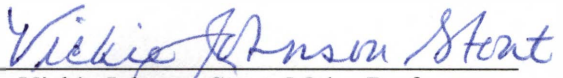
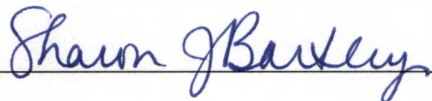


To the Graduate Council:

I am submitting herewith a thesis written by Jennifer L. Lembright entitled "Comparisons of the Technology Use of Secondary Teachers." I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Human Resource Development.

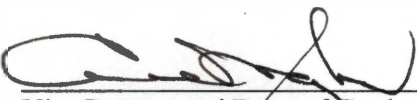

Vickie Johnson Stout, Major Professor

We have read this thesis
and recommend its acceptance:





Accepted for the Council:


Vice Provost and Dean of Graduate Studies

Comparisons of the Technology Use of Secondary Teachers

**A Thesis Presented for the
Master of Science Degree,
The University of Tennessee, Knoxville**

**Jennifer L. Lembright
August 2002**

Thesis
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ABSTRACT

The purpose of this study was to determine and compare the levels of technology use among teachers based on *(a) teacher years of experience, (b) teacher knowledge of computers, and (c) teacher department affiliation*. The respondents included all of the teachers at Bearden High School (Knoxville, Tennessee) during the spring semester of 2002.

Each respondent reported his or her level of technology use using the survey instrument developed by the researcher. The results were then compared on the basis of the above-mentioned independent variables using the Spearman rho and Tukey's statistical tests. Finally, conclusions and implications were presented to understand the factors involved in and thereby increase the amount of technology use in secondary schools.

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CHAPTER I

Introduction

Since the early 1900s a succession of new technologies and methodologies have entered the classroom, and computers have become a common feature within the school landscape. Propelled by government initiatives, K-12 schools throughout the United States of America spent an estimated 6.9 billion in 1999 on technology, such as desktop computers, servers, routers, wiring, Internet access, software and everything else needed to equip our educational institutions for the present multimedia age (Kleiman, 2001).

As students prepare to enter this rapidly changing world of modern industry, the use of technology is expected to bridge an ever-widening gap between schools and society. Yet, as the number of innovative technologies and supportive research increases, computers remain an underutilized tool in the average American classroom. From inadequate teacher training to the inability to integrate software into the current curriculum design, computers are often not being used in ways that significantly enhance teaching and learning.

Inadequate teacher preparation can, and often does, directly affect student preparation. Studies reveal that only a small percentage of today's graduating seniors possess the technology skills needed to qualify for the majority of jobs in the current labor market. Consequently, school systems face the dilemma of training teachers to integrate effectively technology into classroom learning environments in order to

better prepare students. In order for technology to serve as a tool for improving, and ultimately, transforming teaching and learning, such tools must be integral components of the school's overall plan as well as the teacher's individual educational goals.

While considerable research has been conducted on how technology affects student learning, very little research exists on how technology affects teachers. As the "gatekeepers of innovation", teachers must not only be ready to address technology changes, but also to lead the changes. Teachers, not the hardware and software, shape the impact of computers within schools (Good, 2000). Integrative progress is being made.

However, further investigation into the factors that affect a teacher's use of technology still needs to be conducted. Research on this subject must be approached with the questions of *when*, *where* and *how* technology is working in today's classrooms and *what* factors are involved in teacher use of technology.

This study researched the ways teachers at Bearden High School use technology. This chapter is composed of a Statement of the Problem, Statement of the Purpose, Definition of Terms, Research Questions, Hypotheses, Rationale for the Study, Assumptions, Delimitations and Limitation.

Statement of the Problem

Limited research is available concerning the factors involved in the level of technology use among teachers. Further investigation is needed to identify the factors involved in teacher technology use.

Statement of the Purpose

The purpose of this study was to determine teacher use of technology at Knox County's Bearden High School in Knoxville, Tennessee. Comparisons were made based on (a) *teacher years of experience*, (b) *teacher knowledge of computers* and (c) *teacher department affiliation*.

Definition of Terms

The following terms were necessary in researching the factors involved in teacher use of technology:

Teacher department affiliation- The academic department to which a teacher is assigned.

Teacher knowledge of computers- A teacher's self-assessed level of computer expertise.

Teacher years of experience- The length of participation in the teaching profession as measured in years.

Technology use- The use of computers (hardware and software) within the classroom.

Research Questions

Using teachers' self-reporting as a foundation, this study answered the following questions:

1. **Who** are the teachers at Bearden High School during the spring semester of 2002?
2. **How** do teachers at Bearden High School use technology?

3. **How** does teacher use of technology differ based on *teacher years of experience*?

4. **How** does teacher use of technology differ based on *teacher knowledge of computers*?

5. **How** does teacher use of technology differ base on *teacher department affiliation*?

Hypotheses

The following null hypotheses were formulated for this study:

1. **No difference exists** in teacher use of technology based on *teacher years of experience*.

2. **No difference exists** in teacher use of technology based on *teacher knowledge of computers*.

3. **No difference exists** in teacher use of technology based on *teacher department affiliation*.

Rationale for the Study

Technology has transformed nearly every aspect of contemporary life. From computers to television to telecommunication networks, the way people live, work and play continues to evolve as technological advancements occur. Many believe this technology revolution holds the potential for revolutionizing education as well.

When computers, e-mail, and other high-tech tools are used, students improve their thinking skills, teachers change the way they run their classrooms, parents become

more involved, assessments reflect real-world activities and children enjoy learning (National Academy of Sciences, 2000).

Yet teachers, along with many others in today's society, find themselves lost in the changing landscape of technology. While teachers are looked upon as the key to our society's technological future, many have not had the education or training to use technology effectively in their teaching. Although many school systems encourage and facilitate teacher use of basic programs such as word processing, database, and electronic grading systems, teachers still struggle to integrate technology into their teaching curricula.

A poll of 582 teachers conducted in 1997 by the Global Strategy Learning Group found that 71% of respondents mentioned that basic computer training was made available to them within their respective school system. Yet, this ratio dropped to 48% when the same respondents were asked whether they had access to training for the integration of computers into classroom curricula (Zehr, 1997). Therefore, an understanding of how and for what teachers use technology in the classroom, as well as whether and how (a) *teacher years of experience*, (b) *teacher knowledge of computers*, and (c) *teacher department affiliation* affects technology use in the classroom can assist school administrators in planning and providing timely technology-based staff development.

Often, veteran teachers find it difficult to embrace new, innovative changes in curricula, and administrative pressure to incorporate technology into a teacher's curriculum is frequently met with resistance and avoidance. Many experienced

teachers are unsure about its benefits, while others find the new technological forces threatening. To many experienced teachers, technology seems to be a waste of time or intimidating against their developed routines for curriculum development. Therefore, only when teachers see the value of technology in supporting their own productivity will they grow more interested and willing to integrate technology into their teaching.

As computers become commonplace in educational settings, each wave of new technology can produce an occasion for increased anxiety among teachers (Reed, 1993). These negative attitudes towards technological shifts, as well as an overall lack of computer experience, often combine to produce a deep-seated conservatism and reluctance to alter prevailing practices and use mechanical devices in classrooms. Teachers are driven to use the practices used when they were students and hold instructional changes at arm's length. Computer anxiety and technology integration often carry an adverse relationship while experience with computers and technology integration carry a positive one. Consequently, an important factor in the comparison of technology use among secondary teachers is their own personal experience in using computers and their willingness to experiment with new instructional methods.

Personal knowledge of computers seems to play a role in the integrative decisions of teachers. According to Charp (2000), teachers need at least three years to acquire expertise in integrating technology into curriculum. Year one involves mastering the technical resources; year two includes exploring their curricula; and

year three involves refining the classroom applications to include technological components. Furthermore, with the length of time required for teachers to understand and utilize technology as an educational tool, administrators and technical support teams must also work to understand the needs of teachers and the ways in which they can be of help in the facilitation of the integrative process.

Another factor which influences teacher technology use is the teacher's department affiliation. Courses involving computer applications generally lend themselves more to technology than others. However, the use of technology in everyday classroom procedures is just as important as the skills gained in computer-based courses. According to a study by The Milken Family Foundation (1999), the academic institutions with the highest levels of student technology skills and experience were not those with heavy computer course requirements, but rather those that made use of technology within all curricular areas.

Merely supplying teachers with technology often does little good unless teachers are also carefully trained to use the technology through an appropriate in-service program (Rice, 1995). Many have argued that the pace of technological change has made it impossible for teachers to keep up on their own. Numerous experts agree that at least 30% of a school's technology budget should be devoted to professional development for teachers in order for the technology to be effectively used (Zehr, 1997). Yet, as state departments of education continue to spend millions on equipment, only the minimum expenditures are allocated for such teacher training. Information on why technology is or is not being utilized in secondary schools can

also help administrators, policy makers and funding sources make the types of decisions that advance the goals of both the students and teachers.

Therefore, in order to research factors related to the integrative decisions of teachers at Bearden High School, a quantitative study must be conducted to discover how, when and why they are currently utilizing technology in their curriculum. This study determined the factors involved in teacher use of technology based on survey data from respondents at Bearden High School during the spring semester of 2002. Comparisons were made based on *(a) teacher years of experience, (b) teacher knowledge of computers and (c) teacher department affiliation.*

Assumptions

The following assumptions were formulated in the present research of identifying factors involved in the use of technology among Bearden High School teachers:

1. Survey respondents answered the questions as accurately and honestly as possible.
2. Survey respondents were the best sources to identify how technology is used.

