FACTORS AFFECTING TEACHERS' USE OF COMPUTERS
AS PERCEIVED BY RURAL SCHOOL PRINCIPALS

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AN ABSTRACT OF DISSERTATION OF

Mudawi M. Elmusharaf, for the Doctor of Philosophy degree in Curriculum and Instruction. Presented on May 17, 1989 at Southern Illinois University at Carbondale.

TITLE: Factors Affecting Teachers' Use of Computers as Perceived by Rural School Principals.

Major Professor: Dr. Pierre Barrette.

This study addressed the effects of five factors on teachers' use of computers from the perspective of rural school principals. The factors under investigation were: (1) negative attitudes toward computers on the part of teachers; (2) physical location of computers in schools; (3) existence of a computer coordinator in schools; (4) lack of adequate computer training; and (5) various subjects taught by teachers.

Nine research questions focused on the effect of these five factors on the number of computer users and the frequency of computer use by teachers in schools. The tenth question focused on the differences between elementary and high schools with regard to all the above questions.

A stratified random sample method was used to select 52 elementary schools and 37 high schools from 34 counties falling in the states of Illinois, Missouri, and Kentucky. This sample represented 23% of the schools in this area. A
frequency of computer use. Physical location of computers in schools was found to have an effect on the frequency of computer use by teachers.

The results also showed significant differences in the frequency of computer use among various subjects taught by teachers which lead to the conclusion that the frequency of computer use by teachers is affected by the subjects they teach.

No significant difference between elementary and high schools was found concerning the effects of all the five factors. Concerning the various subjects taught by teachers, a significant difference between elementary and high schools was found only in English and Social Studies.
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CHAPTER I

Introduction

Background to the Study

Many educators and social scientists tend to call the recent decades "the information era" because of the extraordinary development in the area of information and communication. The innovation that attracted most of the attention in this information era is the computer. Computers, particularly after the appearance of the microcomputers in the late 1970's, are having and will continue to have a tremendous impact on our society and culture. They are becoming an integral part of every aspect in our lives. Moursund (1986), stated that "the United States has now moved out of the industrial era and into an information era".

Using computers is becoming a necessity for almost everyone living in this society. Xinzer, Sherwood, and Bransford (1986) wrote:

"Note that inventions such as clocks, automobiles, and written language required new types of learning. Once these inventions began to be used frequently, people had to learn to tell time, to drive cars, and to read. Similarly, people must now learn something about computers in order to function effectively in society" (p. 6).

About the necessity of computers in education they mentioned that students who do not become computer literate will be at disadvantage once they graduate from school.
They also mentioned that educators have been encouraged to use computers to improve learning in the classroom.

From reviewing a number of research studies about the use of computers in instruction, Rooze and Worthup (1986) summarized the following advantages for this use:

1. Individualizes instruction, allowing the student to progress at his or her own speed.
2. Can branch to different parts according to student's response.
3. Provides immediate feedback and reinforcement.
4. Flexible and can meet a variety of needs.
5. Involves the student actively.
6. Can free teacher from some instruction and grading tasks.
7. Gives the individual student undivided attention.
8. Creates non-threatening, non-competitive environment.
9. Changes the role of the teacher.
10. Leads to a sense of power and understanding of the machine.

Educators' tasks, in this technological and rapidly changing society, are becoming more difficult. Educators have to keep up with all the changes that take place in their society.

Lounge and Walker (1988) said,

"Education is much more complex today. Instruction is often interdisciplinary with the quality of information far beyond that which can be covered in a
single source. Educators are being charged with the
task of producing high school graduates who can think
critically and solve problems in situations involving
abundant information and multiple solutions.

Mouraund (1986) stated that "It is only recently that I
have begun to think carefully about what constitutes an
appropriate educational system for an information era
society. My progress so far tells me I (and our educational
system) have a long way to go".

Our society has changed dramatically during the last
two decades but we do not see this much change happening in
our educational system which should be responding to the
changes in the society. Oliva (1988) said "Human
institutions like human beings themselves grow and develop
in proportion to their ability to respond to change and to
adapt to changing conditions". One of the ten axioms he
counted for curriculum is that curriculum not only reflects
but is a product of its time.

There are different levels of educators who are in
responsible for making this change but the main tools for
carrying out these changes in the educational system are the
teachers. The magic is in the teachers, and not the
computer (Lounge & Walker, 1988). The question that we, as
educators, should ask ourselves is: have we really prepared
our teachers for carrying out this task? In this
information era computer literacy is becoming a vital job
skill as basic as reading (Bitter and Gamse, 1988).
reason why teachers are not making the maximum use of computers. The study attempts to find some answers by investigating these five factors that may contribute to this minimum use of computers by teachers. These factors will be looked at from the perspectives of school principals and not the teachers.

Principals are expected to be instructional leaders who know what teachers are doing.

"The principal occupies a key position that bridges the gap between context and school, policy and program, and means and ends. The principal's importance emerges from that position. He or she has the greatest access to the wishes and needs of district leaders, parents and community members, school staff, and students" (Dwyer, 1985).

The study also attempts to give some suggestions and recommendations concerning this problem in the final chapter.
Statement of the Problem

Despite the fact that computers exist in 95.6% of the public schools in the U.S., still half of the teachers have never used a computer before (Office of Technology Assessment, 1988). Educators are trying to find out the reason behind this phenomenon.

Many studies have dealt with the factors affecting teachers use of computers but not too many of them have approached it from the perspective of school principals. In addition to this, there is a lack of studies concerning the effect of these factors on computer use in rural schools.

The purpose of this research was to study five of the factors affecting the use of computers by teachers from the perspective of rural school principals and to determine whether there were any differences between elementary and high schools principals concerning these perceptions. The factors under investigation were (1) the negative attitudes of teachers toward computers; (2) the physical location of computers in schools; (3) the existence of someone to coordinate teachers' use of computers in schools; (4) the lack of teachers' computer training; (5) the subjects taught by teachers. An attempt also was made to determine whether there was a difference between elementary and high schools concerning these five factors.
Significance of the Problem

Microcomputers entered schools for the first time, in the second half of the 1970s. Since that date, the number of computers in schools has been growing very rapidly. "The number of computers doubled and redoubled. It is estimated that a doubling was occurring every 14 months. Futurists pointed to the time, not too many years away, when there will be a computer for every student" (Moursund, 1987/88).

