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K--12 teachers' technology integration in Benedum Collaborative professional development schools

Sabah Karayegen-Giraldo
West Virginia University

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Sabah Karayegen-Giraldo

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David L. McCrory, Ph. D., Committee Chair
Neal Shambaugh, Ph. D.
Denetta Dowler, Ph. D.
Jaci Webb-Dempsey, Ph.D.
Eve Faulkes, M.F.A.

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ABSTRACT

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Sabah Karayegen-Giraldo

This study investigated how K-12 teachers and interns in West Virginia University's Professional Development Schools (PDS) are using technology as a tool to enhance their students' education. The study addressed the use of technology as a classroom tool for research, communication, productivity, and problem-solving as outlined by the National Technology Standards for students. Eleven research questions framed this study. Comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies) were included. Descriptive and inferential statistics were used as quantitative research methods. The study involved 327 teachers and 102 intern students in these WVU PDS schools. Technology integration in these schools was measured using a survey given to teachers and interns. The results point to the following: (1) elementary school teachers use technology more often than other level teachers, (2) no significant differences were demonstrated in the way that teachers of different subjects or different grade levels integrate computers in the classroom as a classroom tool for research, communication, productivity, and problem-solving. The only significant difference was found with English teachers who used technology more often than mathematics teachers as a research tool, and (3) students use technology more often than the teachers.

"Come to the edge," he said.

They said, "We are afraid."

"Come to the edge," he said.

They came.

He pushed them.

And they flew.

Apollinaire, as quoted by Elliot W. Eisner in *Educational Researcher*

(Aug/Sept, 1997)

Dedication

To my husband, Juan…

You are my other wing…

Without you, I could not fly... I love you.

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I would like to thank the following people who were with me and supported me during my doctoral studies. Here is my opportunity to let them know how deeply I appreciated everything they have done for me. Words are not sufficient, but let's try.

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And most importantly, I thank all the participants in my study. Without them, this study would not happen. Thank you all.

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List of Symbols and Abbreviations

AYP	Adequate Yearly Progress
CAI	Computer-Assisted Instruction
ISTE	The International Society for Technology in Education
INTASC	The Interstate New Teacher Assessment and Support Consortium
NCATE	The National Council for Accreditation of Teacher Education
NETS	National Educational Technology Standards
NCLB	No Child Left Behind Act of 2001
PDS	Professional Development School
WVU	West Virginia University

CHAPTER 1

Introduction

Imagine…

…the impact of a growing "technology gap" between educational practice and other arenas of society. To prepare youngsters for "the real world," must not educators also engage it?

(Geisert and Futrell, 1995, p. 241)

Technology has come a long way from the 1940s when computers had vacuum tubes and data were recorded on magnetic tapes. However, since the mid-1990s, technology has evolved faster than ever and the role of computers is evolving in our society and in education in particular (Knapp & Glenn, 1996; Morrison & Lowther, 2002; Roblyer & Edwards, 2000; Sharp, 2002). Parallel to these rapid technological changes, expenditures to equip schools with computers and related technology are greater than ever before (Barron et al., 2003, p. 489).

Print media, including chalkboard and pictures, is one of the earliest technologies in classroom. Since the 1820s, we can still see that chalkboard and books are teachers' primary teaching tools. With the chalkboard, a teacher can write, draw, erase, and keep materials such as diagrams, assignments for days. Jackson says, "Given this flexibility, it is no wonder that the chalk-smudged sleeve has become the trademark of the teacher" (as cited in Cuban, 1986, p. 58). Knapp

and Glenn (1996) describe educational technologies in conventional schools as pencils and paper, chalkboards, textbooks, manipulatives, and other resources that help students develop basic skills, concepts, and generalizations. On the other hand, schools today have a variety of technologies that are now available to assist learners in the creation of knowledge and skills. Many of these new technologies can support "research, analysis, problem-solving, and communication processes more effectively than the traditional resources" (p.7). Increased performance and speed have been matched with declining costs, thus enabling more and more schools to have access to these new technologies (p. 12). In addition, President George W. Bush's No Child Left Behind (NCLB) reforms are linked to a 27% increase in spending ($4.8 million). This is the largest single-year increase in American history for federal elementary and secondary education funding (Committee on Education and the Workforce Report, 2002, p.4).

Computers are in the schools, but how are teachers using them? Are they comfortable? Do they get technical support from their schools? Before researching how teachers in West Virginia integrate technology into their classrooms, the outcomes of other studies, which are provided in the next section, may help to explain the integration process overall.

Technology Integration

New technologies continue to evolve into more powerful and sophisticated applications. Knapp and Glenn (1996) ask the essential question – "What do these advances mean for the classroom?" (p.12).2 With the funding and the increase in access to these advanced technologies, today's teachers have opportunities to explore

different ways to teach and design their instruction. Technology, if used appropriately, can help our teachers and students to restructure teaching and learning. Means and Olson (as cited in Knapp & Glenn, 1996) contend that technology:

- Often stimulates teachers to present more complex tasks and material
- Tends to support teachers in becoming coaches rather than dispensers of knowledge
- Provides a safe context for teachers to become learners again and to share their ideas about curriculum and method
- Can motivate students to attempt harder tasks and to take more care in crafting their work
- Adds significance and cultural value to school tasks (p.14).

Means and Olson conclude their review by stating that technology supports the kinds of activities students may have involved before, but technology "is making portions of them easier to accomplish and adding cultural value to the task by making it possible for students to produce products in the same way adults would to approximate real-world standards of quality" (as cited in Knapp & Glenn, 1996, p. 15). However, to suggest that simply using these new technologies such as computers will bring to our classrooms all the needed changes is too simplistic. As mentioned by Knapp and Glenn (1996), the presence of new technologies alone will not change our classrooms. However, technology, if integrated into effective teaching and learning practices, can help reconstruct our classrooms. What are the impacts of computers in our classrooms? The next section gives a short glimpse to the changes occurring in classrooms.

Computer-Assisted Instruction (CAI) Research Findings

One of the technologies taking its place in our classrooms is the computer. Computer-assisted instruction (CAI) refers to applications specifically designed to teach a variety of subject areas to students (Freedman, 2001). These students can receive feedback from the computer in CAI. The computer controls the sequencing of the subject matter. Since access to computers has increased, the research literature contains many studies related to CAI (Farynaiarz & Lockwood, 1992; Hatfield, 1996; Kuehner, 1999; Mann et al., 1999; Kosakowski, 2000; Zhang, 2000). Although these studies will be discussed in detail with a list of research generalizations and problems with the research in Chapter Two, it is valuable to mention briefly how CAI helps the students in our classrooms in the next section.

The research shows that CAI produces equal or greater achievement than traditional instruction in our schools (Kuehner, 1999; Mann et al., 1999). Farynaiarz and Lockwood's study (1992) of the impact of microcomputer simulations on environmental problem solving among community college students reveals that the students showed a significant improvement in their problem-solving skills after using simulation models about lake pollution. In addition to academic achievement and problem-solving skills, CAI also increases students' positive attitudes toward the computer while computers in classrooms motivate students and help them maintain high interest (Hatfield, 1996; Kosakowski, 2000). In addition, Zhang (2000) found that students with learning disabilities benefit from CAI. He worked with five fifth-grade students with learning disabilities. His study shows that students had positive improvement in their writing.

These studies show a positive relationship between CAI and student motivation and achievement. The technology integration which enables student achievement and motivation starts and is possible with a teacher in a classroom. Therefore, this study focused on teachers' attitude, preparation, and integration of technology in their classrooms. The next section identifies the problem and the rationale behind it.

The Problem

Rationale, Significance, or Need for the Study

Although some studies (all related to K-12 teachers who have gone through technology training) have been done, such as TREK 21, to evaluate how West Virginia University Professional Development School (PDS) teachers and interns use and integrate technology, what is less clear is how these teachers and interns use technology as a classroom tool for research, communication, productivity, and/or problem-solving. Also, absent are comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies). This study examined the extent to which individual teachers in West Virginia University PDS are using technology as a tool for their students' education within the criteria of purpose, grade levels, and subject areas.

The Purpose of the Study

The purpose of this study was to determine the extent to which individual teachers in West Virginia University Professional Development Schools (PDS) are using technology as a tool for their students' education. The research addressed the use of technology as a classroom tool for research, communication, productivity, and problem-solving as outlined by the National Technology Standards for students (2000).

The study included comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies).

Participants

The Professional Development School teachers and interns associated with the Benedum Collaborative at West Virginia University were selected for this study. Collaboration between West Virginia University's (WVU) College of Human Resources and Education and 29 public schools in five counties around Morgantown is at the heart of the Collaborative Model. There are 1252 teachers, 105 interns, and 13,431 students in these 29 schools in five counties. Participants in this study were teachers and interns from K-12. These interns are involved in clinical experiences over the course of three years (Claude Worthington Benedum Foundation, n.d.). Interns

- spend the first semester full-time at PDS – teaching, managing a classroom, working with a mentor/ host teacher, attending faculty meetings and parent conferences
- implement "action research projects" at PDS, along the way learning to assess the impact of an initiative, get parent permission for research, gather and analyze data, etc.
- take a "teacher as leader" course
- undertake special projects at their PDS, give 135 hours to their PDS (for instance, for release time for teachers attending professional development activities), complete portfolios, complete academic coursework.

Instrumentation

Technology integration into K-12 classes in Professional Development Schools was measured using a survey given to teachers and interns. The researcher distributed a four-page survey instrument (adapted with permission from an original survey designed and used at the University of South Florida in 2003) to the teachers and interns in the WVU PDS. This instrument was constructed and reviewed by experts in technology and measurement in Florida. A pilot study in Florida was conducted with graduate students and K-12 teachers to determine the clarity and relevance of the survey items. The first section was used to collect demographic data, and the remaining sections addressed the four domains of research -integration; support; preparation, confidence, and comfort; and attitude toward computer use. Participants were asked to rate each statement on a five-point scale. The participation was voluntary. The survey is shown in Appendix A of this study.

Data Collection

After obtaining the approval from West Virginia University's Institutional Review Board and the school district, the survey instrument was sent to all teachers via WVU PDS coordinators. For each school, a letter addressed to the principal outlined the purpose of the study and the assistance necessary for the distribution of the survey within the school. To promote an optimal response rate, the researcher offered an incentive. Teachers were allowed to register for a chance to win to have a personal website designed by the researcher. The survey was given to the interns in their meeting time at WVU. The researcher conducted and collected the surveys that were given to the interns.

Data Analysis

Using SPSS ® software, chi-square statistics (Cramer's V) was used. Each of the participants in the study had a value for the nominal variables of grade level taught and subject taught.

Research Questions

The survey items were designed to provide data relative to the following research questions.

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom?
2. In middle and high schools, how do teachers of different subjects integrate computers?
3. Are there any differences in teachers' use of computers as compared to students' use overall?
4. Are there any differences in each grade level of teachers' use of computers?
5. Are there any differences in middle and high school teachers' use of computers in different subject areas?
6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school?
7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support?
8. What are the teachers' attitudes towards computer use?
9. How do teachers describe their preparation for computer use?

10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom?
11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not?

Assumptions

Because the researcher did not have the resources to make direct observations and ratings of teachers' and interns' technology integration in WVU PDS, the researcher used a self-report measure of integration. It is necessary to assume that the participants were honest in reporting their levels of integration in their self-reports. To encourage honest responses, the survey instrument was administered anonymously, and the participants were encouraged to be open and honest by the researcher who administered it.

Limitations of the Study

Limitations and caveats need to be noted. First, the response rate was small, which may limit the generalizability of the findings. Second, the study included teachers and interns from only West Virginia University Professional Development Schools. These schools offered inservice technology training and support for their teachers and interns through the Benedum Collaborative and a PT3 grant funded by Department of Education (between 2000 -2003). Surveys of teachers and interns in other states with different levels of access to technology or various levels of technical support might produce different results.

Summary

The access to educational technologies for K-12 teachers has increased as the investment through federal funding (e.g., NCLB Act). Computers are in our classrooms, but questions about their use remain. How are they used, are our teachers ready or comfortable to use them, do the schools give their technical support to this integration? Some studies, while answering some of these recently arisen questions, have left us curious about WVU Professional Development Schools. To get a profile how WVU PDS teachers and interns integrate technology into their classrooms, this study was designed using an instrument which was adapted from a study done in the University of Florida. This study was to determine the extent to which individual teachers in WVU PDS are using technology as a tool for their students' education. The research addressed the use of technology as a classroom tool for research, communication, productivity, and problem-solving (as outlined by the National Technology Standards for students). The study included comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies).

CHAPTER 2

Literature Review

This chapter describes literature relevant to the research purposes of this dissertation. It is organized into six sections: (1) definitions and the importance of technology integration into education, (2) some studies related to Computer-Assisted Instruction (CAI) and problems with the research, (3) National Educational Technology Standards (NETS) - an initiative by ISTE (International Society for Technology in Education), (4) The No Child Left Behind Act of 2001 by the President of the United States, George W. Bush, (5) information on WVU Professional Development Schools (PDS) in West Virginia, and (6) a large-scale study done in Florida by Barron et al. (2003). At the end of each section, the relevance of the literature to the research reported in this dissertation is discussed.

Definitions and Technology Integration into Education

Technology is explained in Pytlik et al. (1978) as "A process undertaken in all cultures (a universal), which involves the systematic application of organized knowledge (synthesis) and tangibles (tools and material) for the extension of human faculties that are restricted as a result of the evolutionary process" (p. 6). More specifically in education, these technologies are information and communication technologies such as personal computers, video products such as videocassettes and videodiscs, and communication devices (Knapp & Glenn, 1996). In addition to these definitions, Thornburg predicted that education will change as a result of the Communication Age, necessitating educators to become acquainted with and use new technologies such as CD-ROMS, interactive video, electronic mail, and the Internet (as

cited in Shelly, 1998, p. 270). As used in this study, technology pertains to computer and computer-related equipment and operating systems and networking. In addition, the term technology integration includes how, how well, and by whom technology is used in WVU PDS schools. Integrating technology into education involves making technology into a tool to enhance learning in a content area. The term technology support refers to activities that keep users working or help users improve the ways they work.

The use of technology in our classrooms is growing everyday. With this growth in education occurring in the U.S., the way teachers use computers in the classroom is changing. These changes are outcomes of new innovations and government reforms. The U.S. Department of Education has adopted four national technology goals for schools. Funding is available from different sources to install the necessary infrastructure and to train teachers to use technology to meet the following goals:

- All teachers and students will have modern computers in their classrooms.
- Every classroom will be connected to the information superhighway.
- Effective and engaging software and on-line resources will be an integral part of every school curriculum.
- All teachers will have the training and support they need to help all students learn through computers and through the information superhighway.

These efforts to wire the classrooms to enhance students' learning lead scholars to look for an answer if computers are really the new innovation that will change the way we teach and learn. The following section gives a summary of some studies related to CAI.

The Studies Related to CAI

One of the technologies taking its place in our classrooms is the computer. Computer-assisted instruction (CAI) refers to applications specifically designed to teach a variety of subject areas to students (Freedman, 2001). These students can receive feedback from the computer in CAI. The computer controls the sequencing of the subject matter. Since access to computers has increased, the research literature contains many studies related to CAI (Farynaiarz & Lockwood, 1992; Hatfield, 1996; Kosakowski, 2000; Kuehner, 1999; Mann et al., 1999; Sharp, 2002; Yildirim, 2000; Zhang, 2000).

The research shows that CAI produces equal or greater achievement than traditional instruction in our schools (Kuehner, 1999; Mann et al., 1999). Kuehner (1999) finds that most studies show that computers provide motivating and efficient learning; especially, computer-based instruction can be effective in improving college students' reading skills. Mann et al. (1999) found that the effective use of learning technology has led directly to significant gains in math, reading and language arts skills in West Virginia. Their study indicates that West Virginia's technology program increased socio-economic and gender equity. The technology program was a highly successful one in equalizing opportunity for low-income and rural students especially for students without computers at home.

Farynaiarz and Lockwood's study (1992) of the impact of microcomputer simulations on environmental problem solving among community college students reveals that the students showed a significant improvement in their problem-solving skills after using simulation models about lake pollution. The experimental group of

students showed a highly significant improvement in problem-solving skills after being exposed to three simulation models. In addition to academic achievement and problem-solving skills, CAI also increases students' positive attitudes toward the computer while computers in classrooms motivate students and help them maintain high interest (Kosakowski, 2000; Hatfield, 1996; Yildirim, 2000). Yildirim (2000) examined the changes in preservice and inservice teachers' attitudes toward computers following their participation in an educational computing class. The study also revealed the factors that contributed to their computer use. Results indicate that teachers' attitudes such as anxiety, confidence, and liking, significantly improved after the computer literacy course.

In addition to motivation, academic achievement and problem-solving skills, Zhang (2000) found that students with learning disabilities benefit from CAI. He worked with five fifth-grade students with learning disabilities with written language deficits. He used a specially designed computer program as a writing tool to assist them in a weekly based writing curriculum. His study showed that students had positive improvement in their writing, and it showed positive effects on the participating students' writing behaviors and their written products.

Finally, a research project sponsored by the Office of Educational Research and Improvement, U.S. Department of Education, looked at nine school sites where school staff were active participants in incorporating technology in ways that support education reform during the 1992-93 and 1993-94 school years. The teachers and administrators at the case study sites expressed different reasons for bringing technology into their schools:

- support thinking processes,
- stimulate motivation and self esteem,
- promote equity,
- prepare students for the future,
- support changes in school structure, and
- explore technology capabilities

They summarized the effects of technology on classrooms and students as:

- change in student and teacher roles,
- increased motivation and self-esteem,
- technical skills,
- accomplishment of more complex tasks,
- more collaboration with peers,
- increased use of outside resources, and
- improved design skills/attention to audience.

And finally, the effects of introducing technology on teacher professionalization were stated as:

- increased collaboration among teachers within the school,
- increased interaction with external collaborators and resources, and
- professional growth.

These studies show a positive relationship between CAI and student motivation and achievement. The technology integration which enables student achievement and motivation starts and is possible with a teacher in a classroom. Therefore, this

study focused on teachers' attitude, preparation, and integration of technology in their classrooms to understand the integration process.

On the other hand, pointing out the problems with this research is important to understand the integration process better. Sharp (2002) states that these CAI studies were conducted before microcomputers were readily available. She explains that some studies were eliminated because of methodological flaws or insufficient data while some others are anecdotal, not an experimental design. She adds that educators are just beginning to understand what role the computer could play at schools; however, if computers are the answer is still unknown. Even with these problems, Sharp (2002) makes the relevant generalizations from the synopsis of research findings presented in her book. Summary of these generalizations follows:

1. In science, the computer is a useful tool for simulations since a simulation program is generally less dangerous, less expensive, and less time-consuming than the real experience.
2. The computer is helpful for individualization. Students working with computers can progress at their own pace.
3. The computer changes attitudes toward the computer, school, and school subjects. The computer does motivate children.
4. The relationship between attitude and achievement is low. There is no strong body of evidence that a positive attitude toward the computer will result in improved achievement.

5. Word processing motivates children to write; however, there is no difference found between the quality of writing produced using a computer and that with pencil and paper.
6. Gender studies have found that male students work more frequently with the computer than do females. However, this appears to be a socially developed difference.

Before moving to the national standards, it is important tounderstand why some teachers choose to integrate or choose not to integrate computers into their teaching. In order to understand why some teachers do not use computers, we can focus on teachers who use computers to determine why these teachers are adopting them. Knapp and Glenn (1996) explain the adoption as:

- Observing effective teaching strategies being used by other teachers
- Incorporating new instructional approaches that become popular among teachers
- Applying what is learned from continuing professional studies
- Utilizing new technologies (p. 217).

In another study conducted in 1994, Shelley (1998) found that the key factors that affect the adoption of email by K-12 second language teachers are email training, the desire to stay current with technology, and the desire to communicate with others. The study indicates the vitality of training. Another survey (survey year is not available) done by Moursund showed that the lack of adequately trained teachers was seen as the most widespread problem in the integration of computers in the classroom. The researcher also found that "without knowledgeable and

supportive teachers, the placement of computers in schools will be disappointing and will result in failure" (as cited in O'Donnell, 1996, p. 5).

However, even when technical training is provided, that does not necessarily mean that teachers will use the technologies in their classes as Wilson (1996) showed in the analysis of factors in a person's decision to participate in a virtual environment. The author found that the more significant barriers are in culture, lifestyles, learning styles, paradigms, and comfort zones. This findings show that a shift in thinking about teaching philosophies is also necessary besides technical training. In his study as part of the Minnesota Educational Computing Consortium (MECC), Klassen found that teacher training and attitudes toward computing are critical in determining teacher involvement in instructional computing. In a similar study, Holmes indicates, "teacher acceptance and support are crucial to the implementation of computers and that without teacher support innovations will not be accepted by teachers" (as cited in O'Donnell, 1996, p.11).