Delimitation

The following delimitation was formulated in the present research of identifying factors involved in the use of technology among Bearden High School teachers:

- This study considered the factors involved in teacher use of technology in the spring 2002 at Bearden High School.

Limitations

The following limitations were formulated in the present research of identifying the use of technology among Bearden High School teachers:

- This study was limited to the teachers at Bearden High School.
- The number of survey responses was contingent upon the willingness of teachers to participate.

CHAPTER II

Review of Literature

The following review of literature discusses prior research and writings concerning factors that relate to the level of technology use among secondary educators. The review covers four major areas of technology use.

This chapter includes an examination of research concerning (a) how technology is used within the classroom, (b) teacher access to technology, (c) teacher experience with technology, and (d) teacher resistance to using technology. Each section will show how the topic has contributed to the present research and how the present research adds to the existing body of knowledge.

How Technology is Used

Many of today's schools have invested heavily into computers and related technologies over the past decade. According to the National Center for Educational Statistics (2001), there was a 29% increase in the percentage of teachers using computers on a daily basis from 1998 (47%) to 2000 (76%).

These technologies play important roles in education at many levels as multimedia, Internet, World Wide Web and others are integrated to a greater extent. Along with the increase of school technology comes the corresponding need for further understanding of the extent and types of teacher computer use, as well as their perceptions of preparedness and self-efficiency in the use of these tools within their classrooms.

The majority of the teacher use of computers centers around (a) preparing materials for lessons and (b) communicating with other professionals and parents through email and recording grades. According to Rowand (2000), 39% of public school teachers with access to computers or the Internet indicated they used computers a lot to create instructional materials and 34% reported using computers a lot for administrative record keeping. Less than 10% of teachers reported using computers to access model lesson plans or to access research and best practices.

Yet, while many educators consider technology beneficial in the classroom, “best practices” for how computers should be used in the classroom have not been defined. The Center for Online Professional Education (2000) outlined a few general goals for using technology in schools. These goals included (a) improving students’ acquisition of content knowledge in specific subject areas; (b) motivating students by providing multiple paths to learning to fit individual students’ learning styles and strengths; (c) broadening curriculum objectives to add more problem-solving, inquiry, project-based learning and collaborative work; (d) enabling teachers to strengthen their own preferred approaches; (e) better preparing students for a global workplace; and (f) updating education for the 21st century (Kleiman, 2001)

Becker, Ravitz and Wong (1999) conducted a series of studies to determine the factors involved in *teacher* and *teacher-directed student use* of computers and software within America’s schools. They found that software-utilizing teachers recognize ClarisWorks, Microsoft Works and Web browsers, such as Netscape, as

their most valuable software programs for student use. Moreover, word processing is the most common use of computers by secondary students.

Just as application uses of computers seem to edge out the skill and drill games of the previous years, objectives for computer use have also extended beyond simply “learning computer skills” or utilizing computer games to master content. In fact the most commonly reported objective by students was “finding out about ideas and information,” and the second most commonly reported objective was “expressing themselves in writing” (Becker et al., 1999).

Teachers’ use of technology varies by the subjects they teach. Social Studies teachers and mixed content areas are more interested in students discovering new ideas and researching topics, while English teachers focus more on the use of technology to express student’s own ideas and thoughts in writing. Math, Computer and Business teachers more likely select software to master knowledge and skills in content-specific areas and often use game software to help students meet skill-related objectives (Rowand, 2000). Consequently, Rowand (2000) classified *teacher-directed student use* of computers as either productive (as a learning tool) or skill (for development and mastery).

While teachers do use technology in their classrooms, potential barriers to computer technology integration persist. Examples of such barriers include: (a) lack of training, (b) inadequate access to technology, and (c) insufficient experience in developing curriculum for the application of technology.

With focused effort, potential barriers to teacher technology use can be minimized or alleviated. The National Academy of Sciences (2001) cites Press (2000) as stating, “The technology gap between schools and the rest of the world is real and it is growing. If we plan carefully and bring teachers along with us as we implement new technology wisely together with other needed reforms, learning could be dramatically better”.

In the Becker et al. research (1999), they sought to determine how and why teachers incorporate computers into their instructional practices. They researched a number of factors that impact teachers’ use and integration of technology. Becker et al. found three factors, which substantially impact teachers’ use and integration. These factors included (a) teacher access to technology, (b) teacher experience with technology and (c) teacher resistance to the use of technology.

Teacher Access to Technology

Becker et al. (1999) reported 1998 data, which indicated 93% of teachers in grades 4-12 were using computers as a part of their professional lives. While teachers recognize the Internet as an important tool for teaching and enhancing the quality of education, many complain of having too little time to use it.

The National Center for Educational Statistics (NCES) (2001) cited (a) teacher lack of in-school time, (b) teacher lack of away-from-school release time, and (c) student lack of in-school time for computer use. Additionally, teachers noted the shortage of equipment and lack of technical support as hindrances to their use of

online resources. Regular use of computers seemed highly dependent upon the availability of equipment and technical support.

Becker et al. (1999) found a 1:4 computer to student ratio necessary for computer activities to become regular and frequent components of a teacher's classroom practices. However, beyond computer and business education courses, most other teachers have relatively few computers in relation to the number of students in their classrooms.

In the NCES report (2001), 36% of the teacher participants reported having only one computer in their classroom; 38% reported having two to five computers in their classroom; and 10% reported having more than five computers in their classroom. As a result, a larger number of teachers must go outside of their classrooms and to the school library or special technology lab to access computers and the Internet.

Oftentimes computer use outside or away from the classroom must be scheduled well in advance, which makes it difficult to integrate computers into the flow of daily lessons. Such difficulties may result in computer use being viewed as a "special event" rather than as central to the curriculum. Moreover, curriculum material publishers include computer activities as optional instructional supplements because teacher access to and proficiency in computer use cannot be assumed (Kleiman, 2001).

In addition to lack of equipment, teachers receive less capital investment for training and technical support than most professionals. For example, the National

Academy of Sciences (1995) reported the stark contrast of an average \$1,000 investment per teacher versus an average \$50,000 investment in all other kinds of workers in the United States.

The NCES (2001) reported that teachers in schools with limited local funding were less likely to use computers. In the NCES study, poverty level was defined by the socioeconomic status of the population served. Teachers in schools with a poverty level of less than 11% were more likely to use computers or the Internet a lot for creating instructional materials (52%) than teachers in schools with a school poverty level of 71% or more (32%). Furthermore, teachers in schools with more than 50% minority enrollments were more likely to cite outdated, incompatible, or unreliable computers as a great barrier (32%) than teachers in schools with less than 6% minority enrollments (22%).

In an attempt to reduce the “digital divide” (the gap between technology-rich schools and those with little or no technological resources), federal programs have been created to help inner-city and poverty-level schools purchase computers (e.g. the E-Rate Program, targeted at providing computers for small, medium and poorer schools) (Benton, 2000).

However, the reality corresponding to these attempts is that, when considering issues of technological equity, a mere increase in the number of school computers purchased will not solve the problem. Schools must examine all the essential conditions for transforming computers into effective teaching and learning tools and concentrate on ensuring the necessary training and support for their teachers. As Tom

Bayersdorfer, the Tennessee Education Agency Technology Contact, stated, “We think technology is a very integral part of the education system, but just having the technology available is not sufficient. Educators must know how to use it, or else you’re just putting a lot of money into hardware that becomes outdated very quickly” (NCES, 2001).

Teacher access to computers is important to this study in that it is essential for technology use to take place within our educational institutions. The corresponding need for computer training and professional development for teachers is equally as important and can directly influence a teacher’s integrative abilities.

Teacher Experience with Technology

Even in areas where technology is available, software, hardware and Internet connections often go unused because teachers lack the skills and knowledge that are necessary to integrate them into their daily classroom activities. Many teachers have had some basic computer instruction; however, most have not had training in multi-media or on-line activities. Therefore, educational technology can be an effective supplement to a teacher’s lesson plans across the spectrum of subjects only if the teacher feels comfortable with the technology and understands how best to use it as a complement to the lesson.

Years of teaching experience are also a noted factor in the level of technology use among teachers. Often, the more experience a teacher has, the less willing he or she is to adopt new and innovative technology into curriculum. In Rowand's study (2000), the level of teacher computer skills was studied in relationship to the number

of years taught. It was revealed that teachers with fewer years of experience and those with more hours of professional development felt better prepared to use computers and the Internet for classroom instruction (Rowand, 2000). In her study, only 19 percent of the teachers who taught 20+ years of teaching experience felt they were well prepared to use computers in their curriculum, while 31 percent of teachers who have taught 1-3 years of experience felt well prepared.

Home or personal computer use can also be a factor in the level of technology use among teachers. According to Becker et al. (1999), the longer the teacher has had a home computer, the greater number of distinct computer skills they will report to possess. There is also a very similar relationship between the years of home computer ownership and the amount of professional uses in the classroom (NCES, 2001).

Therefore, a teacher's knowledge of computers plays an important role in the level of their usage in the classroom. This study will compare the respondent's self rated computer abilities with the amount of technology that is incorporated into their curriculum.