In 1981 computers had been used in only 13.2% of the American schools. This percentage jumped to 85.1% in 1984 (Hood, 1985). According to the Staff of Curriculum and Instruction Center (1987) 95.6% of the public schools were using computers in the year 1987 with an average of 14.1 computer per school. The Office of Technology Assessment (1988) estimated the number of computers in all American schools to be 2.1 million and in public schools to be 1.7 million computer. The number in public schools was estimated by Electronic Learning to be 1.5 million computers (Burder, 1989).

The money spent on hardware for instructional computing over the last two decades was estimated by the Office of Technology Assessment (1988) to be $2 billion (p. 6). Moursund (1987/88) said that the money spent on hardware for precollege education in the year of 1987 was $350 million. According to the Office of Technology Assessment (1988)
there are about 900 suppliers for instructional software and
their annual sales are about $200 million.

The disastrous situation that education is confronting
is shown by the fact that half of the teachers have never
used a computer before despite this huge amount of money
being spent on computers in schools. "All the hardware and
software in the world isn't worth a hill of beans unless
teachers know how to use them" (Pantiel & Peterson, 1985).

The Office of Technology Assessment (1988) reported
"Despite the presence of computers in almost all American
public schools, only half of the nation's teachers reported
having used computers. The number who use computers
regularly is much smaller" (p. 14). Education leaders are
pouring huge amounts of money into educational computers
while teachers are not making use of them.

By knowing some of the reasons why teachers are not
using computers in the classrooms, we will be able to
suggest solutions to this problem and stop the drain and
waste of money that has been spent in this area without
getting the anticipated outcomes.

This kind of study is an important one for those who
are concerned about getting the most out the money they
spend in instructional computing. It can fit in some other
settings such as the third world countries where most of the
countries have very limited financial resources.
Research Questions

The purpose of this research was to study five of the factors affecting the use of computers by teachers from the perspective of school principals and to determine whether there were a difference between elementary and high schools concerning these factors. To achieve this purpose, the researcher developed the following research questions:

1. As perceived by rural school principals, do teachers have negative attitudes about computers that affect the number of teachers who use computers in schools?

2. As perceived by rural school principals, do teachers have negative attitudes about computers that affect the frequency of computer use by teachers in schools?

3. As perceived by rural school principals, is there any relationship between the physical location of computers in schools and the number of teachers who use computers?

4. As perceived by rural school principals, is there any relationship between the physical location of computers in schools and how frequently teachers use computers?

5. As perceived by rural school principals, is there any positive relationship between the existence of
any positive relationship between the existence of someone to coordinate the use of computers in schools and the frequency of computer use by teachers?

7. As perceived by rural school principals, is the number of teachers who use computers in school negatively affected by the lack of adequate computer training?

8. As perceived by rural school principals, is the frequency of computer use by teachers in schools negatively affected by the lack of adequate computer training?

9. As perceived by rural school principals, is there any relationship between subjects taught by teachers and how frequently they use computers in schools?

10. Is there any difference between elementary and high schools concerning the five factors affecting teachers' use of computers?
2. School principals will respond to this questionnaire.
3. The principals will be honest in their responses.

Limitations of the Study

The findings of this study will be limited by these factors:

1. The study was of a survey nature and no attempt was made to investigate or evaluate the effectiveness of computer utilization in schools.
2. All the results and conclusions of this study will be applicable only to the area in which the study conducted.
3. The study results were drawn from the perceptions of the school principals in K-12 education.
intervention of a human operator during the processing run (Hodgeski, 1986).

**Computer Coordinator:** An educator, working in a school setting, whose major goal is to improve education through appropriate uses of computers (Mason, 1987).

**Computer Intensity:** The total number of students in a school divided by the number of computers in the school.

**Computer Laboratory:** The installation of computer hardware in a centralized facility either as an independent unit or as network (Mason, 1987).

**Educational Software:** Computer programs written especially for educational applications (Mason, 1987, p.14).

**Elementary School:** A school that includes any combination of Kindergarten or grade 1 to grade 6.

**Hardware:** The physical components of a computer system, including all electronic and electromechanical devices and connections (Hodgeski, 1986)
connected to it (Mandell, 1986).

**Microcomputer**: A small, low-priced computer used in homes, schools and business; also called a personal computer or a home computer (Mandell, 1986).

**Minicomputer**: A large type of computer with the components of a full-sized mainframe system but with a smaller memory (Mandell, 1986).

**Principal**: The person who is the professional leader of a school division or unit, such as a high school, junior high school, or elementary school (Good, 1959).

**Public School**: A school usually of elementary or secondary grade, organized under a school district of the state, supported by tax revenues, administered by public officials, and open to all (Good, 1959).

**Overview of the Chapters**

Five chapters are included in this study. The first chapter, Introduction, includes background to the study, statement of the problem, significance of the problem, research questions, limitations of the study, definition of terms, and the overview of the five chapters.
Chapter II, Review of Related Literature, consists of four parts including: rural education, computers in education, teachers and computers, and factors affecting teachers' use of computers.

Chapter III, Methods and Procedures, is comprised of five sections: the research design, population and sampling, the null hypotheses, instrumentation, and the method of analysis.

Chapter IV, Analysis of Data, is mainly in three parts. The first part is the analysis of the data about the schools and the principals included in the study. The second part is dealing with the results of principals' opinions about the effect of the first four factors on the use of computers by teachers in schools. The third part is a presentation of the results concerning the frequency of computer use in different subjects. The last part is a summary of the chapter.

Chapter V, Summary, Conclusions and Recommendations, includes three sections: summary of the study, conclusions, and recommendations for further studies.
CHAPTER II

Review of Related Literature

Introduction

This chapter is intended to provide a conceptual framework for this study of the factors influencing the use of computers by teachers in schools. The review of literature will be presented in the following sections: rural education, computers and education, teachers and computers, and review of factors.