In another study conducted in 1991 on the use of technology in a foreign language classroom to teach culture, Moore, Morales and Carel (1998) found that foreign language teachers in Texas made little use of computers. In the survey, the researchers prepared to be given to foreign language teachers, they were asked to rank their use of the Internet, CD, videodisc, and video in teaching the target culture. The survey results were analyzed according to demographic factors that were level of education, language taught, school setting and type, and years of teaching. According to the results, video was the most frequently used technology. However, differences in technology usage could not be explained by the demographic

characteristics. The only significant finding was the Internet usage and level of education and language taught. Teachers holding a Ph.D. degree and teachers of Japanese were statistically significant in using the Internet.

Moore, Morales, and Carel (1998) noted that years of teaching, although statistically not significant, was a factor in determining which teachers are using technology in their classrooms. The teachers with the least teaching experience are the ones using the CDs more frequently; however, surprisingly, they used the Internet and video the least. Another research, Berliner (1988) showed that teachers are able to make conscious choices, set their priorities, and be more inventive at the more advanced stages of their teaching (as cited in Moore, Morales & Carel, 1998, p.116). The authors in this study address two reasons for foreign language teachers not using technology in their classrooms: Either the schools did not have the facilities, or the teachers did not have access to suitable material for teaching. However, these teachers did not mention that they lacked the skills or knowledge that is necessary to use these technologies.

A teacher's belief and attitude can shape whether he or she uses technology in classroom. In his study, Lam (2000) asked foreign language teachers about the role of technology in language classrooms. He found that the teachers viewed technology as a supplement, an aid, a resource, and a means to facilitate learning. Then, this view explains why these teachers make little use of technology in their teaching. One teacher in his study even declared that the software she had seen was "pretty stupid and too mechanical" while another one did not feel that "computers were fast enough or language-rich enough" (Lam, 2000, p.405). Furthermore, Lam added that

the teachers expressed a lack of knowledge about how to teach through computers. One teacher expressed the necessity of learning pedagogy of teaching using computers. These teachers' comments show that there is still a traditional teacher-centered approach in their classrooms and this proves what James Rutherford, President of the American Association for the Advancement of Science says,

> There is no reason to believe that simply providing the schools with microcomputers will do much to improve education. Indeed, the thrust of our experience in the United States gives us every reason to believe that doing so will mostly be a waste (as cited in Geisert and Futrell, 1995, p. 240).

On the other hand, teachers who use technology in their classrooms believe that technology reinforces and enriches their teaching. Some teachers begin to change their attitude and beliefs about technology as in an Ertmer et al. (1999) study. A teacher in their study realized that a lesson taught with software encouraged students to work together in problem solving, and this teacher changed her opinion of technology. She felt very uncomfortable at the beginning, but now she sees how much she has learned from learning how to use it with kids. O'Donnell states (1996) that the integration of computers into the classroom presents a personal challenge to teachers. She continues as,

> The degree of integration achieved and the time required for teachers to learn how to fully utilize computers in the classroom is dependent upon the perceived beliefs of the teacher concerning computers and their use in instruction. Integration is a necessarily slow process. Beliefs are not

changed quickly. However, the perceived beliefs of the teacher will guide and drive the teacher toward the goal of computer integration. Beliefs are framed slowly and are dependent upon education, knowledge and personal experience of self and others. (p. 52)

Teachers first use the technologies to reinforce traditional instruction, then slowly begin to adapt their instruction to utilize them in more creative and sophisticated ways as their beliefs about and skills with them change. Dwyer, Ringstaff, and Sandholtz (as cited in Knapp and Glenn, 1996, p.20) explain how the use of technology will change teachers' teaching style:

> Teachers go through an 'instructional evolution in technology' which moves from adoption of technology to common instructional practices to adaptation of technology to experiment with different instructional practices to appropriation of technology into new strategies to invention where technology is used to create learning experiences by the student. Familiarity, confidence, and success lead to changes perceptions of how technology can be used to achieve different student learning outcomes.

In conclusion, Moore, Morales, and Carel (1998) found that teachers in general made little use of computer facilities such as the Internet and email. Although these teachers made considerable use of video materials, they made little use of interactive media such as CD-ROMs. According to the researchers, it is clear that foreign language teachers need to improve their knowledge of how to integrate technology with other activities in classroom instruction. Shelley (1998) found that if educators find the technology will assist them in meeting a particular curricular or personal

goal, they will most likely adopt it. Also important in the adoption process is the compatibility of the technology to educators' needs, reduction of complexity, opportunity to try out the technology, and having technology use observable by others. Lam's study (2000) has sought to show that 'technophobia" of teachers is a misconception and that their decisions regarding technology use are not based on a resistance to or an adoration of technology, but rather on their beliefs about the benefits of the technology for their students. The next section provides the national educational technology standards to understand what teachers need to follow for their technology integration into their teaching.

National Educational Technology Standards

The International Society for Technology in Education (ISTE) and the public at-large recognized the potential of technology to improve student learning. To encourage educational leaders to provide learning opportunities that produce tech-capable students, ISTE has developed a project called National Educational Technology Standards (NETS) Project. The main goal of this project is to enable stakeholders in PreK-12 education to develop national standards for educational uses of technology that facilitate school improvement. The project develops standards to guide educational leaders in recognizing and addressing the essential conditions for effective use of technology to support education. Forty-eight states had adopted, adapted, or aligned with the ISTE standards for their students (¶1, http://iste.org/standards/). West Virginia is one of these states (see Appendix E).

In order to connect curriculum and technology, NETS (2000) state that successful learning activities depend on more than just the technology. Certain

conditions are necessary for schools to use technology effectively. The physical, human, financial, and policy requirements which affect the success of technology in classrooms are summarized as:

- Vision with support and proactive leadership from the education system
- Educators skilled in the use of technology for learning
- Content standards and curriculum resources
- Student-centered approaches to learning
- Assessment of the effectiveness of technology for learning
- Access to contemporary technologies, software, and telecommunication networks
- Technical assistance for maintaining and using technology resources
- Community partners who provide expertise, support, and real-life interactions
- Ongoing financial support for sustained technology use
- Policies and standards supporting new learning environments (p.4).

NETS emphasize that these new learning environments provide rich opportunities for students to find and utilize information and resources, and then apply academic skills they learn for solving real-world problems. Since traditional educational practices no longer provides students with these necessary skills today, students need new strategies for solving problems with new learning environments. The following chart provided by NETS (2000) represents traditional approaches to learning and corresponding strategies associated with new learning environments (p. 5).

Incorporating New Strategies

Traditional Learning Environments	New Learning Environments
Teacher-centered instruction	Student-centered instruction
Single-sense stimulation	Multisensory stimulation
Single-path progression	Multipath progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange
Passive learning	Active/exploratory/inquiry-based learning
Factual, knowledge-based learning	Critical thinking and informed decision-making
Reactive response	Proactive/planned action
Isolated, artificial context	Authentic, real-world context

By shifting from traditional learning environments to new learning environments, our students will be prepared to:

- Communicate using a variety of media and formats
- Access and exchange information in a variety of ways
- Compile, organize, analyze, and synthesize information
- Draw conclusions and make generalizations based on information gathered
- Know content and be able to locate additional information as needed
- Become self-directed learners

- Collaborate and cooperate in team efforts
- Interact with others in ethical and appropriate ways

Although NETS (2000) provides a compilation of all curriculum and technology standards for each grade level and each subject area (a copy is available at www.iste.org), the technology foundation standards for students are divided into six broad categories. These categories provide teachers a guideline for planning technology-based activities in which students achieve success in their learning.

Technology Foundation Standards for Students

1. Basic operations and concepts
   - Students demonstrate a sound understanding of the nature and operation of technology systems.
   - Students are proficient in the use of technology.
2. Social, ethical, and human issues
   - Students understand the ethical, cultural, and societal issues related to technology.
   - Students practice responsible use of technology systems, information, and software.
   - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
3. Technology productivity tools
   - Students use technology tools to enhance learning, increase productivity, and promote creativity.

- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

4. Technology communication tools
    - Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
    - Students use a variety of media and formats to communicate information and ideas effectively to multiply audiences.
5. Technology research tools
    - Students use technology to locate, evaluate, and collect information from a variety of sources.
    - Students use technology tools to process data and report results.
    - Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
6. Technology problem-solving and decision-making tools.
    - Students use technology resources for solving problems and making informed decisions.
    - Students employ technology in the development of strategies for solving problems in the real world.

NETS (2000) ends their description of their project by stating that their purpose is not to promote the use of technology in isolation, but rather for it to be an integral component or tool for learning and communications within the context of academic subject areas. The original study (Barron, 2003) and this study concentrated mainly on categories three through six, the classroom use of technology

as a tool for productivity, communication, research, and problem-solving. These standards become guidelines for educators in many adopted states including West Virginia to fulfill the requirements of NCLB Act which is explored more in the next section.

No Child Left Behind Act

As a result of President George W. Bush's education reforms, effective on July 1, 2002, the Congress passed the No Child Left Behind Act of 2001(NCLB Act) in January 8, 2002, emphasizing accountability for results, new options for parents, and flexibility for local school districts. This law mandates all states to establish a test system to measure students' academic achievement.

To achieve these goals, the most disadvantaged urban school districts receive an average increase of 26.4 percent in federal Title I funding (Title I programs are designed to improve the academic achievement of the economically disadvantaged. Funding is based on the percentage of low-income children in a school and represents the largest single source of federal money in the schools) (http://wvde.state.wv.us/news/641/).

Federal elementary and secondary education funding will receive a 27 percent increase ($4.8 billion). Rural schools are expected to benefit from this Act greatly since they often lack the enrollment, financial resources, and other data needed to compete effectively against larger school districts for competitive federal education grants. In addition to these Title I increases, school districts receive non-Title I federal funds for teacher quality, Reading First, Safe & Drug Free Schools, educational technology, innovative programs, and other grant programs. With this Act, local

school districts now have the ability to make spending decisions with up to 50 percent of its non-Title I federal funds. In addition to Title I, the Enhancing Education through Technology Act of 2001, which is Title II (Part D of NCLB) (see Appendix D), provides grants for states to integrate technology into their curriculum.

Under the 1994 Elementary and Secondary Education Act, all states are required to identify their underachieving schools for several consecutive years and required to report this information to the U.S. Department of Education. As a result of NCLB Act, parents who have their children in these underachieving schools will have the ability to obtain supplemental educational services for their children and to have the option of transferring their children to better-achieving public schools, including charter schools. Given the content of the NCLB Act, testing how our schools in West Virginia are doing with their technology integration into their curricula gains importance. The instrument helps the administration and their teachers to get a profile of their schools in technology integration.

West Virginia and NCLB

One of the NCLB requirements for the grant application must include a statement such as "how the State educational agency will ensure ongoing integration of technology into school curricula and instructional strategies in all schools in the State, so that technology will be fully integrated into the curricula and instruction of the schools by December 31, 2006" (Title II, Part D, §2413). At this point, it becomes important to see how West Virginia University Professional Development Schools are doing in their efforts of technology integration into their curricula. As released by July 29th, 2003, the West Virginia Board of Education and Department of Education

announced that 402 West Virginia schools made Adequate Yearly Progress (AYP)[1]. Their preliminary data indicated:

- 402 schools made AYP
- 326 schools did not make AYP
- More than 670 schools showed improvement in areas like Math, Reading, English/Language Arts and Attendance
- 87% of schools met AYP in the "all student" subgroup
- 101 schools did not make AYP partially because of a low participation rate on the assessment
- 42 schools did not make AYP for two or more years
- 7 schools must offer School Choice[2]
- Of that 4, 4 must also offer Supplemental Educational Services[3]
- Of that 7, 1 must also offer Corrective Action[4]

The West Virginia Department of Education also announced that they provide direct assistance to all the schools that could not meet AYP.

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[1] AYP: For the 2003 calculations, West Virginia's definition of AYP requires all schools to be held accountable to meet all of the academic indicators used to measure AYP. Schools must:

- ❑ meet assessment standards on Total Basic Skills (TBS) or show improvement;
- ❑ meet 95% participation rate on the assessments;
- ❑ meet 80% graduation rate for secondary schools or show improvement and;
- ❑ meet 93% attendance rate for elementary and middle schools or show improvement.

(http://wvde.state.wv.us/news/641/)

[2] PUBLIC SCHOOL CHOICE: All students in Title I schools identified as in "need of improvement" for two or more years will have the option to transfer to another public school in their district which has not been identified for improvement.

[3] SUPPLEMENTAL EDUCATIONAL SERVICES: Title I schools which do not make adequate yearly progress for three consecutive years must arrange for tutoring or other supplemental academic enrichment services that are in addition to the instruction provided during the school day.

[4] CORRECTIVE ACTION: The county district must impose corrective action on Title I schools which do not make adequate yearly progress for four consecutive years. NCLB describes six potential corrective actions, one of which, consistent with state law, *must* be implemented.
(http://wvde.state.wv.us/news/641/)

The Teacher Education Program and PDS schools

The Benedum Collaborative 5-year Teacher Education Program at WVU is designed to prepare the students to meet the national standards such as the Interstate New Teacher Assessment and Support Consortium (INTASC) and the National Council for Accreditation of Teacher Education (NCATE). PDS/WVU liaisons provide expert assistance in some areas and find resources in other areas, to serve as a linkage between the school and the University and to provide training, assistance and a variety of services for the school and the teacher education program. This Teacher Preparation Program also provides professional development, instruction, application, and assessment of the use of technology at a particular Professional Development School.

The program currently has 105 interns, and these interns enrolled in the five-year program are expected to utilize and use technologies regularly at these schools. Specifically, these interns are expected to utilize a minimum of three available computer technologies as a requirement. These technologies are explained as word processing, digital camera, the Internet, scanner, email, listservs, PowerPoint ®, data management, CD-ROM, LCD projectors, and laser discs. Also, they are expected to utilize a minimum of three pieces of audio-visual equipment such as VCR, audiotape player, overhead projector, video disc player, and filmstrip projector.

The Florida Study

The original study from which this study was inspired and adapted was done by Barron et al. (2003). The study was supported in part by the Florida Center for Instructional Technology at the University of South Florida and the Technology

Literacy Challenge Fund for 1999-2000. This study focused on teachers' instructional modes related to technology integration as outlined in the National Educational Technology Standards for Students. Their study was designed to determine the extent to which individual teachers in a large school district were using technology as a tool for their students' education. A large school district with 113,017 students in Florida was selected for this study. This district has a technology supervisor at the district level, and technology workshops are offered for teachers regularly. In order to investigate teachers' use of technology in their classrooms and to relate that use to the NETS guidelines, the authors designed and sent the survey to all teachers in this district. The study used four domains as focal points of their survey – integration; support; preparation, confidence, and comfort; and attitude toward computer use. This study adapted the original instrument by permission. The original instrument was sent to teachers using either a paper version of the survey or instructions regarding participation using the Web-based version (differing from the original study, this study will distribute the instrument only as a paper version).

In the original study, the statistical results showed that elementary school teachers were twice as likely to use computers as a problem-solving tool or communication tool than high school teachers. The authors claimed that this could be due to the fact that elementary school teachers generally have more flexibility in their schedules to integrate innovative approaches. In the subject area differences, results show that science teachers were three times more likely than math teachers and twice more likely than English teachers to integrate computers as a research tool. Science teachers were also three times more likely than English teachers to use as a

problem-solving tool. English teachers did not show the largest frequencies in any of the four areas to integrate and use technology in the classroom.

CHAPTER 3

Methodology

The purpose of this study was to determine the extent to which individual teachers in West Virginia University's Professional Development Schools (PDS) are using technology as a tool to enhance their students' education. The study addressed the use of technology as a classroom tool for research, communication, productivity, and problem-solving as outlined by the National Technology Standards for students (2000). Comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies) were included. In this chapter, the following methods and procedures are presented: the study, research questions, participants, instrumentation, data collection, data analysis, assumptions, and limitations of the study to understand the design of the study.

The Study

This study described K-12 teachers' technology integration into their teaching in WVU Professional Development Schools. The study investigated differences in teachers' use of computers as compared to students' use, differences in each level of teachers' use of computers, differences in teachers' use of computers in different subject areas, the relationship between teachers' level of confidence and comfort using computers, and level of computer integration into the classroom.

This study was conducted across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies) to investigate possible differences or relationships. McMillan (2000) states the reasons why relationships are important:

1. Relationships help to make a preliminary identification of possible causes of students' achievement, teachers' performance, principles' leadership, and other important educational outcomes.

2. Relationships help to identify variables that may have to be investigated further.

3. Relationships help to predict the value of one variable from the value of a second variable (p. 180).

Research Questions

Survey items were designed to answer the following research questions:

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom?
2. In middle and high schools, how do teachers of different subjects integrate computers?
3. Are there any differences in teachers' use of computers as compared to students' use overall?
4. Are there any differences in each grade level of teachers' use of computers?
5. Are there any differences in middle and high school teachers' use of computers in different subject areas?
6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school?
7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support?
8. What are the teachers' attitudes towards computer use?
9. How do teachers describe their preparation for computer use?

10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom?
11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not?

Participants

The Professional Development Schools within the Benedum Collaborative Model in West Virginia were selected for this study. There are 1252 teachers, 105 interns, and 13,431 students in these 29 schools in five counties. Participants in this study were K-12 teachers and interns. The Benedum Collaborative 5-year Teacher Education Program is designed to prepare these interns to meet the national standards such as the Interstate New Teacher Assessment and Support Consortium (INTASC) and the National Council for Accreditation of Teacher Education (NCATE). PDS/WVU liaisons provide expert assistance in some areas and find resources in other areas, to serve as a linkage between the school and the University and to provide training, assistance and a variety of services for the school and the teacher education program. This Teacher Preparation Program also provides professional development, instruction, application, and assessment of the use of technology at a particular Professional Development School.

To determine the potential subjects, the following criteria were defined. Teachers who work at WVU Professional Development Schools in grades K-12 and interns who were teaching as a pre-service teacher at these schools as a requirement of their 5-year Teacher Preparation Program. The participants in this study were chosen through convenience sampling. The reason to choose this group was its

availability. McMillan (2000) summarizes the strengths and weaknesses of convenience sampling as above:

Strengths	Weaknesses
1. Less Costly	1. Difficult to generalize to other subjects
2. Less time-consuming	2. Less representative of an identified population
3. Ease of administration	3. Results dependent on unique characteristics of the sample.

In subject area differences, only responses from middle and high school teachers were used because elementary teachers typically do not consider themselves to be subject matter specialists.

The interns enrolled in the five-year program were expected by the Benedum Collaborative Model to use technologies regularly at their schools. Specifically, these interns were required to utilize a minimum of three available computer technologies. These technologies included word processing, digital camera, the Internet, scanner, email, listservs, PowerPoint®, data management, CD-ROM, LCD projectors, and laser discs. Also, they were expected to utilize a minimum of three pieces of audio-visual equipment such as VCR, audiotape player, overhead projector, video disc player, and filmstrip projector.

Instrumentation

Technology integration into K-12 classes was assessed with a questionnaire (adapted with permission from an original survey designed and used at the University of South Florida in 2003) given to teachers and interns. The instrument is shown in Appendix A. The instrument included questions that revealed the participants'

attitudes, values, and interests. "Attitudes, values, and interests are generally thought of as noncognitive or affective traits that indicate some degree of preference toward something" (McMillan, 2000, p.156). Attitudes, values, and interests reflect likes and dislikes and generally predict behavior, and are important, since they influence motivation and goals, which in turn affect achievement. To indicate their attitudes or values, a Likert scale was used in the instrument. In the Likert scale, "the statement includes a value or positive or negative direction, and the subject indicates agreement or disagreement with the statement" (McMillan, 2000, p. 157). In a Likert scale, if a neutral or middle choice is not provided and this is the real attitude or value of the participant, then the participant will be forced to give an inaccurate response or may choose not to respond at all. Therefore, the instrument had five options to include every participant.

1 strongly disagree (or not at all)

2 disagree (or once a month or less)

3 neutral (or once a week)

4 agree (or several times a week)

5 strongly disagree (or everyday)

McMillan (2000) states that compared to cognitive measures, noncognitive instruments such as questionnaires generally have lower reliability and less evidence for validity. However, questionnaires are very cost effective when compared to face-to-face interviews. This is especially true for studies involving large sample sizes and large geographic areas. Also, questionnaires are less intrusive than telephone or face-to-face surveys. When respondents receive questionnaires in the mail, they are free

to complete the questionnaire on their own time-table. Unlike other research methods, the respondent is not interrupted by the research instrument. On the other hand, questionnaires are open to two sources of error: response set and faking. Response set is "the tendency of the subject to respond in the same way, regardless of the content of the items, for example, always selecting the neutral category…" (McMillan, p. 161). This may be due to social desirability. Faking occurs when participants give deliberately inaccurate responses of their attitudes or interests. Faking is usually dependent on the purpose of the test and the consequences – positive or negative - of the results. Therefore, to avoid the possibility of subjects' faking, this instrument specified that responses would be kept confidential and individual responses would not be identified or reported, and participation was voluntary.