Teacher Resistance to Technology

Arguably, the largest contributing factors in the technology decisions of teachers are the teachers themselves. A look into a teacher's individual attitude toward computers can often provide insightful information regarding the level of technology they employ into their curriculum.

One of the largest influences within the educational technology explosion is the teacher's ability to use a computer successfully as an instruction tool (Akbaba). Low computer anxiety and high motivation have been identified as major components for the successful use of technology within the classroom. As a result, a positive teacher attitude towards technology is critical if computers are to be effectively integrated into curriculum (Benson).

Becker et al. (1999) found that when asked to rate their skill level for eight different computer tasks, teachers' knowledge levels varied from 75% who could locate a disk's directory to only 18% who could develop a multimedia document. In the same study, it was found that the level of computer expertise among teachers could also vary with the nature of the course taught. Not surprisingly, computer teachers were most likely to claim computer expertise (32%), while math teachers (5%) and teachers of "other applied subjects" (2%) were much less likely to report expert computer knowledge (Becker et al., 1999).

In addition to departmental divide in the use of computers, another factor in the resistance to technology lies in the belief that technology will create extra work for teachers and a lack of computer skills requires more time and planning. Brosnan (1998) categorizes such resistance as technophobia or the "negative affective and attitudinal response to technology which the technophobe acknowledges to be irrational." Such attitudes toward technology can significantly affect a teacher's curriculum design, teaching methodologies and the role of computers within the classroom.

Even gender is looked upon to provide possible explanations for the varying attitudes toward technology use. In an Australian survey of teachers, Lee (1997) found that overall, men were more active in computing. The male respondents were more confident in their use of computers and tended to complain more about problems with computer use. Women, on the other hand, used computers less frequently and often blamed themselves for computer problems. Other studies have not found significant relationship between teacher computer use and gender (Nash & Moroz, 1997)

Brosnan (1999), in his research of technophobia, cites “gender appropriateness” as a way to view any differences found in the levels of computer resistance between genders. He argues that we all view aspects of our environment (including technology) with either a masculine or feminine perception and become only comfortable with the aspects that are appropriate for our gender. Therefore, according to his view, women perceive technology as masculine and themselves as feminine; therefore, creating increased anxiety and decreased performance. He argues the opposite to be true for men (Brosnan, 1998).

Summary

One cannot study the role of technology in education without a concentrated look of the role of teachers in technology use. Through comparing how (a) teacher access to technology, (b) teacher experience with technology and (c) teacher resistance to the use of technology affect the level of technology use, we can better understand the role of the teacher as technological advancements occur.

The present study focused on the people and processes of technology use, rather than the hardware and software. Particular attention was given to what motivates teachers to use computers and what barriers can impede the overall process. The research will particularly focus on how (a) *teacher years of experience*, (b) *teacher knowledge of computers* and (c) *teacher department affiliation* contribute to the teacher use of technology. As a format guide and resource, Jason Mayfield's thesis (2000) was utilized in developing this study.

CHAPTER III

Methodology

Knox County School System's Bearden High School teachers were surveyed during the spring semester of 2002 to determine teacher use of technology in the classroom. The sections in the Methodology consist of Design, Subjects, Instrumentation, Data Collection, and Data Analysis. Figure 1 shows the Methodology Conceptual Framework on which this research study was based.

Design

The quantitative descriptive research method was chosen for this study to determine the factors involved in the level of technology use based on *(a) teacher years of experience, (b) teacher knowledge of computers and (c) teacher academic department affiliation*. This method was chosen to aid the investigation of the small number of variables over a short period of time, to identify the current status of teachers' use of technology and to collect in-breadth information concerning the demographic variables.

This approach was also chosen to facilitate the collection of numerical data. The data concerning the factors involved in the level of technology use were compared according to the chosen demographic variables to determine whether differences exist.

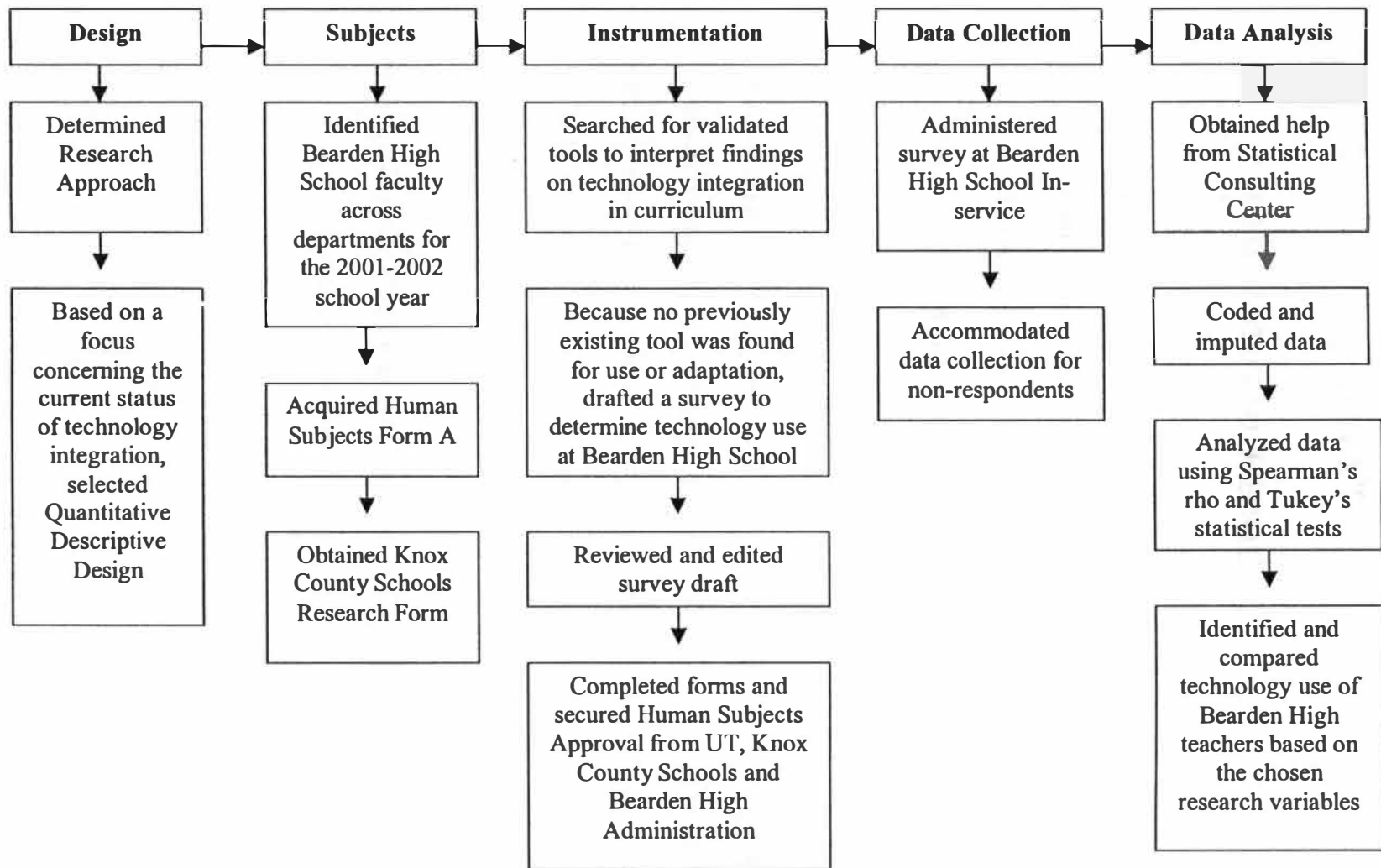


Figure 1. Methodology Conceptual Framework

Subjects

The teacher population at Bearden High School for the 2001-02 school year consisted of 103. The 11 academic departments were as follows: Business, English, Fine Arts, Foreign Language, Mathematics, ROTC, Science, Social Studies, Special Education, Vocational and Wellness/Physical Education.

The survey was made available during the spring semester of 2002 and a total of 77 (75%) teachers completed the survey. The 77 respondents represented 10 of the 11 academic departments with ROTC being the only non-represented department. The Bearden High School teachers provided an excellent representation of typical secondary teachers across all academic departments and proved helpful in adding conclusions to the research.

Instrumentation

A survey of the teacher's perceptions determined and compared the technology use of secondary teachers based on (a) *teacher years of experience*, (b) *teacher knowledge* and (c) *teacher academic department affiliation*. The researcher conducted a literature review to locate an instrument that would be suitable for the purpose of this study. An instrument that contained the desired information was not found; therefore, the researcher created a survey containing items specifically related to the objectives of this study. Appendix A contains an example of the survey used for this study.

The instrument was developed and refined in four steps. First, a draft was written in Microsoft Word and an initial peer review was conducted in a research

methods course at the University of Tennessee. Second, the researcher's graduate program committee members reviewed and edited the survey for the purposes of ensuring content/face validity. Content validity refers to the degree in which a test measures an intended content area and requires both item validity and sampling validity. (Gay 2000)

Third, the instrument was reviewed by the researcher's graduate committee members, and appropriate human subjects approval forms from The University of Tennessee and Knox County were completed. Finally, after obtaining written approval from both the Knox County Statistics Department and Dr. Mary Lou Kanipe, Bearden High Principal, the final version of the instrument was used for data collection. A copy of the researcher's approved Human Subjects Form A appears in Appendix B.