In the part on rural education, a definition of rural is presented, as well as some literature about the situation in rural schools. The computer and education section concentrates on the importance of computers, their impact on education, and the predictions of educators about the future impact of computers on education. Also this part presents the evolution of computers in the field of education and the rapid growth of its use.

The second section, teachers and computers, discusses how computers are changing teaching methods and the role of teachers. This part also illustrates the fact that most of the teachers are either not using computers or not making appropriate use of them.
The third section, factors affecting computer use, summarizes some of the research studies conducted to study the effect of various factors on teachers' computer use. This section presents some of what has been done in the literature about each one of the factors under investigation in this study.

**Rural Education**

**What is Rural Education**

Some people define "rural" as simply being the opposite of "urban". Ruralness has several degrees to different people (Milne, 1976). He said about rural schools, "rural schools can range from the one-room country school setting to the small comprehensive K-12 school district with the school population under 2,000 students". He said that the limited school population is not the only characteristic of rural schools. Another characteristic is that the communities are distant from any large city. According to him, people in the west and the midwest have another characteristic to attribute to ruralness which is being isolated.

**Poverty in Rural Areas**

Tamblyn (1971) wrote about the rural areas saying,

There is more poverty proportionally in rural America than in our cities. In metropolitan areas, one person in eight is poor and in the suburbs the ratio is
one to fifteen; in rural areas, one in every four persons is poor. . . . Some 30% of our population lives in rural areas, but 40% of the nation's poor live there. [p. 3].

The Situation in Rural Schools
In rural schools, the class size is relatively small. The average class size in these areas is 12 to 15 pupils in small schools and 24 to 27 pupils in large schools. This fact could have been an advantage for rural schools because it allows more individualized instruction but, unfortunately, it is contrasted by many other facts such as:

1- Teachers have less training.
2- Efficiency of staff utilization and flexibility are lowest.
3- Very limited financial resources.
4- Unit cost instruction are highest.
5- School terms are shorter.
6- Facilities are more inadequate.

In addition to mentioning these disadvantages for rural education, McClurkin (1970) also wrote

The financial resources of local rural schools have reflected directly the income levels of the patrons gainfully employed in the particular local patterns. Typically, these have not been varied enough to support an adequate educational program. This generalization about the local rural school can be applied to entire state system of rural education. State aid formulas are geared to minimum criteria, and quality services must come as supplements from local resources which the rural poor simply do not have. (p. 15).
He also said that teachers in rural schools have no adequate training and employed at lower salaries for shorter length of time. The percentage of teachers residing in the communities where they teach is smaller. "Most rural schools do not have specialized services beyond those of the regular teachers, and many of them do not have specialists available from outside the school". (p. 24).

In rural schools, as mentioned by Milne (1976), "everyone is treated as a group member, not as an individual; and when the group is average, the program of studies is average". This fact was also supported by Tamblyn when he said, "rural schools generally need to be stimulated into giving more attention to the need of disadvantaged youth. This implies more individualized instruction" (p. 16).

**Computers in Rural Schools**

Because of the poverty of rural areas, rural schools has always been behind urban and suburban schools in terms of the availability of computers and their use. The statistics of 1986-87 school year (The Staff of Curriculum Information Center, 1987) shows that the percent of suburban schools using computers was 97.5% while the percent of rural schools using computers was 94.8%. Ninety-eight percent of rich schools were using computers while only 90.7% of poor schools were using them. However, the microcomputer
Computers and Education

Importance

Computers are revolutionizing every aspect of our lives and our entire civilization might be transformed as a result of this computer technology (Coburn et al., 1985). *TIME* magazine in the issue of January 3, 1983, awarded the personal computer the distinction of being "The Machine of The Year" (Freidrich, 1983, January, 3). Sixty-eight percent of registered voters felt that the microcomputer would improve the quality of their children's education. Madsen and Sebastiani (1987) stated that the microcomputer has already affected education and will continue to have an increasing effect in the future. Computers are slowly but surely making many changes in schools. The change that computers will cause in American education is more dramatically than any other development that can be found on the horizon (McMann, 1988).

Huffman believes that it is a must for teachers to familiarize themselves with microcomputers to be able to
Bork (1987) wrote:

The change driven by the personal computer, will affect all levels of education from earliest childhood through adult education. It will be one of the major historical changes in the ways people learn. The impact of the computer in education will not produce an incremental change, a minor aberration on the current ways of learning system. (p. 3).

Educators should realize these facts and start dealing with them more seriously. The next crisis in education has been identified by the National Institute of Education and the National Science Foundation to be computer literacy. We must begin to help our students overcome their ignorance of technology (West, 1983).

Schools that do not include microcomputer usage and do not try to encourage and promote this usage are failing in their role of preparing students for the world in which they will be functioning and most probably their students will be handicapped (Huffman, 1983; Rogers et al., 1984).

**Future**

Many educators have tried to predict the effect of computers on education in the future. Luehrman (1985) wrote that computer technology will make the school of the future vastly different from the present. Bork (1987) tried to imagine the shape of these future schools saying:
This massive change in education will occur over the next twenty years. Schools will be very different at the end of that period. There will be fewer teachers, and the role of teachers will be different from the role of teachers in our current delivery system (p. 1).

Coburn et al. (1985) also tried to draw a picture of this future school and to describe what will happen to the children as a result of this change, saying: "They would no longer go to school for their education, but instead learn through interactive computer systems, linked to other people and information sources". According to Mullan (1984) teachers' expectation of children will also be changed.

Evolution of Computer in Education

The theoretical basis for the development of computer-based instruction was set by B. F. Skinner in his discussion of the teaching machines, which were developed in the 1920s, and the use of technology in teaching (Skinner, 1959).