The researcher in this study distributed a four-page survey instrument (adapted with permission from an original survey designed and used at the University of South Florida) to the teachers and interns in WVU Professional Development Schools. The original instrument was constructed and reviewed by experts in technology and measurement, and a pilot study was conducted with graduate students and K-12 teachers in Florida. The information based on the pilot study was used to do final revisions to the survey. The first page was to collect demographic data, and the remaining pages collected data to answer to the research questions involving computer integration; support; preparation, confidence, and comfort; and attitude toward computer use. The researcher modified the first page of the original instrument for collecting demographic data because there were two different sets of

population: teachers and interns. The nature of these two groups was different than each other demographically. The rest of the survey was the same as the original instrument. The researcher treated the intern population as teachers. The possible differences among these two groups were not the focus of this study. The survey is shown in Appendix A.

Data Collection

After obtaining the approval from West Virginia University's Institutional Review Board and the school district, the survey instrument was sent to all teachers via WVU PDS coordinators. For each school, a letter addressed to the principal outlined the purpose of the study and the assistance necessary for the distribution of the survey within the school. To promote an optimal response rate, the researcher offered an incentive. Teachers were allowed to register for a chance to win to have a personal website designed by the researcher. The survey was given to the interns in their meeting time at WVU. The researcher conducted and collected the surveys that were given to the interns.

In the original study done by Barron et al. (2003), each participant received a letter describing the study and either a paper version of the survey or instructions regarding participation using the Web-based versions. Approximately 20% of the schools were selected to receive the Web version. These schools also received additional paper surveys. The original study for potential differences in response rates (paper version vs. Web version) showed that teachers were more likely to return the survey by paper (39% return rate) than by the Web (10% return rate). This study sent the survey only via paper because the researcher believes that participants who

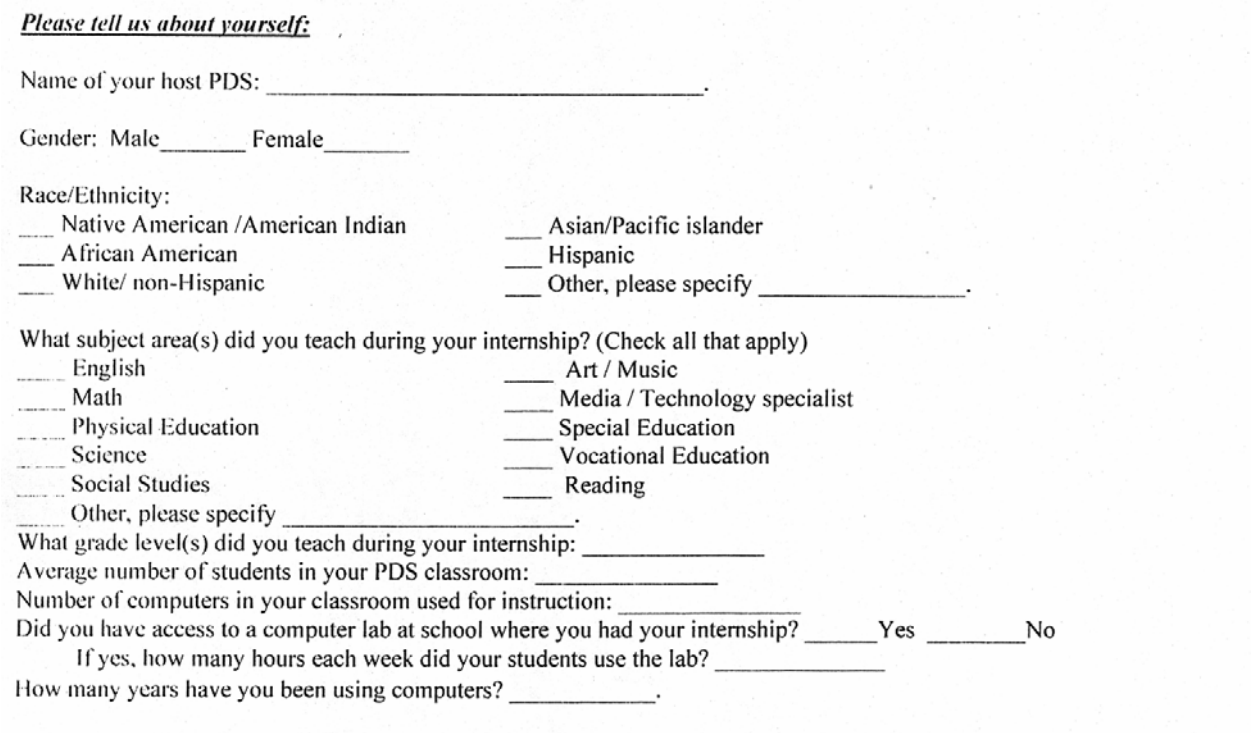
would return by the Web are the ones who feel comfortable using computers which may lower the validity of the study.

Data Analysis

The original study done by Barron et al. (2003) simplified the presentation of results by collapsing the data into two categories for analyses – Yes if the technology integration took place at least once a week, and No if the frequency was less than once a week. Then the results were examined for differences by grade level and subject area. In this study, descriptive and inferential statistics were used to address the research questions. All tests of statistical significance were conducted at the .05 level. The reasons for this choice were: (1) the original study also used this significance level; (2) because the sample size in this study was small, it was preferred to use a larger coefficient (as opposed to .01) (Gay and Airasian, 2003). Following the original study's footsteps, this study used Chi-square statistics (Cramer's V) by using SPSS ® software.

Demographic information about interns was collected in Figure1 and information about teachers in Figure 2.

Figure 1. Demographic information about interns.



Please tell us about yourself:

Name of your host PDS: _____.

Gender: Male_____ Female_____

Race/Ethnicity:

___ Native American /American Indian
___ African American
___ White/ non-Hispanic
___ Asian/Pacific islander
___ Hispanic
___ Other, please specify _____.

What subject area(s) did you teach during your internship? (Check all that apply)

____ English
____ Math
____ Physical Education
____ Science
____ Social Studies
____ Other, please specify _____.
____ Art / Music
____ Media / Technology specialist
____ Special Education
____ Vocational Education
____ Reading

What grade level(s) did you teach during your internship: _____
Average number of students in your PDS classroom: _____
Number of computers in your classroom used for instruction: _____
Did you have access to a computer lab at school where you had your internship? _____Yes _____No
If yes, how many hours each week did your students use the lab? _____
How many years have you been using computers? _____.

Figure 2. Demographic information about teachers.

Please tell us about yourself:

Name of your school: _____.

Gender: Male_____ Female_____

Race/Ethnicity:

___ Native American /American Indian
___ African American
___ White/ non-Hispanic
___ Asian/Pacific islander
___ Hispanic
___ Other, please specify _____.

Highest degree earned:

___ Bachelors
___ Specialist (Ed.S)
___ Other, please specify _____.
___ Masters
___ Doctorate

What subject area(s) do you teach? (Check all that apply)

____ English
____ Math
____ Physical Education
____ Science
____ Social Studies
____ Other, please specify _____.
____ Art / Music
____ Media / Technology specialist
____ Special Education
____ Vocational Education
____ Reading

Total teaching experience in years: _____
What grade level(s) do you currently teach: _____
Average number of students per class: _____
Number of computers in your classroom used for instruction: _____
How many years have you been using computers in your classroom for instruction? _____.
Do you have access to a computer lab? _____Yes _____No
If yes, how many hours each week do your students use the lab? _____.
Have you mentored any WVU intern during the last two years? _____.

To answer the research questions, the following survey questions were used to collect data.

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom? (see Figure 3)

Figure 3. Integration of computers into the classroom.

INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

A one-way ANOVA was conducted to determine whether there were significant differences in how teachers at different grade levels integrate technology in the classroom.

2. In middle and high schools, how do teachers of different subjects integrate computers? (see Figure 4)

Figure 4. Integration of computers into the classroom.

INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

A one-way ANOVA was conducted to determine whether there were significant differences in how teachers of different subjects integrate technology in middle and high schools.

3. Are there any differences in teachers' use of computers as compared to students' use overall? (see Figure 5)

Figure 5. Types of software used to complete school related activities.

TYPES OF SOFTWARE USED TO COMPLETE SCHOOL RELATED ACTIVITIES

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Directions: For each type of software please circle your response to indicate how often you use the software (on the left) and how often your students use the software (on the right) to complete school related activities. If you feel an item does not apply then circle (NA).

1=not at all
2=once a month or less
3= once a week
4= several times a week
5= every day

My Use						My Students' Use					
0	1-2	3-4	5-6	7+	Word processors (e.g., AppleWorks, MS Word)	1	2	3	4	5	NA
1	2	3	4	5	Spreadsheets (e.g., Excel, Lotus)	1	2	3	4	5	NA
1	2	3	4	5	Databases (e.g., FileMaker Pro, Access)	1	2	3	4	5	NA
1	2	3	4	5	Desktop publishing programs (e.g., PageMaker, Microsoft Publisher, Printshop)	1	2	3	4	5	NA
1	2	3	4	5	Presentation software (e.g., PowerPoint, AppleWorks)	1	2	3	4	5	NA
1	2	3	4	5	Web publishing programs (e.g., FrontPage, Dream Weaver)	1	2	3	4	5	NA
1	2	3	4	5	Graphics programs (e.g., Draw & paint programs, PhotoShop, FreeHand, Illustrator)	1	2	3	4	5	NA
1	2	3	4	5	Drill and practice	1	2	3	4	5	NA
1	2	3	4	5	Games	1	2	3	4	5	NA
1	2	3	4	5	Simulations	1	2	3	4	5	NA
1	2	3	4	5	Tutorials	1	2	3	4	5	NA
1	2	3	4	5	Integrated Learning Systems (e.g., Josten, CCC)	1	2	3	4	5	NA
1	2	3	4	5	Web browsers (e.g., Netscape Communicator, Internet Explorer)	1	2	3	4	5	NA
1	2	3	4	5	Programming / authoring tools (e.g., Authorware, Java, Visual Basic)	1	2	3	4	5	NA

A series of t-tests were conducted to reveal differences in students' and teachers' use of technology.

4. Are there any differences in each grade level of teachers' use of computers? (see Figure 6) (see Figure 7) (see Figure 8)

Figure 6. Confidence and comfort using computers.

CONFIDENCE AND COMFORT USING COMPUTERS

Directions: Please read the following statements and circle the one response that best reflects your level of agreement.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

I have had adequate training in using computers.	1	2	3	4	5
I use computers effectively in my classroom.	1	2	3	4	5
I am comfortable giving computer assignments to my students.	1	2	3	4	5
The computer enhances my teaching.	1	2	3	4	5
I am comfortable using computers during classroom instruction.	1	2	3	4	5
My use of computer technology enhances student performance.	1	2	3	4	5
Incorporating multi-media into lessons enhances teaching.	1	2	3	4	5
I am comfortable with computer terminology.	1	2	3	4	5
I am developing expertise in the uses of technology in the classroom.	1	2	3	4	5

Figure 7. Integration of computers into the classroom.

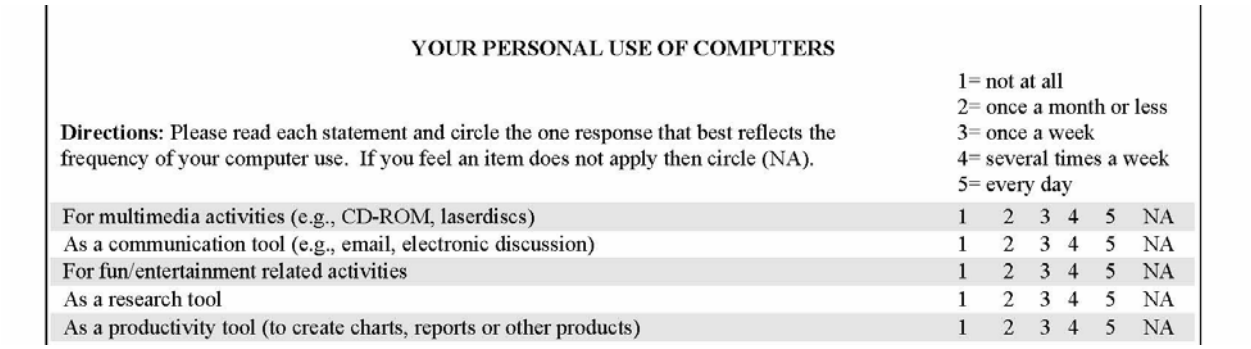
INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

Figure 8. Your personal use of computers.



YOUR PERSONAL USE OF COMPUTERS

Directions: Please read each statement and circle the one response that best reflects the frequency of your computer use. If you feel an item does not apply then circle (NA).

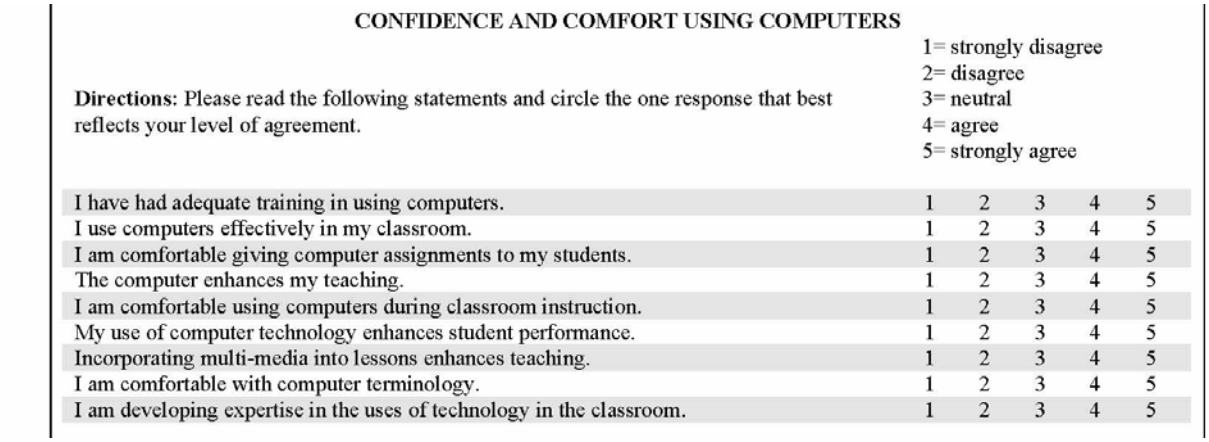
1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

For multimedia activities (e.g., CD-ROM, laserdiscs)	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA
For fun/entertainment related activities	1	2	3	4	5	NA
As a research tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA

A one-way ANOVA was conducted to determine whether there were significant differences in each grade level of teachers' use of computers.

5. Are there any differences in middle and high school teachers' use of computers in different subject areas? (see Figure 9) (see Figure 10) (see Figure 11)

Figure 9. Confidence and comfort using computers.



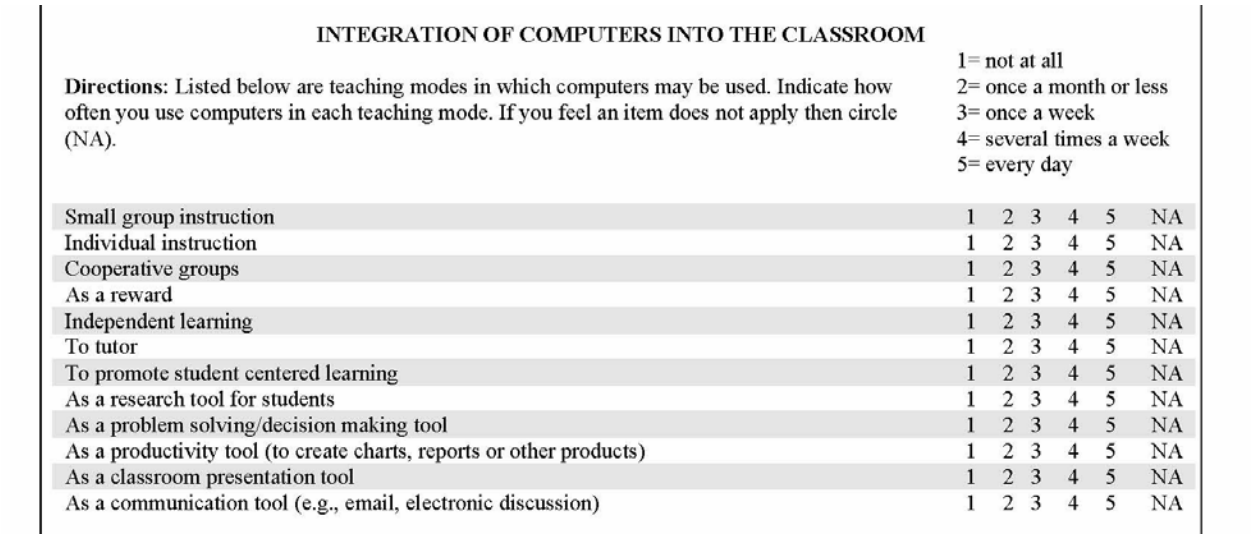
CONFIDENCE AND COMFORT USING COMPUTERS

Directions: Please read the following statements and circle the one response that best reflects your level of agreement.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

I have had adequate training in using computers.	1	2	3	4	5
I use computers effectively in my classroom.	1	2	3	4	5
I am comfortable giving computer assignments to my students.	1	2	3	4	5
The computer enhances my teaching.	1	2	3	4	5
I am comfortable using computers during classroom instruction.	1	2	3	4	5
My use of computer technology enhances student performance.	1	2	3	4	5
Incorporating multi-media into lessons enhances teaching.	1	2	3	4	5
I am comfortable with computer terminology.	1	2	3	4	5
I am developing expertise in the uses of technology in the classroom.	1	2	3	4	5

Figure 10. Integration of computers into the classroom.



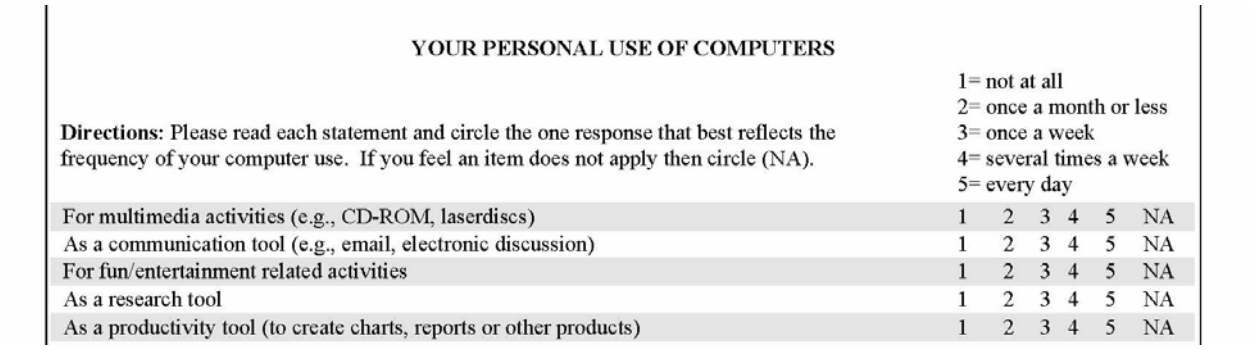
INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

Figure 11. Your personal use of computers.



YOUR PERSONAL USE OF COMPUTERS

Directions: Please read each statement and circle the one response that best reflects the frequency of your computer use. If you feel an item does not apply then circle (NA).