The instrument was developed to answer the research questions and to determine teacher use of technology based on the following independent variables: *(a) teacher years of experience, (b) teacher knowledge of computers, and (c) teacher department affiliation.* The first section of the survey included six questions, which related to the independent variables and enabled the researcher to obtain specific demographic information about the respondents. Survey question one asked respondents to indicate how many years they have taught. Survey question two asked respondents to rate their level of computer knowledge as *beginner, intermediate, or advanced.* Survey questions three and four asked respondents to indicate if they had a computer in their classroom and home. Survey question five asked respondents if

their students used computers to perform class work. Survey question six asked the respondents to list their academic department affiliation.

In the second section of the survey, respondents were asked to indicate the frequency with which they used computers to perform thirteen selected tasks (based upon review of current literature related to teacher technology use, each of the 13 computer uses was found to be a common teacher-performed task). The survey used a five-point Likert scale to facilitate the quantitative research method and allow the researcher to analyze the data mathematically.

Data Collection

The survey was made available to all Bearden High School teachers at the final in-service day of the spring semester 2002. The researcher administered the survey directly to the teachers, and each respondent was given time to complete the survey based on his or her individual uses of technology. The researcher collected the results directly from the teachers to ensure confidentiality. A follow-up data collection for all non-respondents was accommodated, and the final surveys were collected during the last week of school.

Data Analysis

Data analysis began after the collection of the data from the respondents in late May 2002. Data from all 77 completed surveys were entered into a Microsoft Excel spreadsheet.

Each demographic variable was assigned either an alpha or numeric value for coding purposes. *Teacher years of experience* were assigned alpha variables as

follows: 1-5=A, 6-10=B, 11-15=C, 16-20=D, 21-25=E, and over 25=F. *Teacher knowledge of computers* was coded as follows: Beginner=A, Intermediate=B, and Advanced=C. *Teacher department affiliations* were assigned numeric codes as follows: Social Studies=1, Special Education=2, Mathematics=3, Science=4, Business=5, Fine Arts=6, Foreign Language=7, English=8, Wellness=9, and Vocational=10. Questions three, four and five were coded as Yes=1 and No=2.

After the data were entered into the spreadsheet, they were converted into an SPSS file for data analysis. The data compiled from the survey were analyzed using descriptive statistics. Because no central tendencies existed, the data were measured to be non-parametric. In consultation with a statistician from the University of Tennessee Statistical Consulting Center, the researcher opted to use the following non-parametric tests for measuring significant differences. Data representing the independent variables of years taught and level of technology were analyzed using Spearman's rho. Data reflective of the independent variables of computer use in classroom, computer use at home and computers to perform class work were also analyzed using Spearman's rho. Data representing the independent variable of academic department affiliation were analyzed using Tukey's. The reliability coefficient estimate was determined on the onset of the data analysis. A Cronbach alpha of .85 was achieved.

Detailed data analyses appear in Chapter IV.

CHAPTER IV

Data Analysis and Findings

This chapter includes the description of data analysis and respondent findings for the 77 respondents who successfully completed the survey instrument.

To fulfill the purposes of this study, data were examined and analyzed to reveal significant respondent demographics, to answer the five research questions and to test the three hypotheses. As demonstrated by the stated hypotheses, this study proposed that no differences would exist in teacher use of technology based on *(a) teacher years of experience, (b) teacher knowledge of computers, and (c) teacher department affiliation.*

To answer the research questions and test the hypotheses, respondents were asked six questions on the survey instrument concerning demographic information. Respondents were then asked to report the frequency with which they used computer to perform thirteen selected tasks. Figure 2 displays the Variable Matrix on which this study was conducted in terms of profile information and technology use. Numbers show in the dependent variables column represent instrument item numbers for each independent variable.

The sections in the Data Analysis and Findings chapter include (a) Respondent Profile, (b) How Teachers Use Technology, (c) Technology Use Differences based on Years of Experience, (d) Technology Use Differences based on

Profile Information	Variables	
	Independent	Dependent
		“Teacher Use of Technology” Survey Items
	Teacher Years of Experience	1, 7-19
	Teacher Knowledge of Computers	2, 7-19
	Teacher Department Affiliation	6, 7-19

Figure 2. Variable Matrix
 Bearden High School
 n=77

Computer Knowledge and (e) Technology use Differences based on Academic Department Affiliation.

Respondent Profile

Respondents were asked to provide selected demographic information. These questions provided a description of the teacher at Bearden High School during the spring semester of 2002, which answers Research Question One.

Research Question One

Who are the teachers at Bearden High School during the spring semester of 2002?

The respondent profile shows the respondents' (a) *years of experience*, (b) *knowledge of computers*, and (c) *department affiliation* of all teachers who took part in the study. The frequency and percentage of respondents within each independent variable category appear in Table 1.

Table 1. Respondent Profile
 Bearden High School
 n=77

Years of Experience	f	%
1-5 years	18	23.4
6-10 years	6	7.8
11-15 years	16	20.8
16-20 years	15	19.4
21-25 years	9	11.7
Over 25 years	13	16.9
Knowledge of Computers		
Beginner	15	19.4
Intermediate	50	64.9
Advanced	12	15.6
Department Affiliation		
Social Studies	11	14.4
Special Education	5	6.5
Mathematics	12	15.8
Science	10	13.2
Business	5	6.6
Fine Arts	7	9.2
Foreign Language	5	6.6
English	13	17.1
Wellness	3	3.9
Vocational	5	6.6

Survey question one asked the respondents to note their years of teaching experience. For the purpose of this study, *teacher years of experience* were assigned an alpha value (1-5=A; 6-10=B; 11-15=C; 16-20=D; 21-25=E; over 25=F). Eighteen or approximately one fourth (23.4%) of the respondents noted 1-5 years of teaching experience, while only 6 or 7.8% had 6-10 years of experience. Overall, there was even representation among the remaining respondents who have taught 11-15 years

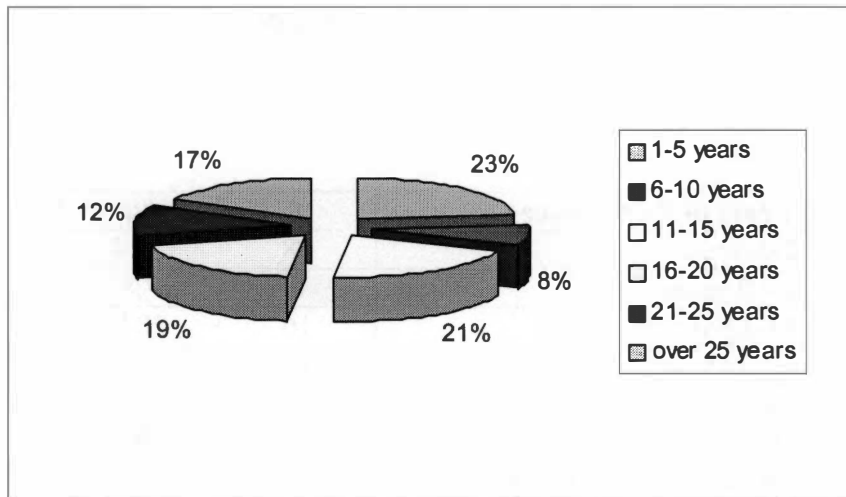


Figure 3. Teacher Years of Experience
 Bearden High School
 n=77

(20.8%), 16-20 years (19.4%), 21-25 years (11.7%) and over 25 years (16.9%).

Figure 3 shows a graphic representation of *teacher years of experience* distribution among the respondents.

Survey question two asked the respondents to indicate their level of *computer knowledge* as a way to further describe the sample of this study and to create an additional means for comparison. Respondents indicated this on the survey by circling their self-assessed level of computer knowledge as Beginner (A), Intermediate (B) or Advanced (C).

According to the analysis, approximately two thirds of the respondents (64.9%) stated their level of computer knowledge to be Intermediate, while 15

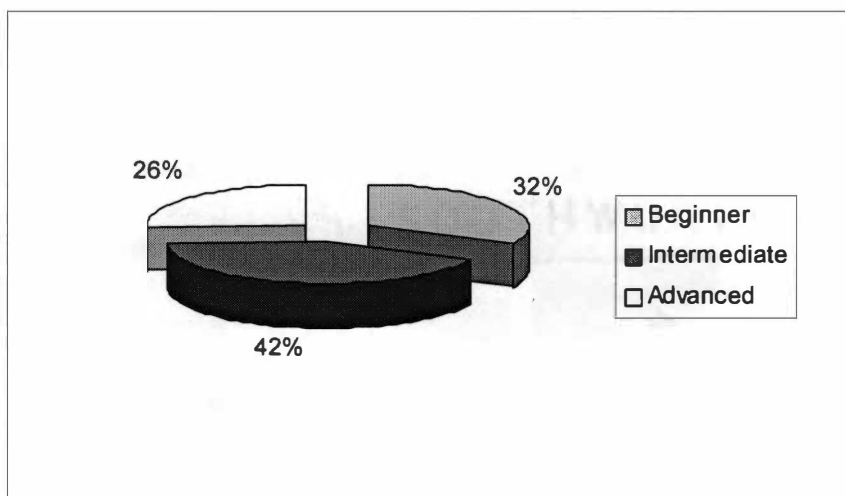


Figure 4. Teacher Knowledge of Computers
 Bearden High School
 n=77

(19.4%) teachers claimed Beginner knowledge and 12 (15.6%) noted Advanced.