The use of computers in education started in the 1950s utilizing the mainframe and the minicomputer. A big project called the PLATO (Programmed Logic for Automatic Teaching Operations) was developed at the University of Illinois supported by the National Science Foundation in 1959. This project covered the five areas of Accounting, Biology, Chemistry, English, and Mathematics. A few years later another project called TICCIT (Time-Shared Interactive Computer Controlled Information Television) was developed at
the University of Texas to include a complete college freshman level courses in Mathematics and English using the minicomputer and color television. Some other educational projects were also developed during that period utilizing the mainframe and minicomputer (Hasselbring, 1986).

The invention of the microprocessor in the early 1970s revolutionized this area by giving birth to a new generation of computers called the microcomputers, characterized by their portability, flexibility, ease of use, and low price. Schools started to purchase the microcomputers in the late 1970s. In less than a decade the number of microcomputers in schools jumped to over 2 million, and the percent of schools owning microcomputers jumped to 95.6 percent with an average of more than 14 microcomputers per school (Office of Technology Assessment (OTA), 1988).

**Teachers and Computers**

**Changing Role**

To meet the technological change caused by the computer revolution in the area of education, American schools are changing their teaching methods and processes (Harmon, 1986). Some educators tried to imagine the change in the role of teachers according to this revolution.

It would seem more reasonable to me to move toward a situation where although the teacher guides the child
in his use of information, he does not stipulate what information needs to be used, but which skills need to be developed. A more open approach to education that harnesses problem-solving and analytical skills and seems more efficacious in these circumstances (Mullan, 1984, p. 136).

Moursund (1987) also believes that the widespread use of instructional computers, in addition to its contribution to mastery learning and individualization of instruction, will change the role of teachers from deliverers to facilitators of information. According to Mullan (1984), the use of computers will change teachers' expectation of children, subject matter, and teaching methods. At levels of education will be affected by this computer revolution according to Bork (1987).

The change driven by the personal computer will affect all levels of education from earliest childhood through adult education. It will be one of the major historical changes in the way people learn. The impact of the computer in education will not produce an incremental change, a minor aberration on the current ways of learning, but will lead to entirely different learning systems (Bork, 1987, p. 3).

Some educators believe that the change is already happening. It is not just a prediction of what is going to happen in the future. "Both the role of teacher and the classroom structure changed significantly when ICAT went in the classroom. Teachers have given some of their tasks to the machine" (Chaiklin & Lewis, 1988).

Church et al. (1985) see that computers are freeing teachers and giving them more chance to give attention to the personalized aspects of teaching.
through this phase to reach the future phase, in which the teacher is the facilitator of the learning process.

The report of the Office of Technology Assessment (OTA) sees computers as tools that are positively affecting the teaching profession. "New technologies are making possible imaginative approaches to teaching traditional subjects and are motivating teachers and children to try new ways of information gathering and learning" (Office of Technology Assessment, 1988, p.1).

Minimum Use

The literature review showed that, despite the existence of computers in 95.6 percent of the schools, almost half of the teachers are not using them for instruction (Office of Technology Assessment [OTA], 1988).

Perskill (1988) wrote:

While the availability of quality software/courseware and the numbers of computers in schools has been increasing, teachers still face barriers to effectively using computer technology to enhance the learning outcomes of their students.

The barriers mentioned included lack of information and training, teachers do not understand how to use
instructional software, and the difficulty of integrating the software into the daily classroom curriculum.

In a national survey, Lehman (1985) surveyed 340 high school science department heads, 85 schools from each of the four national assessment regions. A total of 193 (57%) of the questionnaires were returned. Seventy-seven percent of the respondents said that they, as department heads, did not use microcomputers in their classes. Seventeen percent used microcomputers occasionally, and only 6% said that they used computers on regular basis.

Marburger (1987) in her study of 1067 middle school teachers in Columbus public school district found that 55 percent of the teachers had no experience teaching with computers.

Bruder (1989) said, "considering some estimates show fewer than 15 percent of all teachers in the United States use computers in their teaching". The big numbers of computers accumulated in schools do not guarantee a quantum leap toward efficient usage, effective instruction, or positive learning. A computer is just a medium. It could be misused, inappropriately used, or even neglected (Hill, 1983).

Even though the computer technology is affecting our lives and is expected to transform our entire civilization, many educators have not yet caught up with the current computer revolution (Coburn et al., 1985).
Shane (1987) mentioned that the education system has been criticized for its failure to prepare students with the needed competencies for the workplace. Also the National Task Force on Educational Technology (1986) reported, "While educational institutions have made increasingly large investment in educational technology, the technology has often been misused or underused (p. 59).

Teachers should not be blamed for this failure because many of them have not been trained to use computers and many of those who have been trained were complaining that the training was not sufficient. Wollard (1988) described this saying:

Many teachers are wondering whether they haven't been sold a bill of goods. Pushed into computer seminars, rushed through learning how to use a computer, but inadequately trained in how to teach with it, some teachers question whether their time would not be better spent taking courses related to the curriculum they teach."

**Factors Influencing Computer Use**

**Research Studies**

Marburger (1987) studied the factors affecting classroom use of computers. She surveyed 1067 middle school teachers who teach grades 6-12 in Columbus Public School District. She found that 59% of the respondents had no experience teaching with computers. Fifty-eight percent of them said that the reason for not using computers was that instructional computer applications were not integrated into
their curriculum. Fifty-two percent of them said that the hardware was not available for them. She found no significant relationship between the demographic factors (sex, age, and years in the job) and computer use. Also she found no significant relationship between computer use and grade level taught or having a computer at home. Her study showed that 49% of Mathematics teachers were using computers followed by the Reading teachers 32% then the Language Arts teachers 28%. The reasons for not using computers as showed in her study were: (1) hardware not available; (2) quality of software not available; (3) no training opportunities for teachers provided by their district.

Smith [1987] studied the relationship between some variables and the implementation proneness in science curricula. The participants were 67 middle/junior high school science teachers. High computer anxiety was found to be associated with low microcomputer implementation proneness. Computer training was found to be positively related to microcomputer implementation proneness. Teachers' perceptions of principals' leader behavior was negatively associated with the microcomputer implementation proneness. Age and years in the job were found to have no significant effect on microcomputer implementation proneness.

