1-5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attitudes

Using technology makes me more effective.
Technology helps me organize my work.
I find the use of technology to be motivating.
I am comfortable learning about and using technology
I would like to integrate more technology into my work.
I would like to integrate more technology into my classroom.
The building administration encourages the use of technology.
The district administration encourages the use of technology.
I feel comfortable helping others in the school with technology.
I feel comfortable asking others in the school for help with technology.
I take personal time to learn and practice technology skills.

3 = Strongly agree
2 = Agree
1 = Disagree
0 = Strongly disagree
? = Not applicable

Inservice Times

Please indicate how likely you would be to participate in a technology inservice if offered at these times:

During the school day
After school
In the evening
On the weekend
During the summer

3 = Very likely
2 = Likely
1 = Unlikely
0 = Very unlikely
Support

Please indicate how important the following support is to you:

<table>
<thead>
<tr>
<th>Support</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>School-based technology support personnel</td>
<td></td>
</tr>
<tr>
<td>Release time to observe other teachers using technology</td>
<td></td>
</tr>
<tr>
<td>Technology conferences</td>
<td></td>
</tr>
<tr>
<td>On-site technology workshops</td>
<td></td>
</tr>
<tr>
<td>Classroom computer for teacher use</td>
<td></td>
</tr>
<tr>
<td>Stipend for staff development time</td>
<td></td>
</tr>
<tr>
<td>Computer to take home</td>
<td></td>
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<tr>
<td>College credit</td>
<td></td>
</tr>
<tr>
<td>Video training tapes</td>
<td></td>
</tr>
<tr>
<td>Staffed technology labs open during non-school hours</td>
<td></td>
</tr>
<tr>
<td>Release time for exploring</td>
<td></td>
</tr>
</tbody>
</table>

Please indicate your level of commitment to technology training over the next year:
(3 = Very high, 2 = High, 1 = Low, 0 = Very Low)

Additional Written Comments

Please add your written comments below:
Appendix C

Focus Group Questions and Discussion Form

1. What suggestions do you have pertaining to the scope and sequence of topics?

2. Do you have any suggestions concerning presenters? If so who would you like to hear present?

3. What are the barriers you have experienced with computer integration into the classroom? Do you have any suggestions to eliminate these barriers?

4. What are the attributes of effective computer technology training and what would you like to experience in our 10 sessions of training?

5. How do you currently use computers for school purposes? How would you like to use them differently?

Thank you for participating in this focus group. The information will be used to tailor the training around your needs. We will give the responses to question #2 to the technology specialist so that we can work on scheduling the people you have requested.
Appendix D
Participants' Interview Questions

1. How long have you been teaching?

2. Prior to the training sessions you characterized yourself in the ________ level. Why?

3. What level do you characterize yourself now? Why?

4. How did the series of training sessions differ from those technology workshops you have taken in the past?

5. What experiences during the workshop series influenced your computer skill development?

6. How did the sessions meet your needs as they relate to your current computer usage?

7. Now that you have completed the workshop series, what do you do differently as a result of participation? (personally and professionally)

8. Where would you like to go from here regarding technology?

9. How will you get there?

10. How did extra support personnel influence the training process?

11. For future Staff Development at New Horizons, what would you change about the workshop series?

12. What would you maintain or keep for the summer workshops?

13. What are your feelings toward the learning climate? (physical plant – presenter/participant energy)

14. (High End) You said that your computer skills were self-taught. How did this workshop series differ from self-taught methods?

*15. Did the video camera have a bearing on how you felt?

*16. What impact has the training had on the school?

*17. Did you team up with anyone as a result of the workshops? With who? Why?

*18. What impact did the one week between classes have?

*19. How did the TLM meet the needs of users with differing abilities?

*20. What influence if any did your relationship with the people in the training sessions play?

*21. What role has children played in your computer skill development?

*Not original questions but added after interviews began through member checks
Appendix E

Informed Consent Form

You have been asked to participate in a research study conducted by Matthew S. Shoemaker, a doctoral student in the College of Education program at Lynn University. The basis of the research project is to assess attitudes and behaviors toward computer usage among teachers as they pertain to a specific localized training model. The training model will span ten sessions over eight weeks and will be tailored to the learning needs of participants. The goal of this study is to ascertain the degree to which attitudes toward technology usage can be impacted by the learning model as designed. If effective, the model will be made available to be duplicated and modified as deemed appropriate by the school district.

The study involves a preliminary focus group interview and follow up one-on-one interview at the conclusion of the training sessions. The one-on-one interview will consist of open-ended questions about your personal and professional experience with computer usage as well as questions regarding previous computer training courses. The interviews will be taped and recorded to ensure a more precise analysis of information. Once the analysis has been completed, you will be asked to participate in a follow-up interview to review for accuracy. The total time involved in addition to the training session will not exceed three hours. Participants will also be informally observed in the classroom and computer lab.

The information you provide will be kept in strict confidence. Transcriptions of the interview will be made and coded with numerical representation to protect your identity. Reports of this research will not include any identifiable data. The results of this study will be published in a doctoral dissertation and possibly a professional journal. Lynn University’s Institutional Review Board has authorized access to all materials related to this research.

You have been selected to participate in this research study based upon responses you provided on the Mankato Technology Survey. If you choose not to participate or decide at any time during the study that you prefer not to continue in the study or the ten sessions, you may do so without negative consequences. Should you withdraw, your data will be eliminated from the study and will be destroyed. If you do participate, your data will be coded to protect your identity and confidentiality, and kept in the school safe for a period of five years or until the researcher’s tenure expires at the school. At the end of five years, the data will be destroyed. There is no financial remuneration for participating in this study.

A copy of the final research analysis will be provided to each participant upon request at the completion of the study. Questions pertaining to any aspect of this study or your involvement therein, may be directed to the researcher Matthew S. Shoemaker at work or home. In the event you have concerns about this project which you do not wish to address with Matthew Shoemaker, you may call Dr. Carole Warshaw, Dissertation Committee Chairperson, Lynn, University, at Two copies of this informed consent have been provided. Please sign both indicating you have read, understand, and agree to participate in this research study. Please return one copy to the researcher and keep the other for your files.

Name of Participant (please print) Telephone Number

Signature of Participant Date

Matthew S. Shoemaker, Researcher Date
Appendix F

Informed Consent to Audiorecord

I, ____________________________, give permission to have this interview recorded by means of an audio recording device. I understand the interview will be taped for data collection purposes specific to this research project only. The recording will be transcribed and coded to protect the identity of participants. The recording and transcription will be maintained for a period of five years. At that time the recording and transcriptions will be destroyed. I understand that these tapes as well as all written materials are completely confidential and that I may choose not to continue at any time during the study without negative consequences.

<table>
<thead>
<tr>
<th>Name of Participant (please print)</th>
<th>Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature of Participant</td>
<td>Date</td>
</tr>
</tbody>
</table>

Matthew S. Shoemaker, Researcher Date