The *level of computer knowledge* distribution is depicted graphically in Figure 4.

Survey question six asked respondents to indicate their *teacher department affiliation*. The research assigned numeric values (1-12) to the academic departments for data analysis and eleven of the twelve academic departments at Bearden High School were represented. The distribution of respondent departments were as follows: Social Studies 14.4% (11 respondents), Special Education 6.5% (5 respondents); Mathematics 15.8% (12 respondents); Science 13.2% (10 respondents); Business 6.6% (5 respondents); Fine Arts 9.2% (7 respondents); Foreign Language 6.6% (5 respondents); English 17.1% (13 respondents); Wellness 3.9% (3 respondents); and Vocational 6.6% (5 respondents). Figure 5 provides a graphic

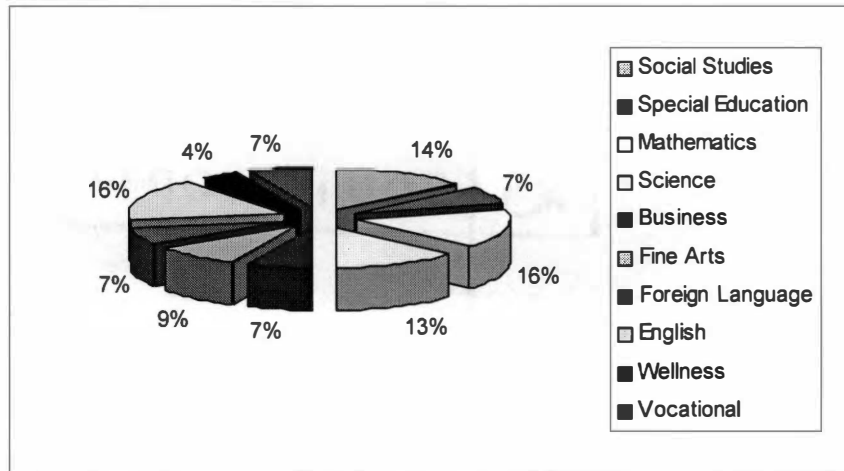


Figure 5. Teacher Department Affiliation
 Bearden High School
 n=77

representation of the *teacher department affiliation* distribution among the respondents.

How Teachers Use Technology

The second section of data analysis answers Research Question Two.

Research Question Two

How do teachers at Bearden High School use technology?

Survey questions 7-19 asked respondents to indicate the frequency with which they used computers to perform a selected task. The survey instrument used a Likert scale of 5=Daily, 4=Weekly, 3=Monthly, 2=Once every nine weeks, 1=Once a semester, 0=Never. According to the respondents, the three technology uses with the highest mean ratings were (a) Grade book, (b) Attendance maintenance, and (c) Personal Use.

Table 2. Teacher Use of Technology
Bearden High School
n=77

Technology Use	Mean Rating*
Grade book	4.64
Attendance maintenance	4.70
Curriculum development	3.05
Lesson preparation	3.38
Lesson delivery/presentation	2.64
Internet research	3.53
Student work	2.47
Professional communication with administration	1.65
Professional communication with faculty	1.86
Professional communication with students	1.83
Professional communication with parents	1.94
Personal use	3.95
Other	0.16

* 5=daily, 4=weekly, 3=monthly, 2=once every nine weeks, 1=once a semester, 0=never

Descriptive Statistics were used to analyze the 13 selected computer tasks in terms of mean, standard deviation, and range. The thirteen-surveyed technology uses are ranked based on mean rating responses in Table 2. The SPSS detailed findings on teacher performed computer tasks are displayed through Table 3.

The survey also asked respondents to note if they have access to a computer at home and/or at school (survey questions 3 and 4). Survey responses were coded with the numeric value of either 1=Yes or 2=No. 96% (74 respondents) reported having a computer in their classroom, while 88% (68 respondents) indicated having a computer at their home. Figures 6 and 7 graphically depict the presence of computers in survey respondents' homes and classrooms respectively and it is important to note that both percentages exceed the general population's computer access.

Table 3. Descriptive Statistics on Teacher Performed Computer Tasks
 Bearden High School
 n=77

Statistics

	N		Mean	Median	Mode	Std. Deviation	Variance
	Valid	Missing					
GRADEBK	77	0	4.6364	5.0000	5.00	.90189	.81340
ATTEND	77	0	4.7013	5.0000	5.00	.77908	.60697
CURRIC	77	0	3.0519	4.0000	4.00	1.61324	2.60253
LESSPREP	77	0	3.3766	4.0000	4.00	1.49595	2.23787
LESSDELI	77	0	2.6364	3.0000	4.00	1.67732	2.81340
INTERNET	77	0	3.5325	4.0000	4.00	1.20944	1.46275
STUDWORK	77	0	2.4675	3.0000	4.00	1.70591	2.91012
ADMCOMM	77	0	1.6494	1.0000	.00 ^a	1.52838	2.33595
FACCOMM	77	0	1.8571	1.0000	1.00	1.47536	2.17669
STUDCOMM	77	0	1.8312	1.0000	1.00	1.58449	2.51059
PARCOMM	77	0	1.9351	2.0000	1.00	1.60867	2.58783
PERSONAL	77	0	3.9481	5.0000	5.00	1.45001	2.10253
OTHER	77	0	1.558	.0000	.00	81216	65960

a. Multiple modes exist. The smallest value is shown

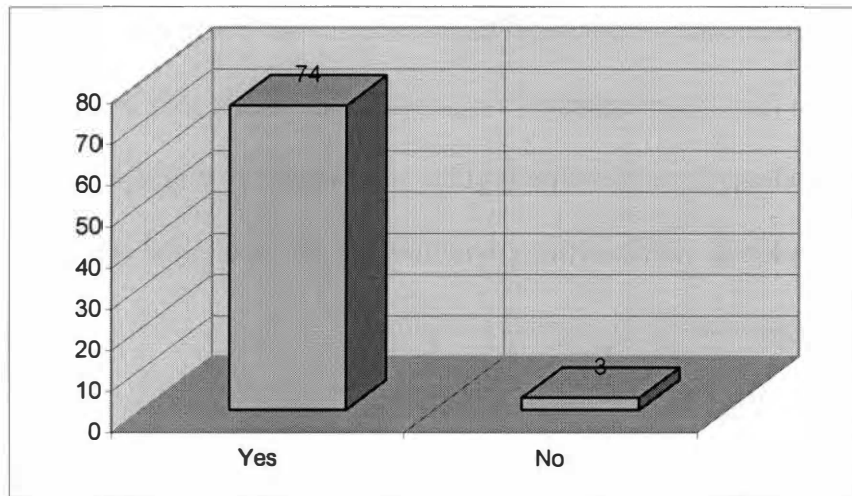


Figure 6. Teacher Reported Computer in Classroom
Bearden High School
 $n=77$

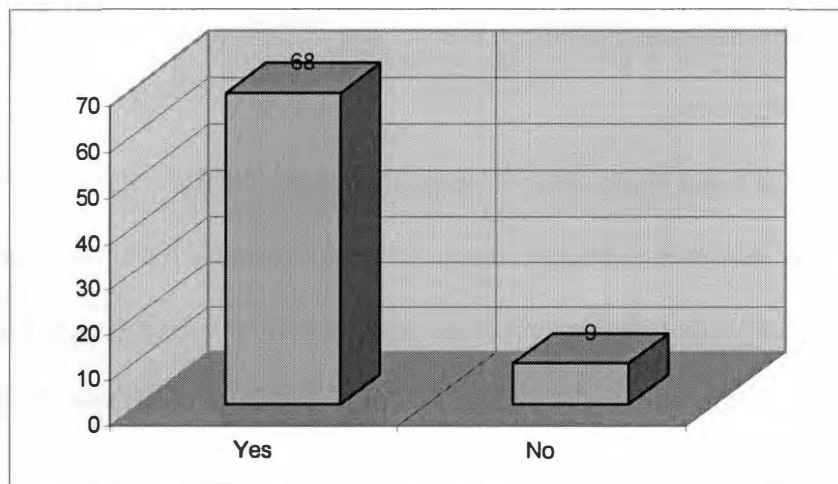


Figure 7. Teacher Reported Computer in Home
Bearden High School
 $n=77$

The respondents were asked if their students used computers for class work in survey question five. The responses were coded numerically as a 1=Yes or 2=No. 62% (48 respondents) indicated that students use computers for class work, while 38% (29 respondents) indicated that computers are not used in the classroom. This distribution is graphically represented in Figure 8.

Technology Use Based on Years of Experience

This section of the Data Analysis depicts respondent data supportive of answering Research Question 3 and testing Hypothesis 1.

Research Question 3

How does teacher use of technology differ based on *teacher years of experience*?

Null Hypothesis 1 (H₀₁)

No difference exists in teacher use of technology based on years of *experience*.

For analysis and comparison of respondent data, the *Spearman rho* statistical test was used to answer the above research question. Because the survey question relating to teacher years of experience was expressed in rank form (e.g. 1-5 years, 6-10 years), the appropriate correlation coefficient to use for analysis was the rank difference correlation. This correlation test is referred to as the Spearman rho.