Mason [1987] studied the factors influencing the use of computer laboratories in four junior high/middle schools in
the district of Columbia. These four schools were identified by United States Department of Education as outstanding secondary schools. The subjects of this study were 23 computer literate individuals. Five of them were school computer laboratory coordinators, two were educational technology aides, and the rest of them (16) were classroom teachers. The variables studied by Mason were time availability, laboratory location, availability and usefulness of software, teachers' computer expertise and perceptions, and the role and perceptions of the computer coordinator. All these factors were found to have an effect on computer use. In addition to these factors, some other factors were found to have an effect on computer use too. These factors were hardware limitations, instructional strategies for using microcomputers, and full-time computer coordinator.

Ingersoll and Smith (1985) reported from the national survey conducted in 1983 in which 5,000 teachers and 1,000 administrators were surveyed to gather information on trends in teacher attitudes toward microcomputers, availability of microcomputers, and administrator purchasing plans. The survey found that the major factors limiting the use of computers by teachers were the limited number of computers, inequitable distribution of equipment, and the lack of quality software.
The reasons for not using computers cited by Watson et al. (1987) were: (1) lack of computer equipment; (2) poor quality software; (3) computer technologies are a fad; (4) the computer is viewed as an additional supplement to education rather than an intellectual tool; (5) the computer is viewed as an additional subject area rather than a means for students to achieve productive results.

Yoder (1986) studied how the gender of elementary teachers affects their degree of computer literacy and their attitudes about computers, how the number of years in the job of elementary teachers affects their degree of computer literacy and their attitudes about computers, and how the attitudes of elementary teachers about computers affects their degree of computer literacy. The subject of this study were 344 elementary teachers in northwest Ohio. The conclusion from this study was that the only significant correlation was found between attitudes about computers and the degree of computer literacy.

Watkins and Brim (1985) studied the use of computers in 14 elementary and secondary schools in the Midwest. They received responses from 60% of the teachers and 95% of the administrators. In this study, 42% said that the reason for not using computers was scheduling difficulties. Forty percent said there were no enough computers, and 26% said that the software was not very good. Only 8% of the respondents said that they had no computer training. They
found no difference between males and females concerning the use of computers in schools.

**Attitudes Toward Computers**

"The explosion of computer technology and knowledge has forced numerous changes on our society, producing feeling of anxiety, stress, and intimidation in many people due to their lack of computer knowledge, self-doubt, and fear of sudden change" (Bennett, 1985, p. 23). For the development of a successful computer implementation in education, we must consider the positive attitudes of teachers about computers because teachers hold the key to the success or failure of it (Mason, 1987, p. 8).

Lumsden and Norris (1984) said that teachers attitude toward educational computing is an important factor to be considered by educational administrators when they plan for the implementation of computers in education. They argued that computer technology can not be implemented successfully without the desire and willingness of teachers and that teachers are in a position to either facilitate or sabotage the best-laid plans of educational administration. They surveyed 450 public school educators in Denton, Texas about their attitudes toward the use of educational computer. The conclusion they reached was:

**Educators' attitudes seem, however, to be positive toward computers as long as the function of the**
computer is removed from their experiential world of practice. When the suggestion is made that computer for their classroom use are desirable, proportion of educators expressing agreement drops precipitously.

Lumaden and Norris (11984) also mentioned that "cyberphobia, fear of computers, is now a common affliction affecting literally millions of Americans". Becker (1985) wrote, "while school systems press to implement computers, teachers vary on the quality of their expertise, interest and acceptance of new technology and seem to express a basic fear of computers". Some educators, like Allen (1985), argue against this notion. Allan thinks that teachers do not fear the computer but they are too busy to learn about it.

Harmon (1986) mentioned that at the beginning of the computer movement, there was a negative attitude toward computers from teachers because they felt that they might be replaced by computers.

Bitter and Gamuse (1988) wrote that teachers are not immune to the attitude of resistance to change which appear to be pervasive in the society.

Location of Computers

Locating the computers in the school building varies from one school to another. The report of the Office of Technology Assessment (OTA) (1988) mentioned "in some schools there is a computer in each classroom; in others, laboratories with 20 or 30 terminals accommodate groups for
any where from 20 minutes to 2 hours per week" (p. 1). The report talked about the different options of locating computers in schools. "In practice, there is a wide disparity, one computer in a classroom, clusters of computers in the library or classrooms, full computer laboratory, and classrooms with no computers" (p. 4).

Mason (1987), in her study of factors influencing the use of microcomputer laboratories, considered the physical location of the computers in the school as one of the factors that might affect computer usage, "where schools put their microcomputers can affect who will use them, how they will be used, and how great an impact they will have on students and teachers" (p. 5).

Bitter & Gamuse (1988) wrote some suggestions about where to place computers in the school building.

There are benefits and limitations inherent in any placement of computers. The ideal placement may be one that places computers in a lab and also in individual classrooms. But when numbers of computers are limited, a school must make a choice based upon availability of staff, physical space, and funds for hardware and software (Bitter & Gamuse, 1988, p. 209).

According to Bitter and Gamuse (1988), the placement of microcomputers can be more substantial problem in grades seven through twelve because the classes are departmentalized and the teacher meets with a new group of students every hour. They mentioned some advantages and disadvantages for placing a computers in computer lab with the advantages they cited were: teachers can instruct
students in different computer skill in whole group lessons and students receive more computer time. The disadvantages they listed were:

1. It will be more difficult to integrate computer use into the curriculum.
2. Students may be required to share computers every time they come to the lab.
3. It requires employing a computer teacher to take care of the lab.
4. It requires buying program disks equal to the number of computers in the lab if there is no network in the school.