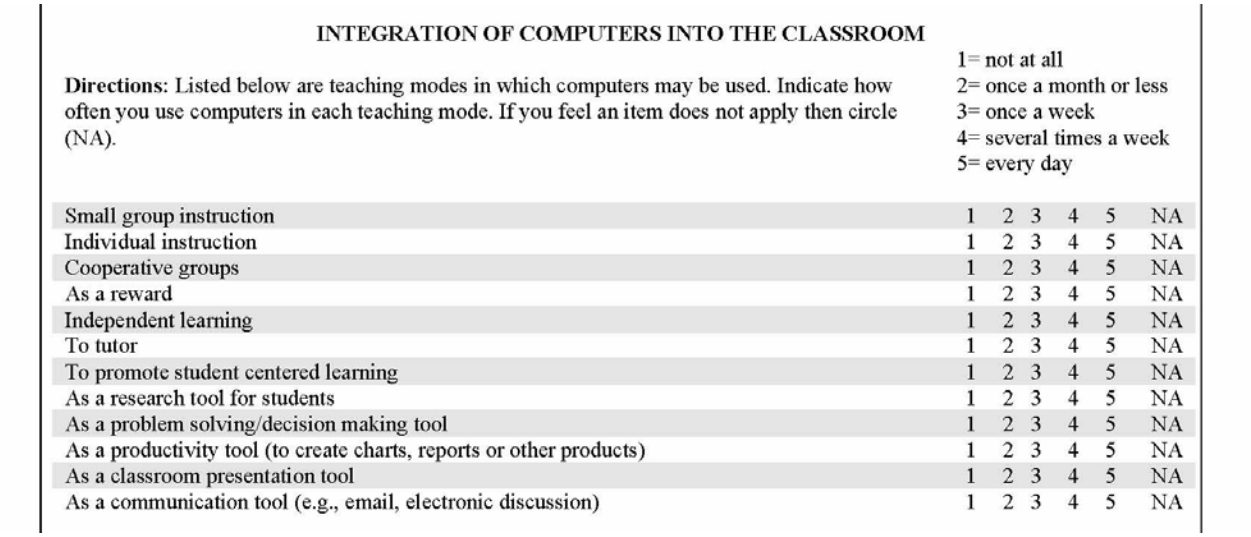
1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

For multimedia activities (e.g., CD-ROM, laserdiscs)	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA
For fun/entertainment related activities	1	2	3	4	5	NA
As a research tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA

A univariate analysis of variance was conducted to determine whether there were significant differences in middle and high school teachers' use of computers in different subject areas.

6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school? (see Figure 12) (see Figure 13)

Figure 12. Integration of computers into the classroom.



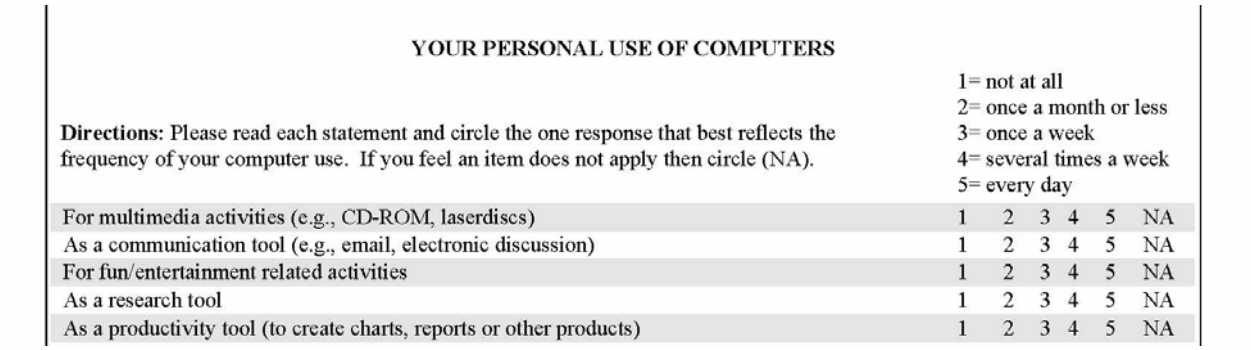
INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

Figure 13. Your personal use of computers.



YOUR PERSONAL USE OF COMPUTERS

Directions: Please read each statement and circle the one response that best reflects the frequency of your computer use. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

For multimedia activities (e.g., CD-ROM, laserdiscs)	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA
For fun/entertainment related activities	1	2	3	4	5	NA
As a research tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA

A Pearson product-moment correlation was conducted to determine whether there was a correlation between a high use of computers for personal use and integration technology at school.

7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support? (see Figure 14) (see Figure 15) (see Figure 16)

Figure 14. General school support.

GENERAL SCHOOL SUPPORT

Directions: Please read the following items and circle the one response that best represents your level of agreement.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

I have adequate time to learn computer skills.	1	2	3	4	5
I have sufficient access to computers at my school.	1	2	3	4	5
I receive a sufficient level of computer related support at my school.	1	2	3	4	5
Faculty members encourage the use of computers.	1	2	3	4	5
The administration supports computer related training.	1	2	3	4	5
The administration actively encourages the use of computers in the classroom.	1	2	3	4	5
The administration actively encourages the use of computers outside the classroom.	1	2	3	4	5

Figure 15. Your personal use of computers.

YOUR PERSONAL USE OF COMPUTERS

Directions: Please read each statement and circle the one response that best reflects the frequency of your computer use. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

For multimedia activities (e.g., CD-ROM, laserdiscs)	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA
For fun/entertainment related activities	1	2	3	4	5	NA
As a research tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA

Figure 16. Technical support.

TECHNICAL SUPPORT

Does your school have an on-site computer support specialist?
Yes _____ No _____ Don't Know _____
If yes, how many computer support specialists does your school have? _____.
If no, then skip this section and move on to the next section.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

The on-site computer specialist adequately assists me in problem solving and trouble shooting.	1	2	3	4	5
The on-site computer specialist is dedicated to helping teachers.	1	2	3	4	5
I have adequate access to our on-site computer specialist.	1	2	3	4	5
I have to contact our specialist several times before I get assistance.	1	2	3	4	5
Our computer specialist shows me techniques to integrate computer technology into the classroom.	1	2	3	4	5

A series of t-tests were conducted to determine whether teachers who reported a high use of computers for personal use were likely to get technical and general school support.

8. What are the teachers' attitudes towards computer use? (see Figure 17)

Figure 17. Attitudes towards computer use.

ATTITUDES TOWARDS COMPUTER USE

Directions: The following statements address general attitudes towards computer use. Please circle the one answer that best reflects your level of agreement.	1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree				
I would like every student in my classes to have access to a computer.	1	2	3	4	5
Computer skills are essential to my students.	1	2	3	4	5
I feel tense when people start talking about computers.	1	2	3	4	5
I feel pressure from others to integrate the computer more into my classroom.	1	2	3	4	5
I would like my students to be able to use the computer more.	1	2	3	4	5
Computers are dehumanizing.	1	2	3	4	5
I avoid the computer whenever possible.	1	2	3	4	5
Computer instruction is just another fad.	1	2	3	4	5
The use of computers should be confined to computer courses.	1	2	3	4	5
I like using the computer to solve complex problems.	1	2	3	4	5
More training would increase my use of the computer in the classroom.	1	2	3	4	5
Computers diminish my role as a teacher.	1	2	3	4	5
Computers should be incorporated into the classroom curriculum.	1	2	3	4	5
Computers make my job easier.	1	2	3	4	5
Computers further the gap between students along socio-economic lines.	1	2	3	4	5
Computer skills will help me as a professional.	1	2	3	4	5
Learning computers make high demands on my professional time.	1	2	3	4	5
Computers change my role as a teacher.	1	2	3	4	5
I can help others solve computer problems.	1	2	3	4	5
Computers enhance classroom instruction.	1	2	3	4	5

A frequency table was constructed to determine the teachers' attitudes towards computer use.

9. How do teachers describe their preparation for computer use? (see Figure 18)

Figure 18. Teacher preparation for computer use.

TEACHER PREPARATION FOR COMPUTER USE					
Directions: For the following items please circle the one response that best reflects the extent to which you've acquired computer skills from the following sources.	1= not at all 2= to a small extent 3= to a moderate extent 4= to a great extent 5= entirely				
As part of your undergraduate coursework	1	2	3	4	5
Inservice courses / workshops	1	2	3	4	5
Independent learning (e.g., online tutorials or books)	1	2	3	4	5
Interaction with other faculty / staff	1	2	3	4	5
Distance Learning courses	1	2	3	4	5
To what extent do you think the following types of computer education would be beneficial to you?					
Introductory computer skills	1	2	3	4	5
Specific applications (e.g., spreadsheet, desktop publishing)	1	2	3	4	5
Specialized training on integrating the computer into the classroom	1	2	3	4	5

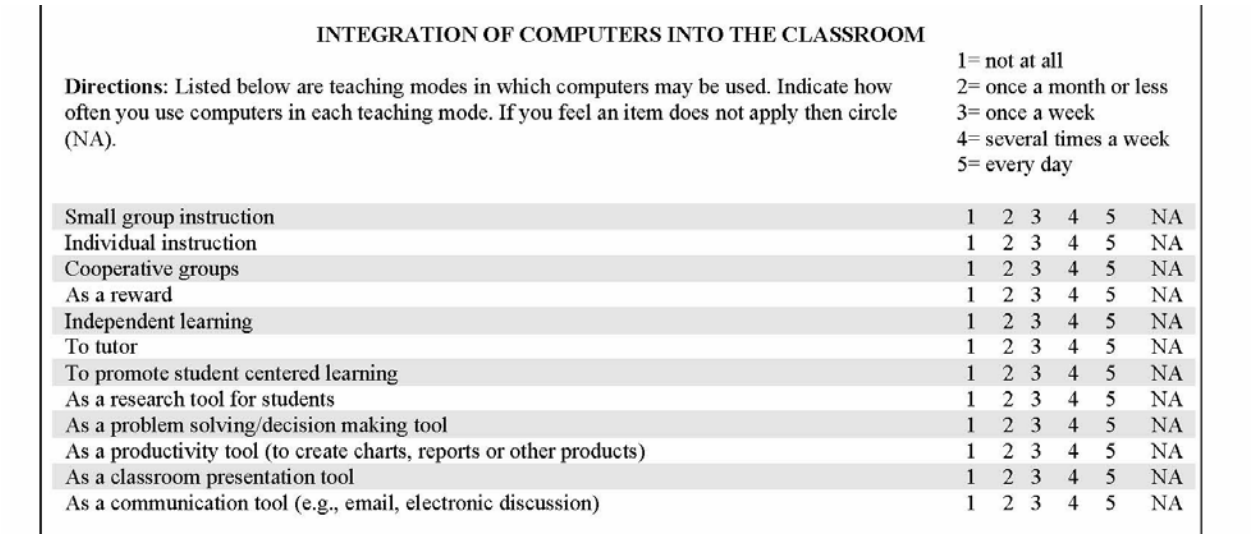
A frequency table was constructed to assess the teachers' preparation for computer use.

10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom? (see Figure 19) (see Figure 20)

Figure 19. Confidence and comfort using computers.

CONFIDENCE AND COMFORT USING COMPUTERS					
Directions: Please read the following statements and circle the one response that best reflects your level of agreement.	1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree				
I have had adequate training in using computers.	1	2	3	4	5
I use computers effectively in my classroom.	1	2	3	4	5
I am comfortable giving computer assignments to my students.	1	2	3	4	5
The computer enhances my teaching.	1	2	3	4	5
I am comfortable using computers during classroom instruction.	1	2	3	4	5
My use of computer technology enhances student performance.	1	2	3	4	5
Incorporating multi-media into lessons enhances teaching.	1	2	3	4	5
I am comfortable with computer terminology.	1	2	3	4	5
I am developing expertise in the uses of technology in the classroom.	1	2	3	4	5

Figure 20. Integration of computers into the classroom.



INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

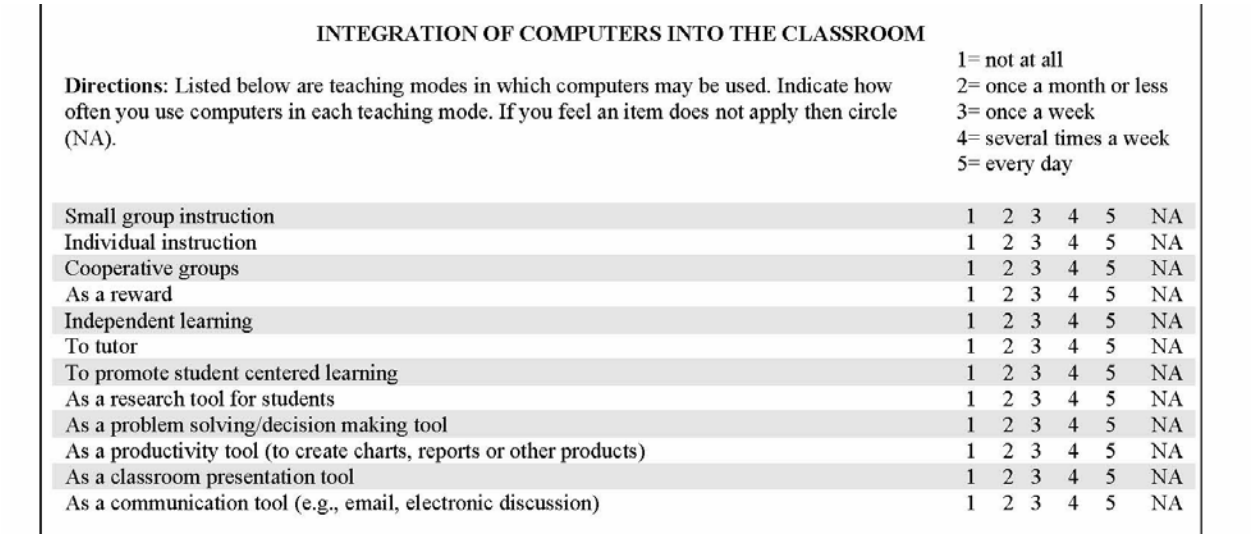
1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

A Pearson product-moment correlation was conducted to determine whether there was a correlation between teachers' level of confidence and comfort using computers and level of computer integration into the classroom.

11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not? (see Figure 21)

Figure 21. Integration of computers into the classroom.



INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

A series of t-tests were conducted to reveal differences in integrating computers between teachers who are mentoring interns and teachers who are not.

Assumptions

Because the researcher did not have the resources to make direct observations and ratings of teachers' and interns' technology integration in Professional Development Schools, the researcher used a self-report measure of technology integration where teachers and interns completed a survey confidentially. It is necessary to assume that the participants were honest in reporting their levels of integration in their self-reports. To encourage honest responses, the survey instrument was administered anonymously, and the participants were encouraged to be open and honest by the researcher who administered it.

Limitations of the Study

Limitations and caveats need to be noted. First, the response rate was small, which may limit the generalizability of the findings. Second, the study included teachers and interns from only Professional Development Schools. These schools offered inservice technology training and support for their teachers and interns through the Benedum Collaborative and a PT3 grant funded by Department of Education (between 2000 -2003). Surveys of teachers and interns in other school districts with different levels of access to technology or various levels of technical support might produce different results.

Chapter 4

Results

The purpose of this study was to determine the extent to which individual teachers in West Virginia University's Professional Development Schools (PDS) are using technology as a tool to enhance their students' education. The study addressed the use of technology as a classroom tool for research, communication, productivity, and problem-solving as outlined by the National Technology Standards for students (2000). Comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies) were included. In this chapter, the research findings are presented by providing a summary of population and demographics of the participants followed by the major findings of the study.

Technology integration into K-12 classes in WVU PDS was measured using a survey given to teachers and interns. The researcher distributed a four-page survey instrument (adapted with permission from an original survey designed and used at the University of South Florida in 2003) to the teachers and interns during the spring semester of 2004 in the WVU PDS in West Virginia. The first section of the instrument was used to collect demographic data, and the remaining sections addressed the four domains of research: integration; support; preparation, confidence, and comfort; and attitude toward computer use. Participants were asked to rate each statement on a five-point scale. The participation was voluntary. The survey is shown in Appendix A.

Population and Demographic Data

This study involved 1,176 teachers and 105 intern students in West Virginia University's Professional Development Schools in 2003-2004. The survey was sent to 1,148 of the 1,176 teachers. Twenty-eight teachers in one school asked to be excluded from the study. After a month, 345 (30%) surveys were received. Unfortunately, 18 had to be eliminated because they did not meet the criteria. Three surveys were completely blank. One had the demographic section filled in but the remainder was blank. Six were completed either by school counselors or secretaries. Eight were completed by teachers who were either teaching at more than one grade level or one location. As a result, useable results were obtained from 327 of the 1,176 teachers (28%). In addition, the survey was given to all 105 interns. Among them, only three interns refused to participate. Table 1 shows the return percentages.

Table 1

Return Percentages for Teachers and Interns

	Number of Surveys	**Returned Surveys**	**Useable Surveys**
Teachers	1,148	345 (30%)	327 (28%)
Interns	105	102 (97%)	102 (97%)

Interns

The first section of the intern survey collected information about location, their gender, ethnicity, teaching subject(s), grade level, average number of students, number of computers in the classroom, whether they had access to a computer

laboratory in the Professional Development School, how many hours each week interns used computers in their classroom for instruction, and how many years interns had been using computers for their personal use.

Of the 102 interns responding the survey, 17 (17%) were males and 85 (83%) were females (see Table 2). There was one (1%) Native American/American Indian, one (1%) African American, 98 (96%) White/Non-Hispanics, and two (2%) others (one student wrote down "human race" in the space provided for specification). Among four subject areas, seven teach English, eight math, seven science, and five teach social science. Some teachers teach more than one subject area, thus they are excluded in some research questions. The focus was on English, social studies, science, and mathematics teachers. Therefore, teachers who were teaching only one of these subject areas were counted. Sixty-three (62%) interns were elementary school teachers, six (6%) were middle school teachers, and 32 (31%) were high school teachers (one survey had missing data). The average number of students they had in their classroom was 23. The average number of computers in their classroom used for instruction was 2.86 (two surveys had missing data). In their WVU PDS schools, 95 interns (93%) had access to a computer laboratory while seven (7%) did not. Each week the interns used computers for an average of 60.35 minutes in their classroom for instruction (12 surveys had missing data). Finally, the interns had been using computers for their personal use for an average of 9.56 years (one survey had missing data).

Table 2

Demographic Data for Interns

Interns (n=102)	**Number**	**Percentage**
Gender		
Male	17	17%
Female	85	83%
Ethnicity		
Native American/American Indian	1	1%
African American	1	1%
White/Non-Hispanic	98	96%
Others	2	2%
Teaching Areas		
English	7	7%
Mathematics	8	8%
Science	7	7%
Social Studies	5	5%
Grade Level		
Elementary	63	62%
Middle	6	6%
High School	32	31%
ND	1	
Average # of Students (per class)	23.07	
Average # of Computers (per classroom)	2.86	
ND	2	

Table 2 (Continued)

Demographic Data for Interns

Access to Computer Laboratories		
Yes	95	93%
No	7	7%
If so, how many hours each week they use	60.35 minutes	
ND	12	
Years for Computer Experience	9.56 years	
ND	1	

Teachers

The demographic section of the teachers survey collected information about the school, gender, ethnicity, highest degree earned, teaching subject(s), grade level currently taught, average number of students in their classroom, average number of computers in the classroom used for instruction, how many years they had been using computers in their classroom for instruction, whether they had access to a computer lab, if so, how many hours each week they used computers in their classroom for instruction, and whether they mentored any WVU interns during the past two years.

Of the 327 teachers responding to the survey, 59 (18%) were males and 267 (82%) were females (one survey had missing data) (see Table 3). There were three (1%) African Americans, 315 (96%) White/Non-Hispanics, three (1%) Hispanics, one (0%) Asian/Pacific islander, and one was (0%) other (four surveys had missing data). Seventy-five teachers (23%) had bachelor's degrees, nine (3%) had specialist degrees (Ed.S), 235 (72%) master's degrees, four (1%) doctoral degrees, and one (0%) marked "other" as their highest degree earned (three surveys had missing data). Twenty-nine

(9%) taught English, 31 (9%) Math, 23 (7%) Science, and 14 (4%) Social Science (some teachers teach more than one subject area and they were excluded in some research questions while five teachers were teaching the same subject at different levels and they were counted twice). Regarding grade level, 166 (51%) respondents taught in elementary schools, 31 (9%) taught in middle schools, and 129 (39%) taught in high schools (one survey had missing data). The average number of students in their classroom was 19.67 (ten surveys had missing data). The average number of computers in the classroom used for instruction was 4.79 (six surveys had missing data). Their total teaching experience in years was 18.74 (two surveys had missing data). In the WVU PDS schools, 277 teachers (85%) had access to a computer lab while 45 (14%) did not (five surveys had missing data). Each week the teachers used computers for an average of 109.63 minutes in their classroom for instruction (91 surveys had missing data). These teachers had been using computers for their personal use for an average of 7.59 years (15 surveys had missing data). Finally, 148 (45%) of the teachers have mentored WVU interns during the past two years while 174 (53%) have not (five surveys had missing data).