The Spearman rho tests correlation at the .05 significance level. When analyzing teacher use of technology against teacher years of experience, it was found

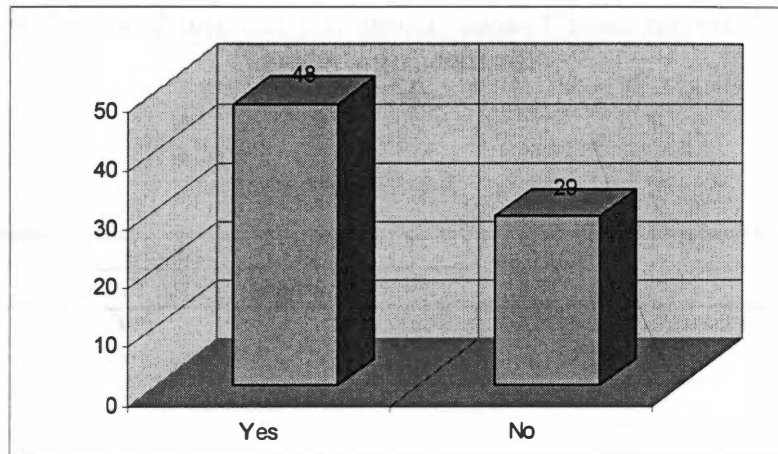


Figure 8. Teacher Reported Computer Use for Class Work
 Bearden High School
 n=77

that the following five computer tasks correlate significantly to a teacher's years of experience: curriculum development (-.252 correlation coefficient); lesson preparation (-.227); lesson delivery (-.300); Internet use (-.299); and communication with students (-.245). As years of experience increase, the frequency of these computer tasks decreases. Results of this analysis concerning the relationship between *teacher years of experience* and teacher use of technology use are shown in Table 4.

Technology Use Based on Knowledge of Computers

This section of the Data Analysis depicts respondent data supportive of answering Research Question 4 and testing Null Hypothesis 2.

Table 4. Correlation of Teacher Computer Use and Years of Experience
Bearden High School
n=77

Correlations				
		YEARST		
		Correlation Coefficient	Sig. (2-tailed)	N
Spearman's rho	GRADEBK	.192	.094	77
	ATTEND	-.075	.518	77
	CURRIC	-.252*	.027	77
	LESSPREP	-.227*	.047	77
	LESSDELI	-.300**	.008	77
	INTERNET	-.299**	.008	77
	STUDWORK	-.087	.454	77
	ADMCOMM	-.135	.243	77
	FACCOMM	-.202	.078	77
	STUDCOMM	-.245*	.032	77
	PARCOMM	-.195	.090	77
	PERSONAL	-.217	.058	77
	OTHER	-.022	.848	77

*. Correlation is significant at the .05 level (2-tailed).

**. Correlation is significant at the .01 level (2-tailed).

Research Question 4

How does teacher use of technology differ based on *teacher knowledge of computers*?

Null Hypothesis 2 (H₀₂)

No difference exists in teacher use of technology based on teacher knowledge of computers.

For analysis and comparison of respondent data, the *Spearman rho* statistical test was used to answer the above research question. Because the survey question relating to teacher knowledge of computers was expressed in rank form (e.g.

Beginner, Intermediate, Advanced), the appropriate coefficient to use was the rank difference correlation. This correlation test is referred to as the Spearman rho.

The Spearman rho tests correlation at the .05 significance level. When analyzing teacher use of technology against teacher knowledge of computers, it was found that the following six computer tasks correlate significantly to a teacher's computer knowledge: grade book maintenance (.233 correlation coefficient); curriculum development (.454); lesson preparation (.424); lesson delivery (.350); Internet use (.376); and personal use (.009). Consequently, in relationship to these computer tasks, at a higher self-assessed level of computer knowledge, certain uses of technology increase. Results of this analysis concerning the relationship between *teacher knowledge of computers* and teacher use of technology are shown in Table 5.

Technology Use Based on Department Affiliation

This section of the Data Analysis depicts respondent data supportive of answering Research Question 5 and testing Null Hypothesis 3.

Research Question 5

How does teacher use of technology differ based on *teacher department affiliation*?

Null Hypothesis 3 (H_{03})

No difference exists in teacher use of technology based on *teacher department affiliation*.

Table 5. Correlation of Teacher Computer Use and Knowledge of Computers
 Bearden High School
 n=77

Correlations				
		COMPKNW		
		Correlation Coefficient	Sig. (2-tailed)	N
Spearman's rho	GRADEBK	.233*	.041	77
	ATTEND	.207	.070	77
	CURRIC	.454**	.000	77
	LESSPREP	.424**	.000	77
	LESSDELI	.350**	.002	77
	INTERNET	.376**	.001	77
	STUDWORK	.111	.335	77
	ADMCOMM	-.044	.707	77
	FACCOMM	.166	.149	77
	STUDCOMM	.100	.385	77
	PARCOMM	.125	.279	77
	PERSONAL	.295**	.009	77
	OTHER	.019	.869	77

*. Correlation is significant at the .05 level (2-tailed).

**. Correlation is significant at the .01 level (2-tailed).

In an attempt to normalize data and to simplify analysis and comparison of respondent data, the cumulative total score of each respondent per department were totaled and each of the eleven departments was assigned a mean total score. Each department was assigned the following numeric code: Social Studies=1; Special Education=2; Mathematics=3; Science=4; Business=5; Fine Arts=6; Foreign Language=7; English=8; Wellness=9; and Vocational=10. Because Freshman Orientation department only included one respondent, it was omitted from this portion of data analysis. The mean totaled scores for each of these departments are provided on Table 6.

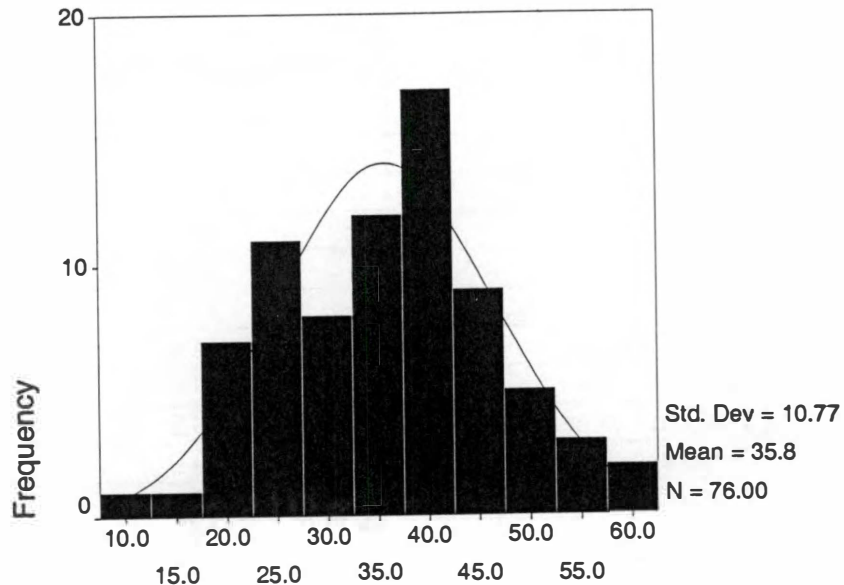
Table 6. Mean Total Computer Scores per Department
 Bearden High School
 n=77

Department	Mean Total Computer Use
Business	51.0
Vocational	43.4
English	37.5
Science	36.1
Fine Arts	35.4
Social Studies	34.4
Mathematics	33.0
Foreign Language	30.2
Wellness	29.0
Special Education	27.4

For analysis purposes, it is ideal for categorical data to contain more than 30 representatives per category. Therefore, in order to normalize data and facilitate more readable correlations, we used the mean total computer use scores per department for analysis. Figure 9 shows the normal curve of the total mean scores (10-60 range) of all 77 survey responses.

After the total mean scores for each department were established, a Between Subjects Effects chart was ran to display any significant differences in department totals. The Between Subjects Effects Test was a prerequisite for conducting the Tukey's honestly significant difference test on the data. This Between Subjects Effects Test is shown in Table 7.

Figure 9. Normalized Curve of Total Computer Use per Department
Bearden High School
 n=77



Total computer use scores (added)

Table 7. Between Subjects Effects Test
Bearden High School
 n=77

Tests of Between-Subjects Effects

Dependent Variable: TOTALCOP

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2250.146 ^a	9	250.016	2.558	.014
Intercept	78505.677	1	78505.677	803.116	.000
DEPTNUM	2250.146	9	250.016	2.558	.014
Error	6451.591	66	97.751		
Total	105906.000	76			
Corrected Total	8701.737	75			

a. R Squared = .259 (Adjusted R Squared = .157)

Next, a *Tukey's* test was conducted for the departmental data. Tukey's honestly significant difference test is used for multiple comparison tests and uses the studentized range statistic to make all pair-wise comparisons between groups and sets the experiment-wise error rate to the error rate for the collection for all pair-wise comparisons.

It was found that the mean total scores of teacher technology use for Special Education (2), Wellness (9), Foreign Language (7), Mathematics (3), Social Studies (1), Fine Arts (6), Science (4), English (8) and Vocational (10) do not differ significantly. In addition, Mathematics (3), Social Studies (1), Fine Arts (6), Science (4), English (8), Vocational (10) and Business (5) also do not differ significantly in their teachers' technology use. However, Tukey's showed that there is a significantly higher mean total of teacher technology use in the Business Department (5) than the departments of Special Education (2), Wellness (9), and Foreign Language (7). Results of this analysis concerning the relationship between *teacher department affiliation* and teacher technology use are graphically presented in Table 8.