The results of a national survey on the use of computers in school, in which 2,265 elementary and secondary schools were surveyed, were discussed by Becker (1985). Four options to locating computers in schools were mentioned: computer laboratory supervised by computer specialist; one or more regular classrooms to be used by individual teachers with their own classes; common spaces, such as the library where teachers may send individuals or groups to use computers under the supervision of a school librarian; rotating computers between rooms. The conclusion from the discussion was that the laboratory has positive consequences in both elementary and secondary levels. In secondary schools, libraries encouraged computer use by teachers more than do computer labs.
From examining five computer location alternatives, Becker (1986) found that a computer laboratory set-up had the most reported positive effects.

Coordinator for Computer Use

Becker (1986) described the curriculum coordinator as a secondarily teacher and said that the role of the computer coordinator is developing slowly.

Edmundson (1986) thinks that it is enviably required for the computer use in school that one of the staff be designated as a computer specialist. He described the task of this person as follows:

This is the person whom other teachers turn for help and advice and who assists with the in-school education/training of their colleagues. Few teachers at present possess the educational and technical knowledge which ideally, the past calls for. This is why most often than not, it is the enthusiast who takes over this role and learns many of the required skills as he (or she) goes along (p. 75).

The job of this computer coordinator was also discussed by Pinkel (1984-85) who served as a computer curriculum coordinator for three years for 23 school districts in San Mateo County, California. What he said about the requirements for this job is:

It is my feeling that a good computer coordinator does not need to be a computer science expert but does need to have a basic computer science understanding (perhaps the elementary school requirement) plus a host of other skills, the first being to know where the resources are and how to tap them. Today's computer coordinator needs a strong curriculum background in a variety of subject areas as well as administrative
knowledge and skills. This person should have classroom teaching experience, including the use of computers in curriculum area(s). A computer coordinator needs the knowledge and the skills necessary to act as the computer advocate in many curriculum areas, computer science being just one of them (Finkel, 1984-85).

Fisher and Finkel (1984) listed a number of tasks to be done by the computer coordinator. These tasks are:

- Scheduling for computer use, cataloging software, maintaining equipment, and seeing that it is used properly.
- The existence of somebody who acts as a computer coordinator in the school was found to have an effect on teachers use of computers (Mason, 1987; Fisher & Finkel, 1984; Edmundson, 1986; Kepner, 1986).

**Computer Training**

Training teachers how to use computers effectively is a major problem in all countries (Bork, 1987). Pantiel & Peterson (1985) wrote, "In the rush to establish the best student-computer ratio, many a well intentioned administrator has failed to budget adequate funding to train teachers".

Studer (1989) wrote "many teachers emerging from teacher education programs are unprepared to teach using computers". For this problem, he blamed undergraduate programs in schools of education "How well do undergraduate programs in schools of education prepare preservice teachers for technology use in the classroom? Not well enough,"
according to deans, professors, computer coordinators and
other administrators interviewed by Electronic Learning".

The Office of Technology Assessment (OTA) (1988)
reported that the vast majority of teachers and those who
are planning to become teachers have had little or no
computer education or training. According to this report,
not more than 33% of all K-12 teachers have had as much as
10 hours of computer training. Most of it was at the
computer literacy level. That means it was on how to use
computers and not on how to teach with them. The report
said, "investment in technology cannot be fully effective
unless teachers receive training and support" (p. 14).

Teachers who teach Mathematics, Science, and Computers
in South Carolina were surveyed in 1985. Fifty-seven
percent of them were found to have had no training regarding
the use of computers in class (Dickey & Kherloptian, 1987).

Madsen & Sebastiani (1987), surveyed 60 secondary
school teachers in a suburban northeast Pennsylvania School
District. They found that the participation in an
in-service computer literacy course significantly improved
teachers attitudes toward computers and their knowledge
about computers. The greatest improvement was found to be
the reduction in anxiety about computers.

Computer training was found to have had a direct effect
on teachers' use of computers (McBurger, 1987; National
Task Force in Educational Technology, 1986; National

An exception to this was Ingersoll and Smith (1985) who reported, "classroom computer use was not significantly affected by teacher training".

Subjects taught by teachers

A national survey about the use of computers was conducted in 1982. In this survey, 1700 teachers were surveyed. This survey reported 76.7% use of computers by the mathematics teachers, 34.7% by the reading teachers, 32% by the computer literacy teachers, 14.7% by science teachers, 12% by business teachers, and 5.3% by social studies teachers (National Education Association, 1982).

Another national survey on computer uses in schools conducted in 1985 showed that 66% of computer use at the elementary schools was by classroom teachers. Ten percent by special education teachers. A small portion of the use was reported by mathematics specialists, reading specialists, and computer specialists. At the secondary level, the results showed that computers were used by 33% of the business teachers, 21% of the mathematics teachers, 12% of the science teachers, 11% of the industrial arts teachers, 7% of the English teachers, and 5% of social studies teachers (Becker, 1986).
In 1984, a study was conducted to review the software available for education. This study reviewed 2054 computer instructional programs. The programs for mathematics were found to be 28% of these programs. The rest of them were 21% for language arts, 11% for science, 6% for social studies, and 5% for reading (Williams, Williams, & Philip, 1985).

Nelson and Waack (1985) surveyed 1749 school principals in Iowa state about the use of computers in their schools. The results showed that 92.1% of them reported computer use by mathematics teachers with 60.6% reporting average to frequent use, 85.7% of them reported computer use by science teachers with 56.4% reporting average to frequent use, 82.2% of them reported computer use by business teachers with 66.1% reporting average to frequent use, and 75.1% of them reported computer use by English and language arts teachers with 21.5% reporting average to frequent use. The least reported was the use by physical education teachers which was reported by 17.9% of the principals with 0% reporting average to frequent use.

**Difference between elementary and high schools**

In 1983, 2,209 elementary and secondary school nationwide were surveyed about the use of computers. In the results summary of this survey Becker (1985) wrote:
Secondary schools have been dominating microcomputer use, at least until recently. In 1983, high schools were twice as likely to own a microcomputer as elementary schools, they had nearly four times as many of them (and even considering their larger student bodies, twice as many per student), and they used them for more hours of the week. As a result, out of the total time that microcomputers were used by students in schools, about three-quarters was in secondary and middle schools—only one-fourth was in elementary.