Table 3

Demographic Data for Teachers

Teachers (n=327)	**Number**	**Percentage**
Gender		
Male	59	18%
Female	267	82 %
ND	1	
Ethnicity		
Asian/Pacific islander	1	0%
African American	3	1%
White/Non-Hispanic	315	96%
Hispanic	3	1%
Others	1	0%
ND	4	
Highest Degree Earned		
Bachelors	75	23%
Specialist	9	3%
Masters	235	72%
Doctorate	4	1%
Other	1	0%
ND	3	
Teaching Areas		
English	29	9%
Mathematics	31	9%
Science	23	7%
Social Studies	14	4%

Table 3 (Continued)

Demographic Data for Teachers

Grade Level		
Elementary	166	51%
Middle	31	9%
High School	129	39%
ND	1	
Average # of Students (per class)	19.67	
ND	10	
Average # of Computers (per classroom)	4.87	
ND	6	
Years for Computer Experience	18.74 years	
ND	2	
Access to Computer Laboratories		
Yes	277	85%
No	45	14%
ND	5	
If so, how many hours each week they use	109.63 minutes	
ND	91	
Mentoring a WVU Intern		
Yes	148	45%
No	174	53%
ND	5	

Although the demographic data is shown as two separate tables (see Table 2 and Table 3) for interns and teachers, within this study they are treated as one group for statistical purposes. Table 4 shows the two groups combined.

Table 4

Demographic Data for All Subjects

Total Subjects (n=429)	**Number**	**Percentage**
Gender		
Male	76	18%
Female	352	82%
ND	1	
Ethnicity		
Native American/American Indian	2	0%
African American	4	1%
White/Non-Hispanic	413	96%
Hispanic	3	1%
Others	3	1%
ND	4	
Teaching Areas		
English	36	8%
Mathematics	39	9%
Science	30	7%
Social Studies	19	4%

Table 4 (Continued)

Demographic Data for All Subjects

Grade Level		
Elementary	229	53%
Middle	37	9%
High School	161	38%
ND	2	
Average # of Students (per class)	21.37	
ND	10	
Average # of Computers (per classroom)	3.86	
ND	8	
Access to Computer Laboratories		
Yes	372	87%
No	52	12%
If so, how many hours each week they use	84.99	
ND	17	
Years for Computer Experience	14.15 years	
ND	3	

Research Questions and Major Findings

The findings of this study are introduced with the following research questions at the forefront of the analysis to facilitate the categorization and organization of the research data:

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom?

2. In middle and high schools, how do teachers of different subjects integrate computers?
3. Are there any differences in teachers' use of computers as compared to students' use overall?
4. Are there any differences in each grade level of teachers' use of computers?
5. Are there any differences in middle and high school teachers' use of computers in different subject areas?
6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school?
7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support?
8. What are the teachers' attitudes towards computer use?
9. How do teachers describe their preparation for computer use?
10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom?
11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not?

Descriptive and inferential statistics were used to address these research questions. All tests of statistical significance were conducted at the .05 probability level. The reasons for this choice were: (1) the original study also used this significance level; (2) because the sample size in this study was small, it was preferred to use a larger coefficient (as opposed to .01) (Gay and Airasian, 2003).

The next section will present the data as collected via the survey instrument. A discussion of data will follow.

Research Question One

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom?

The ANOVA demonstrated that differences did, in fact, exist. To further examine the pattern of differences, a Scheffe's multiple comparisons test was completed (see Table 4).

The results of this comparison test showed that the elementary school teachers used technology for small group instruction more often than did the high school teachers (mean = 2.73 and 2.38, respectively, $p \leq .05$). Similarly, they used technology for individual instruction more often than did the high school teachers (mean = 3.46 and 2.84, respectively, $p \leq .05$).

The results also demonstrated that the elementary school teachers (mean = 3.24) used technology as a reward more often than did high school teachers (mean = 2.36, $p \leq .05$). Elementary school teachers (mean = 3.79) again used technology more often than did high school teachers (mean = 2.90) for independent learning ($p \leq .05$). Similarly, elementary school teachers used technology for tutoring more often than did high school teachers (mean = 3.45 and 2.32, respectively, $p \leq .05$). In addition, these elementary teachers used technology to promote student-centered learning more often than did the high school teachers (mean = 3.42 and 2.82, respectively, $p \leq .05$).

For all of the above results, no significant differences were found for middle school teachers (p≤ .05). Furthermore, no significant differences were demonstrated in the way that teachers at these different grade levels integrate computers in the classroom as a research, problem solving/decision making, productivity, classroom presentation, and communication tool (p≤ .05).

Table 5

Mean Scores of Different Grade Levels – Integration of Computers

Section Six Integration of Computers into the Classroom	Elementary	Middle	High School
Small Group Instruction	2.73*	2.38	2.38*
Individual Instruction	3.46*	2.95	2.84*
Cooperative Groups	2.71*	2.64	2.29*
As a Reward	3.24*	2.61	2.36*
Independent Learning	3.79*	3.27	2.90*
To tutor	3.45*	2.78	2.32*
To Promote Student Centered Learning	3.42*	3.03	2.82*
As a Research Tool for Students	2.99	3.08	3.07
As a Problem Solving/Decision Making Tool	2.69	2.71	2.38
As a Productivity Tool	2.53	2.75	2.45
As a Classroom Presentation Tool	2.59	2.81	2.41
As a Communication Tool	3.23	3.34	2.84

* significant at p≤ .05

Research Question Two

2. In middle and high schools, how do teachers of different subjects integrate computers?

The ANOVA demonstrated that differences did, in fact, exist. To examine the pattern of differences, a Scheffe's multiple comparisons test was completed (see Table 5).

The results of this comparison test showed that English teachers used technology to tutor more often than did social studies teachers (mean = 3.06 and 1.71, respectively, $p \leq .05$). There was no significant difference for science and mathematics teachers ($p \leq .05$). The results also demonstrated that English teachers (mean = 3.33) used technology as a research tool for students more often than did mathematics teachers (mean = 2.14, $p \leq .05$). There was no significant difference for science and social studies teachers ($p \leq .05$).

No significant differences were demonstrated in the way that teachers of different subjects integrate computers in middle and high schools for small group instruction, individual instruction, cooperative groups, as a reward, independent learning, promoting student centered learning, as a problem solving/decision making tool, as a productivity tool, as a classroom presentation tool, and as a communication tool ($p \leq .05$).

Table 6

Mean Scores of Different Subjects – Integration of Computers

Section Six Integration of Computers into the Classroom	English	Mathematics	Science	Social Studies
Small Group Instruction	2.29	1.95	2.35	2.13
Individual Instruction	2.72	2.71	2.52	2.29
Cooperative Groups	2.46	2.10	2.26	2.17
As a Reward	2.49	2.48	2.52	1.67
Independent Learning	3.08	3.10	2.52	2.29
To tutor	3.06*	2.43	2.13	1.71*
To Promote Student Centered Learning	3.22	2.48	2.87	2.54
As a Research Tool for Students	3.33*	2.14*	3.13	2.92
As a Problem Solving/Decision Making Tool	2.60	2.19	2.30	2.29
As a Productivity Tool	2.63	2.24	2.39	2.17
As a Classroom Presentation Tool	2.60	2.10	2.78	2.46
As a Communication Tool	3.54	2.90	3.39	2.42

* significant at p≤ .05

Research Question Three

3. Are there any differences in teachers' use of computers as compared to students' use overall?

The t-test indicated that students used drill and practice more than teachers (mean = 3.10 and 1.76, respectively) (see Table 6). Further, the same was found to be true for games; students used technology for games more often than did teachers (mean = 3.11 and 2.07, respectively, $p \leq .05$).

The results also demonstrated that students (mean = 2.84) used tutorials more than did teachers (mean = 1.74). In addition, these students used integrated learning systems more than did teachers (mean = 2.84. and 1.59, respectively). Again, the same was found in using technology for programming/authoring tools; students used more often than did teachers with a mean of 2.29 for students and 1.50 for teachers ($p \leq .05$).

No significant differences were demonstrated between students and teachers use for word processors, spreadsheets, databases, desktop publishing programs, presentation software, web publishing programs, graphic programs, simulations, and web browsers ($p \leq .05$).

Table 7

Mean Scores of Teacher vs. Student Use

Sections Four & Five Types of Software used to Complete School Related Activities	Teachers' Use	Students' Use
Word Processors(e.g., Appleworks, MS Word)	4.10	5.10
Spreadsheets (e.g., Excel, Lotus)	2.35	2.34
Databases (e.g., FileMaker Pro, Access)	1.70	2.26
Desktop Publishing Programs (e.g., PageMaker)	2.40	2.44
Presentation Software (e.g., PowerPoint)	2.25	2.50
Web Publishing Programs (e.g., DreamWeaver)	1.82	2.24
Graphic Programs (e.g., PhotoShop, FreeHand)	1.95	2.57
Drill and Practice	1.76*	3.10*
Games	2.07*	3.11*
Simulations	1.52	2.64
Tutorials	1.74*	2.84*
Integrated Learning Systems (e.g., Josten, CCC)	1.59*	2.84*
Web Browsers (e.g., Internet Explorer)	4.26	3.41
Programming/Authoring tools (e.g., Java, Authorware)	1.50*	2.29*

* significant at $p \leq .05$

Research Question Four

4. Are there any differences in each grade level of teachers' use of computers?

The ANOVA demonstrated that differences did, in fact, exist in teachers' confidence and comfort using computers. To examine the pattern of differences, a Scheffe's multiple comparisons test was completed (see Table 7). The results of this comparison test demonstrated that elementary school teachers used technology to give computer assignments more often than did middle and high school teachers (mean = 3.47, 3.95, and 3.89 respectively, $p \leq .05$).

No significant differences were found in each grade level of teachers' use of computers for having adequate training in using computers, using computers effectively in their classrooms, computers enhancing their teaching, being comfortable using computers during classroom instruction, use of computer technology enhancing student performance, incorporating multi-media into lessons enhancing teaching, being comfortable with computer terminology, and developing expertise in the uses of technology in the classrooms ($p \leq .05$).

Table 8

Mean Scores of Teachers' Confidence and Comfort Using Computers at Different Grade Levels

Section Two Confidence and Comfort Using Computers	Elementary	Middle	High School
I have had adequate training in using computers	3.74	3.79	3.66
I use computers effectively in my classroom	3.55	3.56	3.65
I am comfortable giving computer assignments to my students	3.47*(1-2)(1-3)	3.95*(2-1)	3.89*(3-1)
The computer enhances my teaching	3.78	3.95	3.86
I am comfortable using computers during classroom instruction	3.70	3.82	3.75
My use of computer technology enhances student performance	3.73	3.72	3.64
Incorporating multi-media into lessons enhances teaching	3.98	3.97	3.96
I am comfortable with computer terminology	3.64	3.79	3.76
I am developing expertise in the uses of technology in the classroom	3.56	3.67	3.67

* significant at $p \leq .05$

A one-way ANOVA was conducted to determine whether there are significant differences in each grade level of teachers' use of computers. The ANOVA demonstrated that differences existed in teachers' integration of computers into the classroom (see Table 8). To examine the pattern of differences, a Scheffe's multiple comparisons test was completed. The results of this comparison test showed that

elementary school teachers used technology for small group instruction more often than did high school teachers (mean = 2.73 and 2.38, respectively, p≤ .05). Similarly, elementary school teachers used technology for individual instruction more often than did high school teachers with a mean score of 3.46 for elementary school teachers, and 2.84 for high school teachers (p≤ .05).

The results also demonstrated that the elementary school teachers (mean = 2.71) used technology for cooperative instruction more often than did high school teachers (mean = 2.29, p≤ .05). In addition, these elementary school teachers used technology as a reward more often than did high school teachers (means = 3.25 and 2.36 respectively, p≤ .05).

The comparison demonstrated that there was a significant difference between elementary school teachers (mean = 3.80) and high school teachers (mean = 2.90) for independent learning (p≤ .05) with elementary teachers using technology for independent learning more often than high school teachers. Also, elementary school teachers used technology for tutoring more often than did high school teachers (mean = 3.46 and 2.32, respectively, p≤ .05). In addition, elementary school teachers (mean = 3.43) also promoted student centered learning by using technology more often than did high school teachers (mean = 2.82, p≤ .05).

No significant differences were demonstrated in each grade level of teachers' use of computers as a research, problem solving/decision making, productivity, classroom presentation, and communication tool (p≤ .05).

Table 9

Mean Scores of Teachers' Integration of Computers into the Classroom at Different Grade Levels

Section Six Integration of Computers into the Classroom	Elementary	Middle	High School
Small Group Instruction	2.73*	2.38	2.38*
Individual Instruction	3.46*	2.95	2.84*
Cooperative Groups	2.71*	2.64	2.29*
As a Reward	3.25*	2.61	2.36*
Independent Learning	3.80*	3.27	2.90*
To tutor	3.46*	2.78	2.32*
To Promote Student Centered Learning	3.43*	3.03	2.82*
As a Research Tool for Students	3.00	3.08	3.07
As a Problem Solving/Decision Making Tool	2.69	2.71	2.38
As a Productivity Tool	2.53	2.75	2.45
As a Classroom Presentation Tool	2.58	2.81	2.47
As a Communication Tool	3.22	3.34	2.84

* significant at p≤ .05

The Scheffe's comparison demonstrated that there was no significant difference in each grade level of teachers' personal use of computers for multimedia activities, as a communication tool, for fun/entertainment related activities, as a research tool, and as a productivity tool (p≤ .05) (see Table 9).

Table 10

Mean Scores of Teachers' Personal Use of Computers at Different Grade Levels

Section Seven Your Personal Use of Computers	Elementary	Middle	High School
For multimedia activities(e.g., CD-ROM)	3.04	2.69	2.88
As a communication tool (e.g., email)	4.39	4.53	4.15
For fun/entertainment related activities	3.43	3.14	3.12
As a research tool	3.83	3.84	3.92
As a productivity tool (e.g., to create charts)	3.41	3.51	3.53

* significant at p≤ .05

Research Question Five

5. Are there any differences in middle and high school teachers' use of computers in different subject areas?

The univariate analysis of variance demonstrated that no differences existed in middle and high school teachers' use of computers in different subjects (F = 1.361, p≤.05) (see Table 10).

Table 11

Middle and High School Teachers' Use of Computers in Different Subject Areas

Tests of Between-Subjects Effects

Dependent Variable: Integration

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1079.074(a)	7	154.153	1.361	.231
Intercept	56142.986	1	56142.986	495.843	.000
MIDDLEHIGH	44.952	1	44.952	.397	.530
ALLSUBJECTS	569.033	3	189.678	1.675	.178
MIDDLEHIGH * ALLSUBJECTS	239.715	3	79.905	.706	.551
Error	10756.596	95	113.227		
Total	108906.000	103			
Corrected Total	11835.670	102			

Research Question Six

6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school?

The test showed that there was a significant positive correlation (r = .327) among the teachers who use computers for personal use and integrate technology at school (Correlation is significant at the 0.01 level [2-tailed]) (see Table 11) (see Figure 22).

Table 12

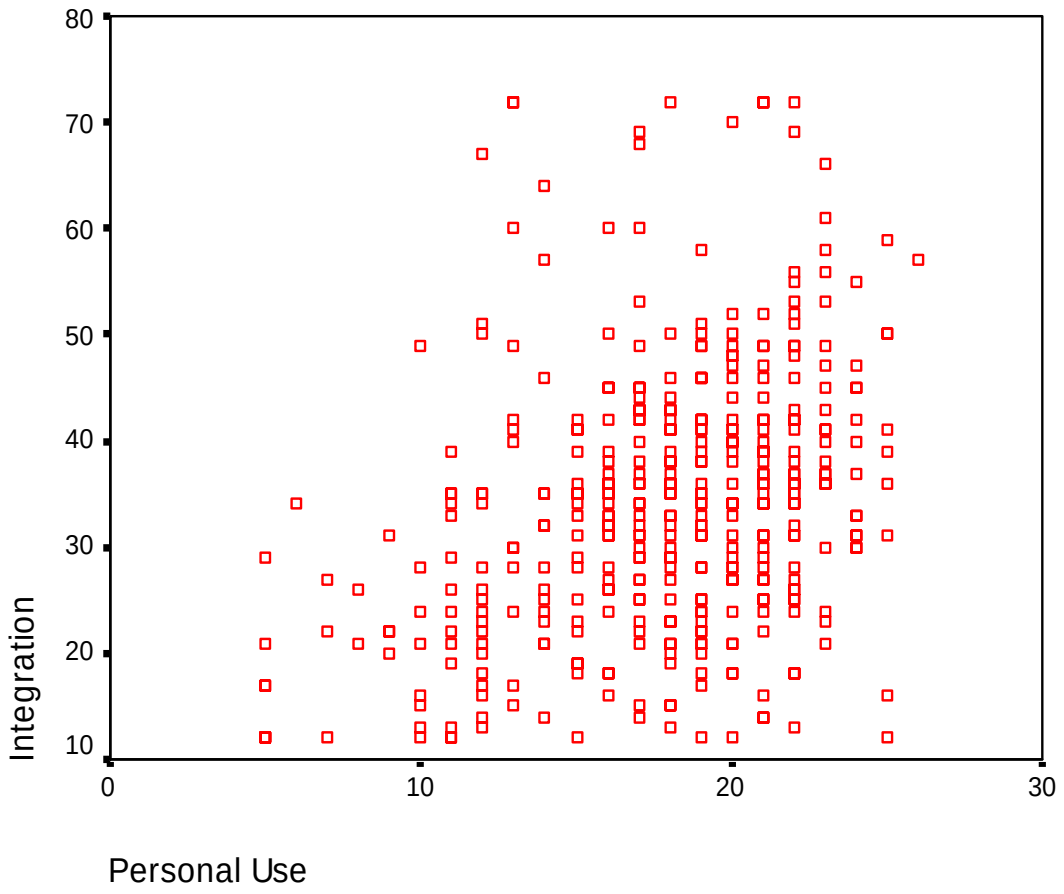
Correlation between a High Use of Computers for Personal Use and Integration Technology at School

Correlations

		Integration	Personal Use
Integration	Pearson Correlation	1	.327(**)
	Sig. (2-tailed)	.	.000
	N	427	424
Personal Use	Pearson Correlation	.327(**)	1
	Sig. (2-tailed)	.000	.
	N	424	428

** Correlation is significant at the 0.01 level (2-tailed).

Figure 22. Correlation between a High Use of Computers for Personal Use and Integration Technology at School



Research Question Seven

7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support?

The t-test indicated that there was no significant difference between using computers for personal use at a high level and getting technical school support ($F = 2.956$, $p \leq .05$) ($t = .295$, $df = 396$, $p \leq .05$) (see Table 12). Again, there was no significant difference between using computers for personal use at a high level and getting general school support ($F = 4.135$, $p \leq .05$) ($t = .191$, $df = 394$, $p \leq .05$).

Table 13

The Relationship between a High Use of Computers for Personal Use and Getting Technical and General School Support

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Technical Support	Equal variances assumed	2.956	.086	.295	396	.768	.27	.922	-1.541	2.084
	Equal variances not assumed			.274	246.480	.784	.27	.992	-1.683	2.227
General School Support	Equal variances assumed	4.135	.043	.191	394	.849	.10	.511	-.908	1.103
	Equal variances not assumed			.184	276.639	.854	.10	.531	-.947	1.142

Research Question Eight

8. What are the teachers' attitudes towards computer use?

The frequency table revealed that the majority of the teachers (91%) would like every student in their classroom to have access to a computer (mean = 4.61 on a 5-point scale) and 87% think that computer skills are essential to their students (mean = 4.47)(see Table 13). Nearly three-quarters of the teachers reported that they do not feel tense when people start talking about computers (73%). However, nearly half of them (46%) feel pressure from others to ingrate the computer more into their classrooms.

The majority of these teachers (81%) would like their students to be able to use the computer more. Most report they do not think computers are dehumanizing (78%) and they do not avoid the computers whenever possible (88%).

Again, the majority of the teachers (90%) do not think that computer instruction is just another fad. Most teachers reported that the use of computers should be confined to computer courses (91%). Nearly half of the teachers (45%) are neutral when it comes to use computers to solve complex problems. Over half reported that more training would increase their use of computers in the classroom (62%).

The majority of the teachers (83%) do not think that computers diminish their role as a teacher, and they think that computers should be incorporated into the classroom curriculum (77%). More than half (61%) of the teachers believe that computers make their job easier. More than a third (37%) of the teachers strongly disagreed or disagreed that computers further the gap between students along socio-

economic lines. Again, the majority of the teachers (88%) think that computers skills will help them as a professional while nearly half of the teachers (44%) agreed that learning computers makes high demands on their professional time.

Nearly half of the teachers (44%) agreed that computers change their role as a teacher and they think that they can help others solve computer problems (48%). Finally, the majority of the teachers (83%) think that computers enhance classroom instruction.