Table 8. Comparison of Teacher Computer Use and Department Affiliation
Bearden High School
n=77

TOTALCOP

Tukey HSD^{a,b,c}

Department in numeric values		N	Subset	
			1	2
2.00	Special Education	5	27.4000	
9.00	Wellness	3	29.0000	
7.00	Foreign Language	5	30.2000	
3.00	Mathematics	12	33.0000	33.0000
1.00	Social Studies	11	34.3636	34.3636
6.00	Fine Arts	7	35.4286	35.4286
4.00	Science	10	36.1000	36.1000
8.00	English	13	37.5385	37.5385
10.00	Vocational	5	43.4000	43.4000
5.00	Business	5		51.0000
Sig.			.146	.062

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

The error term is Mean Square(Error) = 97.751.

a. Uses Harmonic Mean Sample Size = 6.145.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

CHAPTER V

Summary

After the examination of results found in Chapter IV of this study, a summary of the findings is presented. Using the findings as a basis for further discussion, the researcher arrived at a number of conclusions. When paired with the previously reviewed literature, these conclusions allowed the formulation of relevant recommendations. These three components aided the researcher in the development of the implications for technology use among secondary teachers.

This chapter is composed of a Summary of Findings, Conclusions, Recommendations and Implications.

Summary of Findings

This section contains a review of the researcher's findings. The summary is arranged based on responses obtained from answering the five research questions about respondent demographics and technology use among teachers and testing the three null hypotheses pertaining to the differences based on *(a) teacher years of experience, (b) teacher knowledge of computers, and (c) teacher department affiliation.*

Respondent Demographics

In findings stemming from **Research Question One**, *Who are the teachers at Bearden High School during the spring semester of 2002*, information for the teachers at Bearden High School during the spring semester of 2002 was as follows:

- Approximately one fourth of the respondents noted 1-5 years of teaching experience, while only 7.8% had 6-10 years of experience.
- An even representation among the remaining respondents who have taught 11-15 years (20.8%); 16-20 years (19.4%), 21-25 years (11.7%) and over 25 years (16.9%).
- The majority of the respondents (64.9%) stated their level of computer knowledge to be Intermediate.
- The eleven academic departments of respondents had a somewhat even distribution and broke down as follows: Social Studies 14.4% (11 respondents), Special Education 6.5% (5 respondents); Mathematics 15.8% (12 respondents); Science 13.2% (10 respondents); Business 6.6% (5 respondents); Fine Arts 9.2% (7 respondents); Foreign Language 6.6% (5 respondents); English 17.1% (13 respondents); Wellness 3.9% (3 respondents); and Vocational 6.6% (5 respondents).

How Teachers Use Technology

In findings stemming from **Research Question Two**, *How do teachers at Bearden High School use technology*, the technology uses of Bearden High School teachers during the spring semester of 2002 were as follows:

- The two uses of technology with the highest mean ratings were: Grade book maintenance (4.64) and Attendance maintenance (4.70).
- Personal use (3.95) and Lesson preparation (3.38) were the third and fourth highest mean ratings respectively.
- The computer tasks with the lowest mean rating were Professional communication with parents (1.94), with faculty (1.86), with students (1.83), and with administration (1.65).
- 96% of respondents reported having a computer in the classroom; while 88% reported having a computer at home.
- 62% of respondents indicated that their students used computer for class work.

Technology Use Based on Years of Experience

The following findings stemmed from the researcher (a) answering **Research Question Three**, *How does teacher use of technology differ based on teacher years of experience*, and (b) testing **Hypothesis 1**, *No difference exists in teacher use of technology based on teacher years of experience*. Technology use differences based on teacher years of experience at Bearden High School during the spring semester of 2002 were as follows:

- Based on the Spearman rho statistical test, the following five computer tasks correlated significantly to a teacher's years of experience: Curriculum development (-.252 correlation coefficient); Lesson preparation (-.227); Lesson delivery (-.300); Internet use (-.299); and Communication with students (-.245).
 - This finding on technology use based on *teacher years of experience* supported the **rejection** of Hypothesis 1.
- The other eight computer tasks (Grade book, Attendance, Student work, Communication with administration, Communication with faculty, Communication with parents, Personal use and Other) did not correlate significantly to teacher years of experience.
 - This finding on technology use based on *teacher years of experience* supported the **acceptance** of Hypothesis 1.

Technology Use Based on Knowledge of Computers

The following findings stemmed from the researcher (a) answering **Research Question Four**, *How does teacher use of technology differ based on teacher knowledge of computers*, and (b) testing **Hypothesis 2**, *No difference exists in teacher use of technology based on teacher knowledge of computers*. Technology use differences based on teacher knowledge of computers at Bearden High School during the spring semester of 2002 were as follows:

- Based on the Spearman rho statistical test, the following six computer tasks correlated significantly to a teacher's computer knowledge: Grade book

maintenance (.233 correlation coefficient); Curriculum development (.454); Lesson preparation (.424); Lesson delivery (.350); Internet use (.376); and Personal use (.009).

- This finding on technology use based on *teacher knowledge of computers* supported the **rejection** of Hypothesis 2.
- The other seven computer tasks (Attendance, Student work, Communication with administration, Communication with faculty, Communication with students, Communication with parents and Other) did not correlate significantly to a teacher's computer knowledge.
 - This finding on technology use based on *teacher knowledge of computers* supported the **acceptance** of Hypothesis 2.

Technology Use Based on Department Affiliation

The following findings stemmed from the researcher (a) answering **Research Question Five**, *How does teacher use of technology differ based on teacher department affiliation*, and (b) testing **Hypothesis 3**, *No difference exists in teacher use of technology based on teacher department affiliation*. Technology use differences based on teacher department affiliation at Bearden High School during the spring semester of 2002 were as follows:

- Based on Tukey's statistical test, the mean total scores of teacher technology use for Special Education, Wellness, Foreign Language, Mathematics, Social Studies, Fine Arts, Science, English and Vocational do not differ significantly.

- In addition, Mathematics, Social Studies, Fine Arts, Science, English, Vocational, and Business do not differ significantly in their teachers' technology use.
 - These findings on technology use based on *teacher department affiliation* supported the **acceptance** of Hypothesis 3.
- However, there is a significantly higher mean total of teacher technology use in the Business Department than the departments of Special Education, Wellness, and Foreign Language.
 - This finding on technology use based on *teacher department affiliation* supported the **rejection** of Hypothesis 3.

Conclusions

Based on the findings of this study, the following conclusions were reached:

- Bearden High School teachers used computers more frequently to perform administrative tasks (Grade book and Attendance maintenance) than lesson-related tasks (Curriculum development and Lesson preparation).
- Bearden High School teachers use the Internet much more often for research than for communication.
- As a Bearden High School teacher's years of experience increases, their use of computers for the following tasks decreases: Curriculum development, Lesson preparation, Lesson delivery, Internet use, and Communication with students.

- As a Bearden High School teacher's self-assessed level of computer knowledge increases, their use of computers for the following tasks increases: Grade book maintenance, Curriculum development, Lesson preparation, Lesson delivery, Internet use and Personal use.
- The Bearden High School Business Department teachers use computers for everyday tasks more frequently than teachers of other academic departments.

Recommendations

The findings of this research are limited due to the relatively narrow scope of the investigation. However, there are clear recommendations that have surfaced as a result of careful examination of this study. This researcher's recommendations for fellow researchers and educators include:

- Pilot testing the survey instrument prior to implementation.
- Conducting further research to include other schools and teachers in the Knox County School System.
- Conducting additional research using this survey instrument to accommodate reliability testing and to improve the ability to generalize findings.
- Conducting additional research to determine a possible correlation between teacher computer access at home and overall teacher computer use.
- Employing different data collection techniques for ascertaining and defining factors behind the technology use of teachers.

Implications

The major implications of this research are as follows:

- Administrators, in-service coordinators, and teachers must be aware of how (a) years of experience, (b) knowledge of computers, and (c) department affiliation relate to teacher technology use.
- Administrators need to “lead by example” and place technology and curriculum integration as a primary building-level initiative, e.g. use of email for communication with faculty.
- Administrators must also provide adequate technical support in order for teachers’ primary focus to be curriculum and not hardware/software maintenance.
- More technology training needs to be available for teachers.
- An awareness of teacher demographic data can aid administrators in facilitating timely and appropriate training.
- Technology training must include both the use of computers for administrative and communication tasks, as well as practical uses for computers in the classroom.
- Standards for technology use and integration need to be established and specifically created for individual academic departments.
- In-school and out-of-school release time should be established for teacher technology training.

- Technology training should be coordinated for and targeted toward those teachers who have one or more of the following characteristics:
 - advanced years of teaching experience,
 - a low self-assessed knowledge of computers,
 - a department affiliation that reported low-levels of technology use.
- The use of blended instruction—instruction using both traditional and technical components—should be considered, as appropriate, for the purpose of enriching and fortifying learning.