Elementary schools were also affected by having microcomputers with less capacity. For example, in 1983, 37% of microcomputer-owning elementary schools did not have any disk drives for their microcomputers. This was three times the fraction of micro-owning secondary schools without disk drives. Ten percent of secondary schools with micro had their machines linked in a "network" of some kind, whereas this was true of only 1% of microcomputer-owning elementary schools (p. 6).

He also found that the computer intensity and the number of computers were even less favorable in elementary schools than were in secondary schools. Another result of this survey was that the microcomputer was used 11 hours per week in elementary schools compared to 13 hours per week for secondary schools.

In the discussion of another national survey conducted in 1985, Becker (1986) wrote:

In 1983 typically only one or two teachers used computers, now many more do. Two-thirds of the computer-using secondary schools have at least three teachers regularly using computers in their school, and one-third have at least six. For elementary schools, it's about the same.

During the last few years, the gap between elementary and secondary schools have been reduced but elementary schools are still behind. The percent of elementary schools
using computers jumped from 62.4% in 1984 to 82.2% in 1985 and to 94% in 1987. At the same time the computer intensity improved from 112.4 in 1984 to 79.3 in 1985 and to 43.7 in 1987. The number of computers per building increased from 3.6 in 1984 to 5.1 in 1985 and to 9.4 in 1987 (The Staff of Curriculum Information Center, 1987).

In 1984, a study was conducted to review 2054 instructional programs. At the elementary level the Mathematics came at the top with 29% of the software followed by Language Arts with 20%, the Science with 8%, and the Social Studies with 6% of the software. At the secondary level, the Science came first with 32% of the software followed by the Mathematics with 24%, the Language Arts with 8%, the Social Studies with 5%, and the Reading with 1% of the software (Williams, Williams, & Phillips, 1985).

Nelson and Waack (1985) in their survey of 1013 school principals in the state of Iowa showed a difference between elementary and secondary schools even in principals' attitudes. They reported that requiring all teacher education majors to complete at least one computer course during their preservice training was strongly favored by 84% of secondary school principals while it was favored by 95% of elementary school principals.
CHAPTER III

Methods and Procedures

Introduction

Research Design

This research study was descriptive in nature. The only exception for this was that a t-test and ANOVA test were used in this study. The t-test was used to see whether there was a significant difference between elementary schools and high schools with regard to the factors affecting teachers' use of computers. The ANOVA test was used to determine whether a significant difference exists among the subjects taught by teachers regarding the frequency of computer use. Descriptive research as defined by Gay (1976) is "Collecting data in order to test hypotheses or answer questions concerning current status of the subject of the study" (p. 10).

"In a descriptive method, the researcher investigates the status of a phenomenon: what it is and/or to what it is related" (Wolpert, 1984, p. 9). According to him, the descriptive method can provide useful information which allow a person to make intelligent decisions and it is commonly used in educational research.
The purpose of this research was to determine whether the use of computers by teachers in schools was affected by any one of the five factors under investigation. The problem was looked at from the perspective of school principals.

The area in which the study was conducted was the area of southern Illinois, southeast Missouri, and western Kentucky. It includes the 35 counties which fall within a circle within a 65 miles radius around the city of Carbondale, Illinois. For the purpose of this research, St. Clair county in the state of Illinois was excluded because it is a metropolitan area and not a rural area like the rest of the counties within this circle. After excluding St. Clair county, the total number of counties within the circle became 34 counties, 22 of them in the state of Illinois, seven of them in the state of Missouri, and the remaining five in the state of Kentucky (See Appendix A for the list of counties.) The total number of public schools (K-12 education) in this area was 395 schools (246 elementary schools and 149 high schools).

A questionnaire was the method by which data were collected from the sample of school principals about their perceptions of the factors affecting teachers' use of computers.
Population and Sampling

Population

The population for this study was 246 elementary school principals and 149 high school principals in 34 counties. Twenty-two of these counties were in the area of southern Illinois, seven in the area of southeast Missouri, and five in the area of western Kentucky. The area was determined by drawing a circle with a 65 miles radius around the city of Carbondale, Illinois. To keep the sample homogeneous, St. Clair county in the state of Illinois was excluded because it has over 260,000 population while the rest of the counties do not exceed 64,000 (Rand McNally & Company, 1989). Principals’ names and addresses were obtained from the school directories of the three states for the year 1987/1988. The sample from this population was randomly selected. "Random sample is the best single way to obtain a representative sample" (Gay, 1987, p. 104). The method used for the selection of this sample was stratified random sampling. "Stratification, in addition to random selection, increases the likelihood that the sample will be representative of the population" (Tuckman, 1978, p. 230).

The names of school principals were stratified into two strata: elementary school principals and high school principals. Each one of the two lists was arranged in alphabetical order and each name was assigned a number
ranging from 001 to 246 for the elementary school principals and ranging from 001 to 149 for high school principals. A random sample was selected from each one of these two groups using a random number table.

Sample Size

About the appropriate sample size, Tuckman (1978) said "You should select as large a sample as is practical since with a large sample the sampling error is likely to be small" (p. 232). The general rule for determining the sample size is to use the largest sample possible (Borg & Gall, 1971; Wolpert, 1984).

For this kind of research there is a recommended sample size. "For descriptive research, a sample of 10% of the population is considered minimum. For smaller populations, 20% may be required" (Gay, 1987, p. 114). Wolpert (1984) said "For most survey-type research, 15-20% of population yielding at least 30 subjects/objects is usually considered acceptable" (p. 114). There is another consideration to be put in mind when trying to determine a sample size for a study. This consideration is the feasibility.

Researchers select a sample which is large enough to satisfy the requirement of the analysis procedures they plan to use, yet not so large as to represent a waste of resources. For example, if a population of 500 school principals was identified for a survey study, a sample of 5 or 10 would probably not be sufficiently large for a rigorous analysis to be conducted, but a sample of 15% or more would be unnecessary. A quality sample of 40 or 50 might do
nicely for a particular analysis (Wolpert, 1984, p. 69).