Table 14

Percentages and Mean Scores of Teachers' Attitudes towards Computer Use

Section Nine Attitudes Towards Computer Use	Str.Disag	Disagree	Neutral	Agree	Str.Agree	Mean
I would like every student in my classes to have access to a computer	1%	1%	6%	22%	69%	4.61
Computer skills are essential to my students	1%	2%	8%	26%	61%	4.47
I feel tense when people start talking about computers	47%	26%	17%	8%	3%	2.00
I feel pressure from others to integrate the computer more into my classroom	25%	22%	26%	21%	7%	2.65
I would like my students to be able to use the computer more	4%	3%	14%	43%	38%	4.09
Computers are dehumanizing	53%	25%	16%	4%	3%	1.78
I avoid the computer whenever possible	64%	24%	7%	3%	3%	1.64
Computer instruction is just another fad	64%	26%	6%	1%	3%	1.52
The use of computers should be confined to computer courses	64%	27%	5%	2%	2%	1.51
I like using the computer to solve complex problems	13%	13%	45%	19%	10%	3.02
More training would increase my use of the computer in the classroom	8%	9%	22%	38%	24%	3.61
Computers diminish my role as a teacher	49%	34%	10%	4%	3%	1.79
Computers should be incorporated into the classroom curriculum	2%	4%	17%	42%	35%	4.03
Computers make my job easier	5%	10%	24%	33%	27%	3.68
Computers further the gap between students along socio-economic lines	15%	22%	30%	22%	11%	2.92
Computer skills will help me as a professional	2%	2%	8%	41%	46%	4.28
Learning computers makes high demands on my professional time	10%	16%	31%	32%	12%	3.20

Table 14 (Continued)

Percentages and Mean Scores of Teachers' Attitudes towards Computer Use

Computers change my role as a teacher	9%	14%	33%	32%	13%	3.24
I can help others solve computer problems	10%	12%	30%	34%	14%	3.29
Computers enhance classroom instruction	1%	2%	13%	48%	36%	4.15

Research Question Nine

9. How do teachers describe their preparation for computer use?

The frequency table revealed that nearly half of the teachers (48%) did not acquire computer skills as part of their undergraduate/graduate coursework (see Table 14). Many (46%) acquired their computer skills through inservice courses/workshops.

The majority of these teachers (51%) acquired computer skills through independent learning (e.g., online tutorials or books) while nearly half of them (41%) reported that they have acquired computer skills through interaction with other faculty/staff. Most of them (84%) disagreed that they have acquired computer skills through their distance learning courses.

The majority of these teachers (72%) do not think that introductory computer skills would be beneficial to them, but half of them (50%) think that specific applications such as spreadsheet or desktop publishing would be beneficial to them. In addition, many reported that specialized training on integrating the computer into the classroom would be beneficial to them (64%).

Table 15

Percentages and Mean Scores of Teachers' Preparation for Computer Use

Section One Teacher Preparation for Computer Use	Not at all	Small extent	Moderate extent	Great extent	Entirely	Mean
As a part of undergrad/graduate coursework	30%	19%	23%	21%	8%	2.58
Inservice courses/workshops	7%	16%	31%	39%	7%	3.24
Independent learning (e.g., online tutorial)	9%	16%	25%	39%	12%	3.30
Interaction with other faculty/staff	8%	19%	33%	34%	6%	3.13
Distance learning courses	73%	11%	8%	6%	2%	1.53
Introductory computer skills	50%	21%	15%	10%	4%	1.96
Specific applications (spreadsheet)	8%	11%	31%	34%	16%	3.40
Specialized training on integrating the computer into the classroom	5%	9%	22%	38%	26%	3.71

Research Question Ten

10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom?

The test demonstrated that there was a significant positive correlation ($r = .205$) between teachers' level of confidence and comfort using computers and level of computer integration into the classroom ($p \leq 0.01$ level [2-tailed]) (see Table 15) (see Figure 23).

Table 16

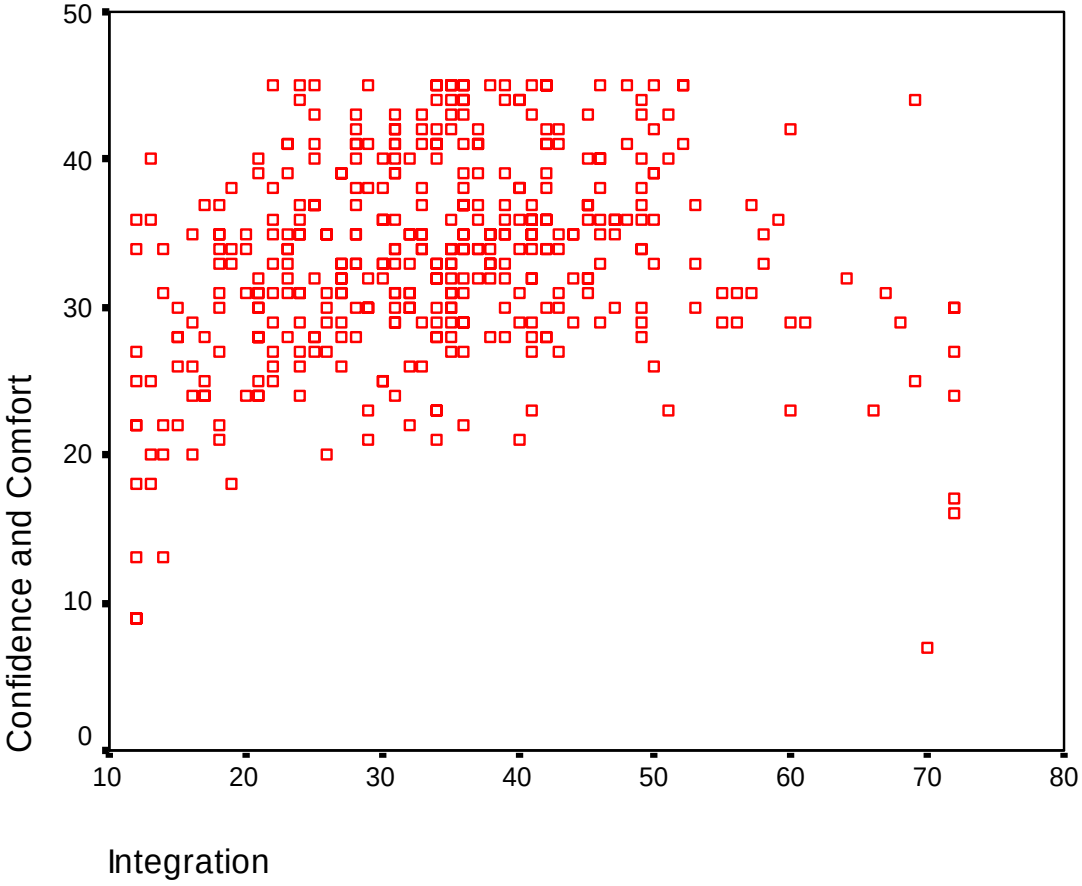
The Relationship between Teachers' Level of Confidence and Comfort Using Computers and Level of Computer Integration into the Classroom

Correlations

		Confidence/Comfort	Integration
Confidence/Comfort	Pearson Correlation	1	.205(**)
	Sig. (2-tailed)	.	.000
	N	429	424
Integration	Pearson Correlation	.205(**)	1
	Sig. (2-tailed)	.000	.
	N	424	427

** Correlation is significant at the 0.01 level (2-tailed).

Figure 23. The Relationship between Teachers' Level of Confidence and Comfort Using Computers and Level of Computer Integration into the Classroom



Research Question Eleven

11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not?

The t-test indicated that there was no significant difference between teachers who are mentoring interns (mean = 33.46) and those who are not (mean = 35.05) (F = 4.070, p≤.05) (t= -1.075, df = 321, p≤.05) (see Table 16).

Table 17

Integration of Computers between Teachers who Mentored Interns and Those who did not Mentor

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Integration	Equal variances assumed	4.070	.044	-1.075	321	.283	-1.60	1.484	-4.515	1.325
	Equal variances not assumed			-1.090	320.775	.277	-1.60	1.464	-4.476	1.285

In summary, elementary school teachers are more likely to use technology in their classrooms than high school teachers. Middle school teachers did not show a statistically significant difference in their technology integration from either of the other two groups. Students use technology more than do their teachers. The teachers who report higher levels of personal computer use are more likely to integrate technology in their classrooms. In general, teachers have positive attitude towards computers and technology integration. Finally, there was a positive relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom.

CHAPTER 5

Conclusions and Recommendations

This study investigated the extent to which individual teachers in West Virginia University's Professional Development Schools (PDS) are using technology as a tool to enhance their students' education. The study addressed the use of technology as a classroom tool for research, communication, productivity, and problem-solving as outlined by the National Technology Standards for students (2000). Comparisons across grade levels (elementary, middle, and high schools) and subject areas (English, mathematics, science, and social studies) were included. In this chapter, the results are discussed and further recommendations are made.

This research included 11 research questions to guide this study:

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom?
2. In middle and high schools, how do teachers of different subjects integrate computers?
3. Are there any differences in teachers' use of computers as compared to students' use overall?
4. Are there any differences in each grade level of teachers' use of computers?
5. Are there any differences in middle and high school teachers' use of computers in different subject areas?
6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school?

7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support?
8. What are the teachers' attitudes towards computer use?
9. How do teachers describe their preparation for computer use?
10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom?
11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not?

In this study, descriptive and inferential statistics were used to address these research questions. All tests of statistical significance were conducted at the .05 probability level. Two forms of survey (one for interns and one for teachers) were used to address the extent to which individual teachers in West Virginia University's Professional Development Schools (PDS) are using technology as a tool to enhance their students' education. The survey for interns was administered by the researcher during a course. The teacher version was sent to the schools with a self-addressed and stamped envelope.

Data were collected from these participants during the spring semester, 2004. A total of 102 out of 105 interns completed the survey. The teacher version was delivered to 1148 teachers in WVU PDS schools, and 345 responded to the survey. Out of 345, a total of 329 surveys met the criteria to be incorporated in study, as discussed in Chapter 3.

Conclusions and Findings

Research Question One

1. Are there differences in the way that teachers at different grade levels integrate computers in the classroom?

The results showed that the elementary school teachers used technology more often than high school teachers for small group instruction, individual instruction, as a reward, to promote student-centered learning, for tutoring, and for independent learning. The reason for the elementary school teachers using technology more can be the fact that elementary schools do not have separate classes for different subjects. The ease of having computers in one classroom would make it more common. Also, elementary school is where students learn about computers, and rudimentary English skills can also be taught via a computer – writing, reading, vocabulary, and typing skills. Further, by high school, most students have gained computer skills and would only take a computer course if they wanted as a separate course. However, no significant differences were demonstrated in the way that teachers at these different grade levels integrate computers in the classroom as a research, problem solving/decision making, productivity, classroom presentation, and communication tool.

Research Question Two

2. In middle and high schools, how do teachers of different subjects integrate computers?

The results showed that English teachers used technology to tutor more often than did social studies teachers. The results also demonstrated that English teachers

used technology as a research tool for students more often than did mathematics teachers. The possible reason for this result could be that English courses tend to have more assignments which would allow for computer use such as writing assignments, journals, etc. The other disciplines would find computers useful mainly for research projects, but do not generally require as many writing type assignments. No significant differences were demonstrated in the way that teachers of different subjects integrate computers in middle and high schools for small group instruction, individual instruction, cooperative groups, as a reward, independent learning, to promote student centered learning, as a problem solving/decision making tool, as a productivity tool, as a classroom presentation tool, and as a communication tool.

Research Question Three

3. Are there any differences in teachers' use of computers as compared to students' use overall?

The results indicated that students used computers for drill and practice, games, and tutorials more than teachers. In addition, these students used computers for integrated learning systems and for programming/authoring tools more than did teachers. The possibility for this result could be the fact that students begin at home with computer games, and the computer has become the new toy of the 20th and 21st century. Further, the computer is the means of communication of youth today. Teachers tend to use computers more for email, research, lesson preparation, and handouts. Therefore, a computer to a teacher is more a work tool, where for students; it is entertainment, communication, and school appliance.

No significant differences were demonstrated between students and teachers use for word processors, spreadsheets, databases, desktop publishing programs, presentation software, web publishing programs, graphic programs, simulations, and web browsers.

Research Question Four

4. Are there any differences in each grade level of teachers' use of computers?

The results demonstrated that elementary school teachers used technology to give computer assignments more often than did middle and high school teachers. They also used technology for small group instruction, individual instruction, cooperative instruction, independent learning, tutoring, student centered learning, and as a reward more often than did high school teachers.

Research Question Five

5. Are there any differences in middle and high school teachers' use of computers in different subject areas?

The results demonstrated that no differences existed in middle and high school teachers' use of computers in different subjects. The reason may be due to the fact that both these level teachers would have the same required need for a computer. Both middle school and high schools have essentially the same set up, just different level of material to teach. In addition, out of 431 subjects, the study only had 37 middle school teachers which may limit the statistical power due to low participation.

Research Question Six

6. Are teachers who report a high use of computers for personal use more likely to integrate technology at school?

There was a significant positive correlation among the teachers who use computers for personal use and integrate technology at school. Therefore, it can be concluded that teachers use computers consistently whether during their work or home.

Research Question Seven

7. Are teachers who report a high use of computers for personal use more likely to get technical and general school support?

There was no significant difference between using computers for personal use at a high level and getting technical school support. Again, there was no significant difference between using computers for personal use at a high level and getting general school support.

Research Question Eight

8. What are the teachers' attitudes towards computer use?

The frequency table revealed that the majority of the teachers would like every student in their classroom to have access to a computer and they think that computer skills are essential to their students. This is parallel to the National Technology Goals of U.S. Department of Education which states that "All teachers and students will have modern computers in their classrooms." Nearly three-quarters of the teachers reported that they do not feel tense when people start talking about computers. However, nearly half of them feel pressure from others to ingrate the

computer more into their classrooms. Yildirim's study (2000) reveals the factors that contribute to teachers' computer use are teachers' attitudes such as anxiety, confidence, and liking which are significantly improved after their computer literacy course.

The majority of these teachers would like their students to be able to use the computer more. Most report they do not think computers are dehumanizing and they do not avoid the computers whenever possible.

Again, the majority of the teachers do not think that computer instruction is just another fad. Most teachers reported that the use of computers should be confined to computer courses. Nearly half of the teachers are neutral when it comes to use computers to solve complex problems. However, Farynaiarz and Lockwood's study (1992) show that the experimental group of students showed a highly significant improvement in problem-solving skills.

Over half reported that more training would increase their use of computers in the classroom. That is also one of the national goals of the U.S. Department of Education, stating that "All teachers will have the training and support they need to help all students learn through computers and through the information superhighway." In addition, Lam (2000) found in his research that the teachers expressed a lack of knowledge about how to teach through computers. One teacher in his study expressed the necessity of learning pedagogy of teaching using computers. These teachers' comments show that there is still a traditional teacher-centered approach in their classrooms.

The majority of the teachers do not think that computers diminish their role as a teacher, and they think that computers should be incorporated into the classroom curriculum. More than half of the teachers believe that computers make their job easier. More than a third of the teachers strongly disagreed or disagreed that computers further the gap between students along socio-economic lines. In fact, Mann et al. (1999) study find out that West Virginia's technology program increased socio-economic and gender equity, and it was a highly successful one in equalizing opportunity for low income and rural students especially for students without computers at home. Again, the majority of the teachers think that computer skills will help them as a professional while nearly half of the teachers agreed that learning computers makes high demands on their professional time. The research project sponsored by the Office of Educational Research and Improvement, U.S. Department of Education, (1992-93 and 1993-94) summarized the effects of technology on teacher professionalization as increased collaboration among teachers within the school, increased interaction with external collaborators and resources, and professional growth.

Nearly half of the teachers agree that computers change their role as a teacher and they think that they can help others solve computer problems. Finally, the majority of the teachers think that computers enhance classroom instruction. The literature review shows that computer assisted instruction increases students' positive attitudes toward the computer while computers in classrooms motivate students and help them maintain high interest (Kosakowski, 2000; Hatfield, 1996; Yildirim, 2000).

Research Question Nine

9. How do teachers describe their preparation for computer use?

Nearly half of the teachers did not acquire computer skills as part of their undergraduate/graduate coursework. Many acquired their computer skills through inservice courses/workshops.

The majority of these teachers acquired computer skills through independent learning (e.g., online tutorials or books) while nearly half of them reported that they have acquired computer skills through interaction with other faculty/staff. Most of them disagree that they have acquired computer skills through their distance learning courses.

The majority of these teachers do not think that introductory computer skills would be beneficial to them, but half of them think that specific applications such as spreadsheet or desktop publishing would be beneficial to them. In addition, many reported that specialized training on integrating the computer into the classroom would be beneficial to them. Moursund's research (year is not available) showed that the lack of adequately trained teachers was seen as the most widespread problem in the integration of computers in the classroom. The researcher also found that "without knowledgeable and supportive teachers, the placement of computers in schools will be disappointing and will result in failure" (as cited in O'Donnell, 1996, p. 5).

Research Question Ten

10. What is the relationship between teachers' level of confidence and comfort using computers and level of computer integration into the classroom?

There was a significant positive correlation between teachers' level of confidence and comfort using computers and level of computer integration into the classroom. In his study as part of the Minnesota Educational Computing Consortium (MECC), Klassen found that teacher training and attitudes toward computing are critical in determining teacher involvement in instructional computing. In a similar study, Holmes indicates, "teacher acceptance and support are crucial to the implementation of computers and that without teacher support innovations will not be accepted by teachers" (as cited in O'Donnell, 1996, p.11).

Research Question Eleven

11. Are there any differences in integrating computers between teachers who are mentoring interns and teachers who are not?

There was no significant difference between teachers who are mentoring interns and those who are not.

In this study, it can be concluded that elementary school teachers use technology more often than other level teachers. In the original study done by Barron, et al. (2003), they also found that elementary school teachers were twice as likely to use computers as a problem-solving tool or communication tool than high school teachers. Becker, Ravitz, and Wong (1999) also found that elementary teachers are more apt to use computers on a regular basis with their students.

According to Barron et al. (2003), elementary teachers generally have more flexibility in their schedules to integrate innovative approaches.

In the original study, science teachers were three times as likely as math teachers and twice as likely as English teachers to integrate computers as a research tool. English teachers in the original study did not exhibit the largest frequencies in any of the four areas that focused on technology integration and use in the classroom. Their findings were supported by the Chicago study done by Hart et al. in 2002, which reports that mathematics teachers using technology at a rate higher than the system average, and English teachers are less than the system average (as cited in Barron, 2003). However, Becker et al. (1999) found that the English teachers had their students use computer frequently. This study, like the original one, is designed to address the use of technology as a classroom tool for research, communication, productivity, and problem-solving as outlined by the National Technology Standards for students (2000). However, no significant differences were demonstrated in the way that teachers of different subjects or different grade levels integrate computers in the classroom in any of these four areas. The only significant difference was found with English teachers who used technology more often than mathematics teachers as a research tool.

The discrepancies among these studies could be related to the time interval between the studies and to the different structure of the surveys.

In addition to above finding, in this study, it was found that students use technology more often than the teachers. This was interesting due to low income of these students. According to Mann (2002), West Virginia was 40th among the

American states by per capita income and 33rd in student achievement in 1991. He states that children from low-income families have low achievement. In 1999, West Virginia's per capita income had not changed, but its pupil performance had moved 22 places up the list to 11th. Mann explains the progress by the study supported by the Milken Family Foundation as the statewide press to include technology in instruction represented by the "Basic Skills/Computer Education" program.

Implications for Educators

This study revealed that middle and high school teachers could integrate technology into their teaching more. Other subject areas – social studies, science and mathematics need to corporate technology into their classrooms more often than their current use. The study also showed that students use technology more often than their teachers. Teachers need to engage with technology more outside or inside their classrooms to become comfortable. The study also supported this notion because there was a positive correlation among the teachers who use computers for personal use and integrate technology at school. Teachers in this study would like every student in their classroom to have access to a computer. This sends a message to administrators whose classrooms are equipped with old computers or lack computers at all. More than half of these teachers agreed that more training would increase their use of computers in the classrooms. Although they believe that learning computers makes high demands on their professional time, they would like to get training on specific applications such as spreadsheet or desktop publishing. They believe that specialized training on integrating the computer into the classroom would be beneficial to them. The study also revealed that most of the teachers

acquired their computer skills through inservice courses and workshops and through interaction with other faculty/staff. This emphasizes the importance of technology training given to the teachers provided by school administration. The Benedum Collaborative may use this study to design training sessions for their interns and WVU PDS teachers. These training programs help teachers stay current with the latest technology and increase their level of confidence and comfort using computers. These teachers already believe that computers enhance their classroom instruction, but they ask for more technology training for their professional growth.

While talking to some participants, it became certain that they feel the standards such as NETS bring too much confusion and frustration to them. They wish these standards were clearer and simpler. The policy makers could investigate more about the needs of these teachers rather than solely demanding the execution of these standards.