REFERENCES

References

- Akbaba, S. & Kurubacack, G. *Teachers' Attitudes Towards Technology*. (n.d.)
Retrieved November 11, 2001, from
<http://www.webcom.com/journal/akbaba.html>
- Becker, H.J, Ravitz, J.L. and Wong, Y. (1999). *Teacher and Teacher-Directed Student Use of Computers and Software*. Retrieved November 30, 2001, from
University of California, Irvine Web site:
http://www.crito.uci.edu/tlc/findings/computeruse/html/body_startpage.html
- Benson, S.J. *Computer Anxiety: Impediment to Technology Integration?* (n.d.).
Retrieved November 11, 2001, from
<http://pt3.nmsu.edu/educ621/sharon2.html>.
- Benton Foundation. (2001). *Digital Divide*. Retrieved October 10, 2001, from
<http://www.benton.org/digital/>
- Brosnan, M. (1999). Technophobia: The Psychological Impact of Information Technology. [Electronic version]. *Computers & Education*, 33, 279-280.
- Charp, S. (2000, January). The Millennial Classroom [Electronic version]. *T.H.E. Journal*, Retrieved October 24, 2001, from
<http://www.thejournal.com/magazine/vault/A2581.cfm>.
- Gay, L. & Airasian, P. (2000). *Educational Research: Competencies for analysis and application* (6th ed.). Upper Saddle River, NJ: Prentice-Hall Inc.

- Good, D T. (2000). *The Digital Classroom: How Technology is Changing the Way We Teach and Learn*. Cambridge: Harvard Education.
- Hinostroza, E. & Mellar, H. (2000). Teachers' Belief About Computers: Report of a Case Study. *Educational Computing Research*, 22(4), 397-409.
- Kleiman, G. M. (2001). Myths and Realities About Technology in K-12 Schools. *Journal of Leadership and New Technologies*. Retrieved October 23, 2001, from <http://www2.edc.org/LNT/news/Issue14/feature1.html>
- Mayfield, J. (2000). *Comparisons of the Motivational Sources of High School Business Students*. Unpublished master's thesis, The University of Tennessee, Knoxville.
- Nash & Moroz. (1997). *Findings from a National Survey of Users of Community Technology Centers*. Retrieved October 23, 2001, from <http://www.ctcnet.org/impact98/imp98toc.htm>
- National Academy of Sciences. (2000). *Reinventing Schools: The Technology is Now!* Retrieved December 1, 2001, from <http://www.nap.edu/readingroom/books/techgap/navigate.cgi>
- Reed, W. M. & Overbaugh, R.C. (1993). The Effects of Prior Experience and Instructional Format on Teacher Education Students' Computer Anxiety and Performance. *Computers In School*, 9(4), 75-89.
- Rice, M. (1995). Issues Surrounding the Integration of Technology into the K-12 Classroom: Notes from the Field. [Electronic version]. *Interpersonal*

Computing and Technology: An Electronic Journal for the 21st Century, 3(1), 67-81.

Rowand, C. (2000). Teacher Use of Computers and the Internet in Public Schools.

[Electronic version]. *Education Statistics Quarterly*, Retrieved November 30, 2001, from <http://nces.ed.gov/pubs2000/quarterly/summer/3elem/q3-2.html>

The Milken Family Foundation. (1999, February 23). *Information Technology Underused in Teacher Education*. Retrieved January 10, 2002, from <http://www.mff.org/edtech/article.taf>

United States Department of Education, National Center for Educational Statistics.

(2001, September). *Teachers' Tools for the 21st Century*. Retrieved October 10, 2001, from <http://nces.ed.gov/pubs2000/2000102.pdf>

Zehr, M.A. (1998, April) Teaching the Teachers. *Education Week*. Retrieved December 20, 2001, from <http://www.edweek.org/sreports/tc/teach/te-n.html>

APPENDICES

APPENDIX A

SURVEY INSTRUMENT

Teacher Use of Technology Survey

Instructions: Your assistance is needed to determine teacher use of technology. Participant anonymity will be maintained, and all responses will be confidential. Only summary data will be compiled and reported in conjunction with the researcher's master's thesis.

Your completion of the survey constitutes your consent to participate in this research project. You may withdraw your consent at any time without penalty.

Please circle the response you deem most appropriate for each of the following items.

1. How many years have you taught?
 1-5 6-10 11-15 16-20 21-25 over 25
2. How would you rate your level of computer knowledge?
 Beginner Intermediate Advanced
3. Do you have a computer in your classroom?
 Yes No
4. Do you use a computer at home?
 Yes No
5. Do your students use computers to perform classwork?
 Yes No
6. Please list your academic department _____

Please indicate the response that best represents the frequency with which you use computers to perform the selected tasks.

- 5 – Daily
 4 – Weekly
 3 – Monthly
 2 – Once every nine weeks
 1 – Once a semester
 0 – Never

Computer Use	Frequency of Use				
Grade book	5	4	3	2	1
Attendance maintenance	5	4	3	2	1
Curriculum development	5	4	3	2	1
Lesson preparation	5	4	3	2	1
Lesson delivery/presentations	5	4	3	2	1
Internet research	5	4	3	2	1
Student work	5	4	3	2	1
Professional communication with administration	5	4	3	2	1
Professional communication with other faculty	5	4	3	2	1
Professional communication with students	5	4	3	2	1
Professional communication with parents	5	4	3	2	1
Personal use	5	4	3	2	1
Other (please describe)	5	4	3	2	1

*Respondents completed the research instrument in its original state, which was a larger-font version of what appears on this page. For thesis publication purposes, the researcher reduced the size of the survey instrument in order to comply with The University of Tennessee thesis publication guidelines.

APPENDIX B

FORM A

Form A

IRB # _____

Certification for Exemption from IRB Review for Research Involving Human Subjects

A. Principal Investigator(s) and/or CO-PI(s):

Jennifer Lembright
Dr. Vickie Stout

B. Department:

College of Human Ecology
Human Resource Development

C. COMPLETE MAILING ADDRESS AND PHONE NUMBER OF PI(s) and CO-PI(s):

Jennifer Lembright	3700 Sutherland Ave., Apt. J-5 Knoxville, TN 37919	865/946-4383
Dr. Vickie Stout	1215 West Cumberland Ave. 310 Jesse Harris Building Knoxville, TN 37996	865/974-6289

D. TITLE OF PROJECT:

Comparisons of the Technology Integration of Secondary Teachers

E. EXTERNAL FUNDING AGENCY AND ID NUMBER:

N/A

F. GRANT SUBMISSION DEADLINE:

N/A

G. STARTING DATE:

April 2002

H. ESTIMATED COMPLETION DATE:

May 2002

I. RESEARCH PROJECT:

1. Objective(s) of Project:

The purpose of this study is to determine teacher use of technology at Bearden High School. Comparisons will be made based on teacher experience, teacher knowledge of computers and teacher department affiliation.

Subjects:

The participants of this study will include all of the teachers at Bearden High School in the spring of 2002.

2. Methods or Procedures:

After the researcher acquires appropriate human subject approval from The University of Tennessee, the Knox County School System and Bearden High School Administration, the survey will be administered to all teachers during the spring semester of 2002.

Descriptive statistics will be employed to analyze the raw data, such as Microsoft Excel and SOSS software. The researcher will seek additional counsel from the statistical services at The University of Tennessee, Knoxville.

3. Category:

Paragraph 2 – research involving survey or interview procedures – entitles this research effort to exemption, per 45 CFR 46.101 (b) from review by the Institutional Review Board. The probability and magnitude of hard or discomfort anticipated in the research are not greater in and of themselves than these ordinarily encountered in daily life or during the performance of routine physical or psychological examination or tests.

The researcher will ensure all records will be kept confidential. The records will be stored in a locked cabinet belonging to Dr. Vickie Stout, an associate professor in the Department of Human Resource Development in the College of Human Ecology at the University of Tennessee, Knoxville. Data will be made available only to persons conducting the study.

- J. CERTIFICATION: The research described herein is in compliance with 45 CFR 46.101 (b) and presents subjects with no more than minimal risk as defined by applicable regulations.

Principle
Investigator

Jennifer Lombright Jennifer Lombright 5/3/02
Name Signature Date

Student Advisor/
Committee Chair

Vickie J. Stout Vickie J. Stout 5-3-02
Name Signature Date

Dept. Review
Committee Chair

Sharon J. Bartley Sharon J. Bartley 5-7-02
Name Signature Date

APPROVED:
Dept. Head

Michael Lane Morris M. Lane Morris 5-7-02
Name Signature Date

VITA

Jennifer L. Hartzler was born in Peoria, Illinois in 1977, the third daughter of Philip D. Hartzler and Linda R. Hartzler. In 1995, Miss Hartzler entered Taylor University in Upland, Indiana and earned a Bachelor of Arts in Business Administration Cum Laude in May of 1999. In August 2000, Jennifer L. Hartzler and Jonathan A. Lembright were married in Morton, Illinois and moved to Knoxville, Tennessee shortly after to begin graduate work. Mrs. Lembright was accepted into the University of Tennessee Graduate School in January 2001 in pursuit of a Business/Marketing Teaching License and a Master of Science in Human Ecology, for which this thesis is the final requirement. During the 2001-02 school year, Mrs. Lembright served as an Intern in the Marketing and Business Departments at Bearden High School. Mrs. Lembright and her husband will be moving to East Lansing, Michigan in August 2002 where she plans to work as an educator.