Limitations

Limitations and caveats in this study need to be noted. First, the response rate was small, which may limit the generalizability of the findings. Second, the study included teachers and interns from only Professional Development Schools. This schools offered inservice technology training and support for their teachers and interns through the Benedum Collaborative and a PT3 grant funded by Department of Education (between 2000 -2003). Surveys of teachers and interns in other districts with different levels of access to technology or various levels of technical support might produce different results. In addition, the researcher did not have the resources to make direct observations and ratings of teachers' and interns' technology

integration in WVU PDS. She used a self-report measure of integration. To encourage honest responses, the survey instrument was administered anonymously, and the participants were encouraged to be open and honest by the researcher who administered it. However, still reliance on self-report may lower the validity of the results.

Recommendations for Further Research

For future research, the study can be extended to other populations such as teachers in other states. Another set of modified questions can be given to the students in these PDF schools to get a profile their technology use. In the future, the interns and teachers can be analyzed as two different subject groups in order to compare pre-service teachers' technology use to teachers' use. Further, as a qualitative study, some of these WVU PDS teachers can be interviewed to investigate the issues more in detail, such as how English teachers use the computers in their classrooms to understand why others do not. This study concluded that teachers want to use technology in their classrooms. However, their needs and problems can be investigated more in detail through one-to-one interviews or classroom observations. The study showed that classrooms have computers. Observations will help to understand whether these computers are usable or not.

In conclusion, this study found that technology is being used and integrated in Professional Development Schools in West Virginia slowly, but gradually. This survey of teachers can provide data to help answer key questions such as whether technology is integrated into the teaching/leaning environment. To keep up with the standards, school principles may benefit from this study to decide how to improve their

implementation programs. The study pointed that elementary and English teachers integrate technology more often than other teachers. The reasons for their high level of integration can guide and motivate other teachers to integrate technology more into their teaching. Also, students use technology more than did their teachers. In technology, tomorrow is today. Teachers should have more responsibility to close the growing "technology gap" between educational practice and other arenas of society. To prepare these youngsters for "the real world," teachers must also engage it.

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Appendices

Appendix A: The Instrument

(adapted from the original study done by the University of Florida)

WestVirginiaUniversity
College of Human Resources and Education

The goal of my research is to investigate the use of computers as a tool in classrooms. The information gathered will be used to meet doctoral dissertation requirements and to help clarify the role that computers play now can lead to improved use of computers as an instructional tool. I hope that this survey will also help you to review your technology integration efforts into your teaching.

I want to point out several things to you before you start:

1. Your participation is entirely voluntary and you do not have to respond to every item or question;
2. Your responses will remain anonymous and confidentiality will be maintained;
3. Neither your academic or employment status will be affected by refusing to participate or by withdrawing from the study.
4. If you have any questions about this study, please contact me at skarayegen@hotmail.com or (304) 598 83 79.

Thank you for agreeing to participate in this study.

Sabah Karayegen-Giraldo

02/16/2004

Department of Advanced Educational Studies
Educational Leadership Studies, Educational Psychology,
Social and Cultural Foundations, Technology Education

Allen Hall
PO Box 6122
Morgantown, WV 26506-6122

Phone: 304-293-3049
Fax: 304-293-2279

WestVirginiaUniversity
College of Human Resources and Education

The goal of my research is to investigate the use of computers as a tool in classrooms. The information gathered will be used to meet doctoral dissertation requirements and to help clarify the role that computers play now can lead to improved use of computers as an instructional tool. I hope that this survey will help you to see where your school is in technology integration and help your school to provide you more assistance in your integration effort.

I want to point out several things to you before you start:

1. Your participation is entirely voluntary and you do not have to respond to every item or question;
2. Your responses will remain anonymous and confidentiality will be maintained;
3. Neither your academic or employment status will be affected by refusing to participate or by withdrawing from the study.
4. At the end of completing the survey, if you want to win a chance for a class website (that will be entirely designed for you by the researcher), please go to www.juangiraldo.com/survey.html . Enter your name. Please keep in mind that this survey and your name in the website are independent from each other.
5. If you have any questions about this study, please contact me at skarayegen@hotmail.com or (304) 598 83 79.

A **SELF-ADDRESSED** and **STAMPED** envelope is attached to this survey for your convenience. Please return the survey by March 31, 2004.

Thank you for agreeing to participate in this study.

Sabah Karayegen-Giraldo

03/09/2004

Department of Advanced Educational Studies
Educational Leadership Studies, Educational Psychology, Social and Cultural Foundations, Technology Education

Allen Hall
PO Box 6122
Morgantown, WV 26506-6122

Phone: 304-293-3049
Fax: 304-293-2279

INTERNS

PERCEPTIONS of COMPUTERS & TECHNOLOGY

WEST VIRGINIA UNIVERSITY
COLLEGE OF HUMAN RESOURCES AND EDUCATION

Purpose: This survey is designed to gain a better understanding of how educators use technology in the classroom and their level of experience with computers. The survey includes sections addressing level of confidence, skill, support, and uses of computers and technology in teaching. Responses will be kept strictly confidential and individual responses will not be identified or reported.

Thank you for your time and interest.

Please tell us about yourself:

Name of your host PDS: _____.

Gender: Male_____ Female_____

Race/Ethnicity:

___ Native American /American Indian
___ African American
___ White/ non-Hispanic
___ Asian/Pacific islander
___ Hispanic
___ Other, please specify _____.

What subject area(s) did you teach during your internship? (Check all that apply)

____ English
____ Math
____ Physical Education
____ Science
____ Social Studies
____ Art / Music
____ Media / Technology specialist
____ Special Education
____ Vocational Education
____ Reading
____ Other, please specify _____.

What grade level(s) did you teach during your internship: _____
Average number of students in your PDS classroom: _____
Number of computers in your classroom used for instruction: _____
Did you have access to a computer lab at school where you had your internship? _____Yes _____No
If yes, how many hours each week did your students use the lab? _____
How many years have you been using computers? _____.

TEACHERS

PERCEPTIONS of COMPUTERS & TECHNOLOGY

WEST VIRGINIA UNIVERSITY
COLLEGE OF HUMAN RESOURCES AND EDUCATION

Purpose: This survey is designed to gain a better understanding of how educators use technology in the classroom and their level of experience with computers. The survey includes sections addressing level of confidence, skill, support, and uses of computers and technology in teaching. Responses will be kept strictly confidential and individual responses will not be identified or reported.

Thank you for your time and interest.

Please tell us about yourself:

Name of your school: _____.

Gender: Male_____ Female_____

Race/Ethnicity:

___ Native American /American Indian
___ African American
___ White/ non-Hispanic
___ Asian/Pacific islander
___ Hispanic
___ Other, please specify _____.

Highest degree earned:

___ Bachelors
___ Specialist (Ed.S)
___ Other, please specify _____.
___ Masters
___ Doctorate

What subject area(s) do you teach? (Check all that apply)

____ English
____ Math
____ Physical Education
____ Science
____ Social Studies
____ Other, please specify _____.
____ Art / Music
____ Media / Technology specialist
____ Special Education
____ Vocational Education
____ Reading

Total teaching experience in years: _____
What grade level(s) do you currently teach: _____
Average number of students per class: _____
Number of computers in your classroom used for instruction: _____
How many years have you been using computers in your classroom for instruction? _____.
Do you have access to a computer lab? _____Yes _____No
If yes, how many hours each week do your students use the lab? _____.
Have you mentored any WVU interns during the past two years? _____.

TEACHER PREPARATION FOR COMPUTER USE

Directions: For the following items please circle the one response that best reflects the extent to which you've acquired computer skills from the following sources.

1= not at all
2= to a small extent
3= to a moderate extent
4= to a great extent
5= entirely

As part of your undergraduate/graduate coursework	1	2	3	4	5
Inservice courses / workshops	1	2	3	4	5
Independent learning (e.g., online tutorials or books)	1	2	3	4	5
Interaction with other faculty / staff	1	2	3	4	5
Distance Learning courses	1	2	3	4	5
To what extent do you think the following types of computer education would be beneficial to you?					
Introductory computer skills	1	2	3	4	5
Specific applications (e.g., spreadsheet, desktop publishing)	1	2	3	4	5
Specialized training on integrating the computer into the classroom	1	2	3	4	5

CONFIDENCE AND COMFORT USING COMPUTERS

Directions: Please read the following statements and circle the one response that best reflects your level of agreement.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

I have had adequate training in using computers.	1	2	3	4	5
I use computers effectively in my classroom.	1	2	3	4	5
I am comfortable giving computer assignments to my students.	1	2	3	4	5
The computer enhances my teaching.	1	2	3	4	5
I am comfortable using computers during classroom instruction.	1	2	3	4	5
My use of computer technology enhances student performance.	1	2	3	4	5
Incorporating multi-media into lessons enhances teaching.	1	2	3	4	5
I am comfortable with computer terminology.	1	2	3	4	5
I am developing expertise in the uses of technology in the classroom.	1	2	3	4	5

GENERAL SCHOOL SUPPORT

Directions: Please read the following items and circle the one response that best represents your level of agreement.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

I have adequate time to learn computer skills.	1	2	3	4	5
I have sufficient access to computers at my school.	1	2	3	4	5
I receive a sufficient level of computer related support at my school.	1	2	3	4	5
Faculty members encourage the use of computers.	1	2	3	4	5
The administration supports computer-related training.	1	2	3	4	5
The administration actively encourages the use of computers in the classroom.	1	2	3	4	5
The administration actively encourages the use of computers outside the classroom.	1	2	3	4	5

TYPES OF SOFTWARE USED TO COMPLETE SCHOOL RELATED ACTIVITIES

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Directions: For each type of software please circle your response to indicate how often you use the software (on the left) and how often your students use the software (on the right) to complete school related activities. If you feel an item does not apply then circle (NA).

1=not at all
2=once a month or less
3= once a week
4= several times a week
5= every day

My Use						My Students' Use					
0	1-2	3-4	5-6	7+	Word processors (e.g., AppleWorks, MS Word)	1	2	3	4	5	NA
1	2	3	4	5	Spreadsheets (e.g., Excel, Lotus)	1	2	3	4	5	NA
1	2	3	4	5	Databases (e.g., FileMaker Pro, Access)	1	2	3	4	5	NA
1	2	3	4	5	Desktop publishing programs (e.g., PageMaker, Microsoft Publisher, Printshop)	1	2	3	4	5	NA
1	2	3	4	5	Presentation software (e.g., PowerPoint, AppleWorks)	1	2	3	4	5	NA
1	2	3	4	5	Web publishing programs (e.g., FrontPage, Dream Weaver)	1	2	3	4	5	NA
1	2	3	4	5	Graphics programs (e.g., Draw & paint programs, PhotoShop, FreeHand, Illustrator)	1	2	3	4	5	NA
1	2	3	4	5	Drill and practice	1	2	3	4	5	NA
1	2	3	4	5	Games	1	2	3	4	5	NA
1	2	3	4	5	Simulations	1	2	3	4	5	NA
1	2	3	4	5	Tutorials	1	2	3	4	5	NA
1	2	3	4	5	Integrated Learning Systems (e.g., Josten, CCC)	1	2	3	4	5	NA
1	2	3	4	5	Web browsers (e.g., Netscape Communicator, Internet Explorer)	1	2	3	4	5	NA
1	2	3	4	5	Programming / authoring tools (e.g., Authorware, Java, Visual Basic)	1	2	3	4	5	NA

INTEGRATION OF COMPUTERS INTO THE CLASSROOM

Directions: Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

Small group instruction	1	2	3	4	5	NA
Individual instruction	1	2	3	4	5	NA
Cooperative groups	1	2	3	4	5	NA
As a reward	1	2	3	4	5	NA
Independent learning	1	2	3	4	5	NA
To tutor	1	2	3	4	5	NA
To promote student centered learning	1	2	3	4	5	NA
As a research tool for students	1	2	3	4	5	NA
As a problem solving/decision making tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA
As a classroom presentation tool	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA

YOUR PERSONAL USE OF COMPUTERS

Directions: Please read each statement and circle the one response that best reflects the frequency of your computer use. If you feel an item does not apply then circle (NA).

1= not at all
2= once a month or less
3= once a week
4= several times a week
5= every day

For multimedia activities (e.g., CD-ROM, laserdiscs)	1	2	3	4	5	NA
As a communication tool (e.g., email, electronic discussion)	1	2	3	4	5	NA
For fun/entertainment related activities	1	2	3	4	5	NA
As a research tool	1	2	3	4	5	NA
As a productivity tool (to create charts, reports or other products)	1	2	3	4	5	NA

TECHNICAL SUPPORT

Does your school have an on-site computer support specialist?
Yes _____ No _____ Don't Know _____
If yes, how many computer support specialists does your school have? _____.
If no, then skip this section and move on to the next section.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

The on-site computer specialist adequately assists me in problem solving and trouble shooting.	1	2	3	4	5
The on-site computer specialist is dedicated to helping teachers.	1	2	3	4	5
I have adequate access to our on-site computer specialist.	1	2	3	4	5
I have to contact our specialist several times before I get assistance.	1	2	3	4	5
Our computer specialist shows me techniques to integrate computer technology into the classroom.	1	2	3	4	5

ATTITUDES TOWARDS COMPUTER USE

Directions: The following statements address general attitudes towards computer use. Please circle the one answer that best reflects your level of agreement.

1= strongly disagree
2= disagree
3= neutral
4= agree
5= strongly agree

I would like every student in my classes to have access to a computer.	1	2	3	4	5
Computer skills are essential to my students.	1	2	3	4	5
I feel tense when people start talking about computers.	1	2	3	4	5
I feel pressure from others to integrate the computer more into my classroom.	1	2	3	4	5
I would like my students to be able to use the computer more.	1	2	3	4	5
Computers are dehumanizing.	1	2	3	4	5
I avoid the computer whenever possible.	1	2	3	4	5
Computer instruction is just another fad.	1	2	3	4	5
The use of computers should be confined to computer courses.	1	2	3	4	5
I like using the computer to solve complex problems.	1	2	3	4	5
More training would increase my use of the computer in the classroom.	1	2	3	4	5
Computers diminish my role as a teacher.	1	2	3	4	5
Computers should be incorporated into the classroom curriculum.	1	2	3	4	5
Computers make my job easier.	1	2	3	4	5
Computers further the gap between students along socio-economic lines.	1	2	3	4	5
Computer skills will help me as a professional.	1	2	3	4	5
Learning computers makes high demands on my professional time.	1	2	3	4	5
Computers change my role as a teacher.	1	2	3	4	5
I can help others solve computer problems.	1	2	3	4	5
Computers enhance classroom instruction.	1	2	3	4	5

Appendix B: Demographic Data

Figure 24. Gender Percentages

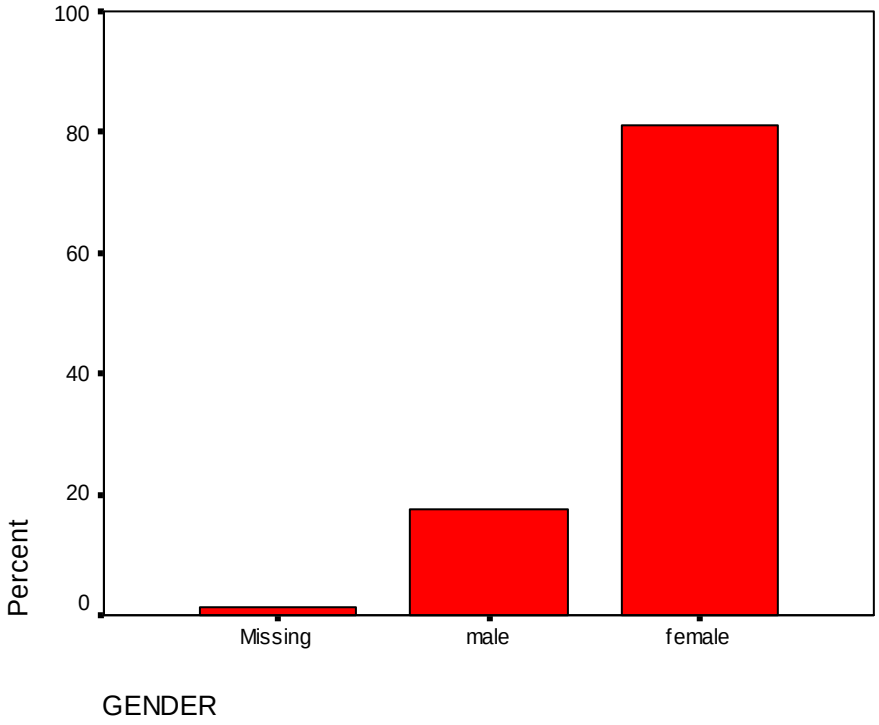


Figure 25. Ethnicity Percentages

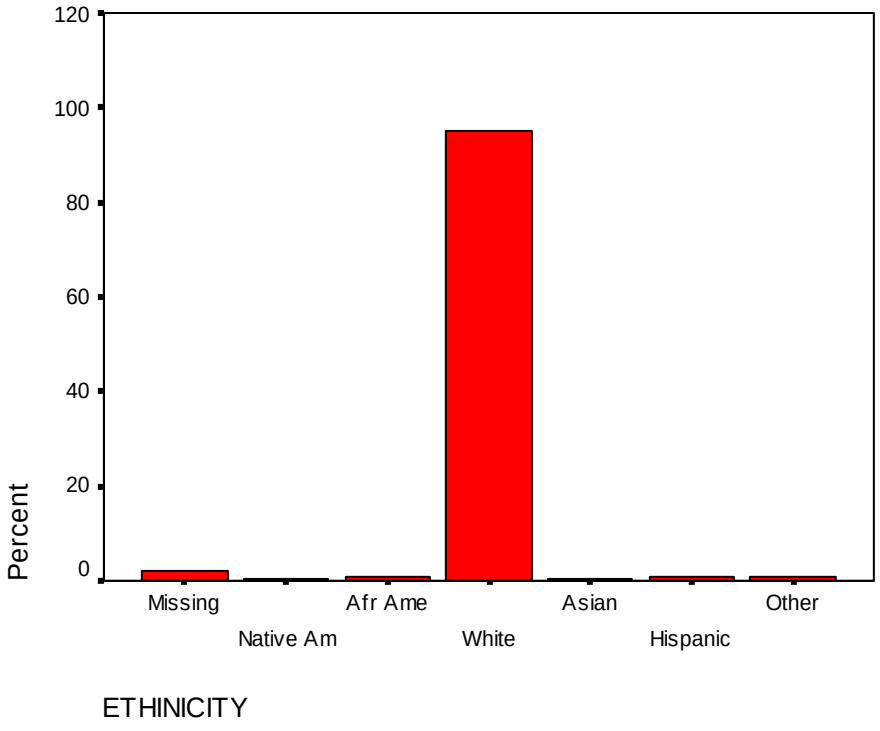
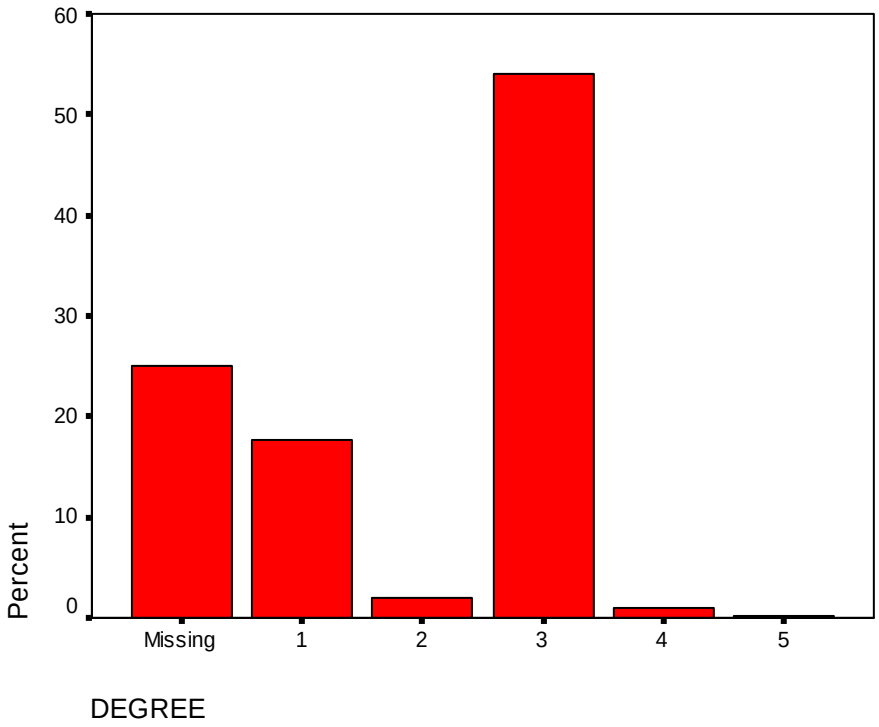
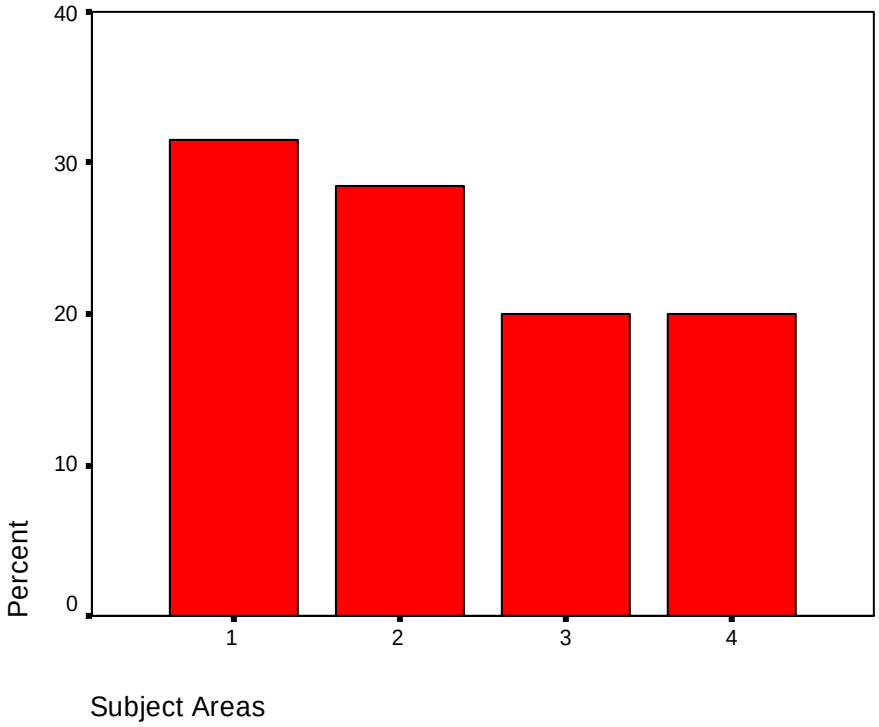


Figure 26. Highest Degree Earned Percentages



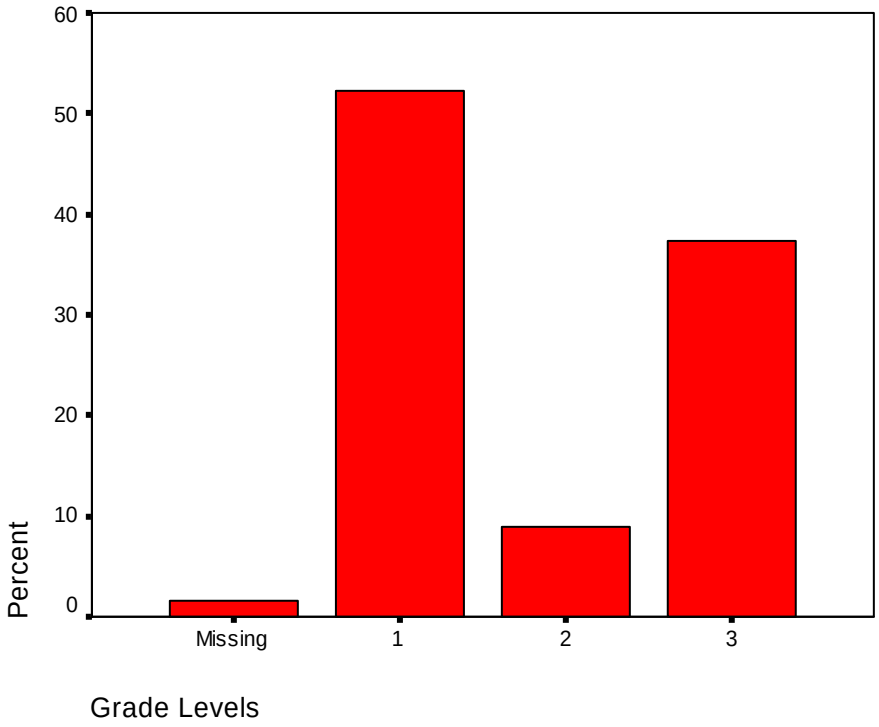
1 Bachelors
2 Specialists (ED.S)
3 Masters
4 Doctorate
5 Other

Figure 27. Percentages of Subject Areas



1 English
2 Math
3 Science
4 Social Studies

Figure 28. Percentages of Grade Levels



1 Elementary School
2 Middle School
3 High School

Appendix C: Curriculum and Content Area Standards

NETS for Teachers

(This document available at http://csnets.iste.org/)

I. **TECHNOLOGY OPERATIONS AND CONCEPTS.**

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students)
B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. **PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES.**

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
B. apply current research on teaching and learning with technology when planning learning environments and experiences.
C. identify and locate technology resources and evaluate them for accuracy and suitability.
D. plan for the management of technology resources within the context of learning activities.
E. plan strategies to manage student learning in a technology-enhanced environment.

III. **TEACHING, LEARNING, AND THE CURRICULUM**.

Teachers implement curriculum plans, that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.
B. use technology to support learner-centered strategies that address the diverse needs of students.
C. apply technology to develop students' higher order skills and creativity.
D. manage student learning activities in a technology-enhanced environment.

IV. **ASSESSMENT AND EVALUATION.**

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. **PRODUCTIVITY AND PROFESSIONAL PRACTICE.**
Teachers use technology to enhance their productivity and professional practice. Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.
B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C. apply technology to increase productivity.
D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. **SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES.**
Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:

A. model and teach legal and ethical practice related to technology use.
B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C. identify and use technology resources that affirm diversity
D. promote safe and healthy use of technology resources.
E. facilitate equitable access to technology resources for all students.

GENERAL PREPARATION

Upon completion of the general preparation component of their program, prospective teachers:

1. demonstrate a sound understanding of the nature an operation of technology systems. (I)*
2. demonstrate proficiency in the use of common input and output devices; solve routine hardware and software problems; and make informed choices about technology systems, resources, and services. (I)*
3. use technology tools and information resources to increase productivity, promote creativity, and facilitate academic learning. (I, III, IV, V)

4. use content-specific tools (e.g., software, simulation, environmental robes, graphing calculators, exploratory environments, Web tools) to support learning and research. (I, III, V)*
5. use technology resources to facilitate higher order and complex thinking skills, including problem solving, critical thinking, informed decision making, knowledge construction, and creativity. (I, III, V)*
6. collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works using productivity tools. (I, V)*
7. use technology to locate, evaluate, and collect information from a variety of sources. (I, IV, V)*
8. use technology tools to process data and report results. (I, III, IV, V)*
9. use technology in the development of strategies for solving problems in the real world. (I, III, V)*
10. observe and experience the use of technology in their major field of study. (III, V)
11. use technology tools and resources for managing and communicating information (e.g., finances, schedules, addresses, purchases, correspondence). (I, V)
12. evaluate and select new information resources and technological innovations based on their appropriateness to specific tasks. (I, III, IV, V)*
13. use a variety of media and formats, including telecommunications, to collaborate, publish, and interact with peers, experts, and other audiences. (I, V)*
14. demonstrate an understanding of the legal, ethical, cultural, and societal issues related to technology. (VI)*
15. exhibit positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity. (V, VI)*
16. discuss diversity issues related to electronic media. (I, VI)
17. discuss the health and safety issues related to technology use. (VI)

* Adapted from the ISTE National Educational Technology Standards for Students.

PROFESSIONAL PREPARATION

Prior to the culminating student teaching or internship experience, prospective teachers:

1. identify the benefits of technology to maximize student learning and facilitate higher order thinking skills. (I, III)

2. differentiate between appropriate and inappropriate uses of technology for teaching and learning while using electronic resources to design and implement learning activities. (II, III, V, VI)
3. identify technology resources available in schools and analyze how accessibility to those resources affects planning for instruction. (I, II)
4. identify, select, and use hardware and software technology resources specially designed for use by PK-12 students to meet specific teaching and learning objectives. (I, II)
5. plan for the management of electronic instructional resources within a lesson design by identifying potential problems and planning for solutions. (II)
6. identify specific technology applications and resources that maximize student learning, address learner needs, and affirm diversity. (III, VI)
7. design and teach technology-enriched learning activities that connect content standards with student technology standards and meet the diverse needs of students. (II, III, IV, VI)
8. design and peer teach a lesson that meets content area standards and reflects the current best practices in teaching and learning with technology. (II, III)
9. plan and teach student-centered learning activities and lessons in which students apply technology tools and resources. (II, III)
10. research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information resources to be used by students. (II, IV, V, VI)
11. discuss technology-based assessment and evaluation strategies. (IV)
12. examine multiple strategies for evaluating technology-based student products and the processes used to create those products. (IV)
13. examine technology tools used to collect, analyze, interpret, represent, and communicate student performance data.(I, IV)
14. integrate technology-based assessment strategies and tools into plans for evaluating specific learning activities. (IV)
15. develop a portfolio of technology-based products from coursework, including the related assessment tools. (IV, V)
16. identify and engage in technology-based opportunities for professional education and lifelong learning, including the use of distance education. (V)
17. apply online and other technology resources to support problem solving and related decision making for maximizing student learning. (III, V)
18. participate in online professional collaborations with peers and experts. (III, V)
19. use technology productivity tools to complete required professional tasks. (V)
20. identify technology-related legal and ethical issues, including copyright, privacy, and security of technology systems, data, and information. (VI)
21. examine acceptable use policies for the use of technology in schools, including strategies for addressing threats to security of technology systems, data, and information. (VI)
22. identify issues related to equitable access to technology in school, community, and home environments. (VI)
23. identify safety and health issues related to technology use in schools. (VI)

24. identify and use assistive technologies to meet the special physical needs of students. (VI)

STUDENT TEACHING / INTERNSHIP

Upon completion of the culminating student teaching or internship experience, and at the point of initial licensure, teachers:

1. apply troubleshooting strategies for solving routine hardware and software problems that occur in the classroom. (I)
2. identify, evaluate, and select specific technology resources available at the school site and district level to support a coherent lesson sequence. (II, III)
3. design, manage, and facilitate learning experiences using technology that affirm diversity and provide equitable access to resources. (II, VI)
4. create and implement a well-organized plan to manage available technology resources, provide equitable access for all students, and enhance learning outcomes. (II, III)
5. design and facilitate learning experiences that use assistive technologies to meet the special physical needs of students. (II, III)
6. design and teach a coherent sequence of learning activities that integrates appropriate use of technology resources to enhance student academic achievement and technology proficiency by connecting district, state, and national curriculum standards with student technology standards (as defined in the ISTE National Educational Technology Standards for Students). (II, III)
7. design, implement, and assess learner-centered lessons that are based on the current best practices on teaching and learning with technology and that engage, motivate, and encourage self-directed student learning. (II, III, IV, V)
8. guide collaborative learning activities in which students use technology resources to solve authentic problems in the subject area(s). (III)
9. develop and use criteria for ongoing assessment of technology-based student products and the processes used to create those products. (IV)
10. design an evaluation plan that applies multiple measures and flexible assessment strategies to determine students' technology proficiency and content area learning. (IV)
11. use multiple measures to analyze instructional practices that employ technology to improve planning, instruction, and management. (II, III, IV)
12. apply technology productivity tools and resources to collect, analyze, and interpret data and to report results to parents and students. (III, IV)
13. select and apply suitable productivity tools to complete educational and professional tasks. (II, III, V)
14. model safe and responsible use of technology and develop classroom procedures to implement school and district technology acceptable use policies and data security plans. (V, VI)

15. participate in online professional collaboration with peers and experts as part of a personally designed plan, based on self-assessment, for professional growth in technology. (V)

FIRST-YEAR TEACHING

Upon completion of the first year of teaching, teachers:

1. assess the availability of technology resources at the school site, plan activities that integrate available resources, and develop a method for obtaining the additional necessary software and hardware to support the specific learning needs of students in the classroom. (I, II, IV)
2. make appropriate choices about technology systems, resources, and services that are aligned with district and state standards. (I, II)
3. arrange equitable access to appropriate technology resources that enable students to engage successfully in learning activities across subject/content areas and grade levels. (II, III, VI)
4. engage in ongoing planning of lesson sequences that effectively integrate technology resources and are consistent with current best practices for integrating the learning of subject matter and student technology standards (as defined in the ISTE National Educational Technology Standards for Students). (II, III)
5. plan and implement technology-based learning activities that promote student engagement in analysis, synthesis, interpretation, and creation of original products. (II, III)
6. plan for, implement, and evaluate the management of student use of technology resources as part of classroom operations and in specialized instructional situations. (I, II, III, IV)
7. implement a variety of instructional technology strategies and grouping strategies (e.g., whole group, collaborative, individualized, and learner centered) that include appropriate embedded assessment for meeting the diverse needs of learners. (III, IV)
8. facilitate student access to school and community resources that provide technological and discipline-specific expertise. (III)
9. teach students methods and strategies to assess the validity and reliability of information gathered through technological means. (II, IV)
10. recognize students' talents in the use of technology and provide them with opportunities to share their expertise with their teachers, peers, and others. (II, III, V)
11. guide students in applying self — and peer-assessment tools to critique student-created technology products and the process used to create those products. (IV)

12. facilitate students' use of technology that addresses their social needs and cultural identity and promotes their interaction with the global community. (III, VI)
13. use results from assessment measures (e.g., learner profiles, computer-based testing, electronic portfolios) to improve instructional planning, management, and implementation of learning strategies. (II, IV)
14. use technology tools to collect, analyze, interpret, represent, and communicate data (student performance and other information) for the purposes of instructional planning and school improvement. (IV)
15. use technology resources to facilitate communications with parents or guardians of students. (V)
16. identify capabilities and limitations of current and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (I, IV, V)
17. participate in technology-based collaboration as part of continual and comprehensive professional growth to stay abreast of new and emerging technology resources that support enhanced learning for PK-12 students. (V)
18. demonstrate and advocate for legal and ethical behaviors among students, colleagues, and community members regarding the use of technology and information. (V, VI)
19. enforce classroom procedures that guide students' safe and healthy use of technology and that comply with legal and professional responsibilities for students needing assistive technologies. (VI)
20. advocate for equal access to technology for all students in their schools, communities, and homes. (VI)
21. implement procedures consistent with district and school policies that protect the privacy and security of student data and information. (VI)

Appendix D: **Enhancing Education through Technology Act of 2001.**

(http://www.ed.gov/policy/elsec/leg/esea02/pg34.html)

Part D — Enhancing Education Through Technology

SEC. 2401. SHORT TITLE.

This part may be cited as the 'Enhancing Education Through Technology Act of 2001'.

SEC. 2402. PURPOSES AND GOALS.

(a) PURPOSES- The purposes of this part are the following:

(1) To provide assistance to States and localities for the implementation and support of a comprehensive system that effectively uses technology in elementary schools and secondary schools to improve student academic achievement.

(2) To encourage the establishment or expansion of initiatives, including initiatives involving public-private partnerships, designed to increase access to technology, particularly in schools
served by high-need local educational agencies.

(3) To assist States and localities in the acquisition, development, interconnection, implementation, improvement, and maintenance of an effective educational technology infrastructure in a manner that expands access to technology for students (particularly for disadvantaged students) and teachers.

(4) To promote initiatives that provide school teachers, principals, and administrators with the capacity to integrate technology effectively into curricula and instruction that are aligned with challenging State academic content and student academic achievement standards, through such means as high-quality professional development programs.

(5) To enhance the ongoing professional development of teachers, principals, and administrators by providing constant access to training and updated research in teaching and learning through electronic means.

(6) To support the development and utilization of electronic networks and other innovative methods, such as distance learning, of delivering specialized or rigorous academic courses and curricula for students in areas that would not otherwise have access to such courses and curricula, particularly in geographically isolated regions.

(7) To support the rigorous evaluation of programs funded under this part, particularly regarding the impact of such programs on student academic achievement, and ensure that timely information on the results of such evaluations is widely accessible through electronic means.

(8) To support local efforts using technology to promote parent and family involvement in education and communication among students, parents, teachers, principals, and administrators.

(b) GOALS-

(1) PRIMARY GOAL- The primary goal of this part is to improve student academic achievement through the use of technology in elementary schools and secondary schools.

(2) ADDITIONAL GOALS- The additional goals of this part are the following:

(A) To assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability.

(B) To encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices by State educational agencies and local educational agencies.

SEC. 2403. DEFINITIONS.

In this part:

(1) ELIGIBLE LOCAL ENTITY- The term eligible local entity' means —

(A) a high-need local educational agency; or

(B) an eligible local partnership.

(2) ELIGIBLE LOCAL PARTNERSHIP- The term eligible local partnership' means a partnership that —

(A) shall include at least one high-need local educational agency and at least one —

(i) local educational agency that can demonstrate that teachers in schools served by the agency are effectively integrating technology and proven teaching practices into instruction, based on a review of relevant research, and that the integration results in improvement in —

(I) classroom instruction in the core academic subjects; and

(II) the preparation of students to meet challenging State academic content and student academic achievement standards;

(ii) institution of higher education that is in full compliance with the reporting requirements of section 207(f) of the Higher Education Act of 1965 and that has not been identified by its State as low-performing under section 208 of such Act;

(iii) for-profit business or organization that develops, designs, manufactures, or produces technology products or services, or has substantial expertise in the application of technology in instruction; or

(iv) public or private nonprofit organization with demonstrated experience in the application of educational technology to instruction; and

(B) may include other local educational agencies, educational service agencies, libraries, or other educational entities appropriate to provide local programs.

(3) HIGH-NEED LOCAL EDUCATIONAL AGENCY- The term high-need local educational agency' means a local educational agency that —

(A) is among the local educational agencies in a State with the highest numbers or percentages of children from families with incomes below the poverty line; and

(B)(i) operates one or more schools identified under section 1116; or

(ii) has a substantial need for assistance in acquiring and using technology.

SEC. 2404. AUTHORIZATION OF APPROPRIATIONS.

(a) IN GENERAL- There are authorized to be appropriated to carry out subparts 1 and 2, $1,000,000,000 for fiscal year 2002, and such sums as may be necessary for each of the 5 succeeding fiscal years.

(b) ALLOCATION OF FUNDS BETWEEN STATE AND LOCAL AND NATIONAL INITIATIVES- The amount of funds made available under subsection (a) for a fiscal year shall be allocated so that —

(1) not less than 98 percent is made available to carry out subpart 1; and

(2) not more than 2 percent is made available to carry out subpart 2.

(c) ALLOCATION OF FUNDS FOR STUDY- Of the total amount of funds allocated under subsection (b)(2) for fiscal years 2002 through 2007, not more than $15,000,000 may be used to carry out section 2421(a).

(d) LIMITATION- Of the amount of funds made available to a recipient of funds under this part for a fiscal year, not more than 5 percent may be used by the recipient for administrative costs or technical assistance, of which not more than 60 percent may be used by the recipient for administrative costs.

Appendix E: Use of NETS by State.

(http://cnets.iste.org/docs/States_using_NETS.pdf)

Use of NETS by State

National Educational Technology Standards (NETS) and the States

The *NETS for Students* were released in June 1998, *NETS for Teachers* in June 2000, and *NETS for Administrators (TSSA)* in November 2001. At the state level, 48 of the 51 states have adopted, adapted, aligned with, or otherwise referenced at least one set of standards in their state technology plans, certification, licensure, curriculum plans, assessment plans, or other official state documents. States that have adopted, adapted, aligned with, or referenced the NETS in state department of education documents are listed below. *Updated: June 17, 2003*

STU	TCH	ADM	(A=adopted, adapted, or aligned with; R=referenced)	STATE	STU	TCH	ADM	(A=adopted, adapted, or aligned with; R=referenced)	STATE
A	A	A		Alabama	A	A	A		Missouri
R	R	R		Alaska	A	A	A		Nebraska
A	A	A		Arizona		A			Nevada
A	A	A		Arkansas	R	A	A		New Hampshire
		R		California	A	A	A		New Jersey
A	A			Colorado		A			New Mexico
A	A	A		Connecticut	A	A	A		New York
A	A	A		Delaware	A		A		North Dakota
	A			District of Columbia	A		A		Ohio
A	A			Florida	A				Oklahoma
	A	A		Georgia	A		A		Oregon
A				Hawaii			A		Pennsylvania
	A			Idaho	A				Rhode Island
A	A	A		Illinois	A	A			South Carolina
	R	R		Indiana		A	A		South Dakota
A	A	A		Kansas		A	R		Tennessee
A	A	A		Kentucky	R	A	R		Texas
A	A	A		Louisiana	A				Utah
		R		Maine	A	A	A		Vermont
R	A	A		Maryland	A	R	R		Virginia
A	A			Massachusetts	A	A	A		Washington
A	A	A		Michigan	A	A	A		West Virginia
A	A	A		Minnesota	A		A		Wisconsin
A	A	A		Mississippi			A		Wyoming