From this search in the literature, the researcher decided to select a sample that is 25% of the population. Because there were 246 elementary school and 149 high school in this area, a sample of 62 elementary school principal and 37 high school principals were selected.

Research Questions and Hypotheses

Research Questions

The purpose of this research was to study the effect of five different factors on teachers' use of computers from the perspective of school principals and to determine whether there was a difference between elementary and high schools concerning these factors. To achieve this purpose, the researcher developed the following research questions:

1. As perceived by rural school principals, do teachers have negative attitudes about computers that affect the number of teachers who use computers in schools?

2. As perceived by rural school principals, do teachers have negative attitudes about computers that affect the frequency of computer use by teachers in schools?

3. As perceived by rural school principals, is there
any relationship between the physical location of computers in schools and the number of teachers who use computers?

4. As perceived by rural school principals, is there any relationship between the physical location of computers in schools and how frequently teachers use computers?

5. As perceived by rural school principals, is there any positive relationship between the existence of someone to coordinate the use of computers in schools and the number of teachers who use computers?

6. As perceived by rural school principals, is there any positive relationship between the existence of someone to coordinate the use of computers in schools and the frequency of computer use by teachers?

7. As perceived by rural school principals, is the number of teachers who use computers in school negatively affected by the lack of adequate computer training?

8. As perceived by rural school principals, is the frequency of computer use by teachers in schools negatively affected by the lack of adequate computer training?

9. As perceived by rural school principals, is there
any relationship between subjects taught by teachers and how frequently they use computers in schools?

10. Is there any difference between elementary and high schools concerning the five factors affecting teachers' use of computers?

Research Hypotheses

The null hypotheses for these research questions are:

1. As perceived by rural school principals, teachers do not have negative attitudes about computers that affect the number of teachers who use computers in schools.

2. As perceived by rural school principals, teachers do not have negative attitudes about computers that affect how frequently they use computers in schools.

3. As perceived by rural school principals, there is no relationship between the physical location of computers in schools and the number of teachers who use computers in schools.

4. As perceived by rural school principals, there is no relationship between the physical location of computers in schools and the frequency of computer use by teachers.

5. As perceived by rural school principals, there is
6. As perceived by rural school principals, there is no positive relationship between the existence of someone to coordinate the use of computers in schools and increasing the frequency of computer use by teachers.

7. As perceived by rural school principals, there is no lack of adequate computer training among teachers that affect the number of teachers who use computers in schools.

8. As perceived by rural school principals, there is no lack of adequate computer training among teachers that affect the frequency of computer use by teachers in schools.

9. As perceived by rural school principals, there is no relationship between subjects taught by teachers and the frequency of their computer use in schools.

10. There is no significant difference between elementary and high schools concerning the five factors affecting teachers' use of computers.
et al. (1972). To achieve this objective, the researcher excluded items that do not make a definite contribution to answering the research questions. The questionnaire was typed on a letter quality printer, then the size was reduced using a copy machine. After reducing the size to make it fit in two sides of a paper, the questionnaire was copied in yellow paper. The yellow color was recommended by some writers such as Backstrom (1963), "the front page should be a distinctive paste -pink or yellow- because individual questionnaires are easier to find when piled around the office and easier to count when distributing them for interviews" (p. 116).

The Content

The questionnaire consisted of three sections. The first section contained eleven questions intended to collect demographic information about the schools in which the study was conducted and the principals of these schools. The second section contained eight items related to the first eight research questions. The format of the questions selected by the researcher for this section was the structured questions format. The way this format was used in the study was a statement followed by Likert-type response scale ranging from SA (strongly agree) to SD (strongly disagree). Respondents were to circle the letter
of the option that indicated the degree to which they agreed or disagreed with each one of the statements according to the situation in their particular school. The third part of the questionnaire contained one question about the differences in the frequency of computer use between the teachers who teach different subjects. The format of this question was a Likert-type response scale ranging from (a) representing 5 periods of use per week or more, to (e) representing no use at all. In addition, (NA) was an option representing not applicable. (see Appendix C for the questionnaire.) The closed questions-format was selected because "the closed questionnaire, with its list of alternatives, structures the concept under study and minimizes the risk of misinterpretation" (Mouly, 1978, p. 192). And because most investigators prefer this format (Ary et al., 1972).

Reliability and Validity

It has been stated by Mouly (1978) that the reliability of a questionnaire is difficult to establish and is quite often ignored. He believes that usual procedures for calculating questionnaire reliability are obviously inapplicable. Instead, he suggested that "ensuring validity might be a better investment of one's time and energy" (p. 196).
standard deviations were used to determine whether the first four factors had any effect on teachers' use of computers. For the fifth factor, different subjects taught by teachers, an ANOVA test was used to determine whether a significant difference exists among the subject with regard to the frequency of computer use by teachers. Because the last question contained categorical variables, the t-test was used to determine whether a significant difference existed between elementary schools and high schools or not.

Response Rate

A response rate of 50% was set by the researcher as a goal for questionnaire return. "A response rate of at least 50 percent is adequate for analysis and reporting. A response rate of at least 60 percent is good. And a response rate of 70 percent or more is very good" (Babbie, 1973, p. 165). This goal was to be reached by the first mailing of the questionnaire, the follow up mailing, and then telephone calls before the third mailing.
CHAPTER IV

Analysis of Data

Data Collection

The purpose of this chapter was to present the analysis of data which were obtained by means of a questionnaire. Copies of the questionnaire were mailed to a random sample of 99 school principals (62 elementary and 37 high) in 34 counties in the area of Southern Illinois, Southeast Missouri, and Southwest Kentucky (see Appendix A for list of counties). These 99 schools represent 25% of the schools in this area. The initial response to the mailed questionnaire resulted in 70 returns (70.7%) within the first three weeks from the original mailing. The follow up mailing resulted in 7 additional responses within two weeks period to raise the number of responses to 77 representing 77.7% of the sample.

In the first part of the questionnaire, school principals were requested to respond to questions concerning demographic information about themselves and their schools. Each item of this part in the questionnaire is discussed descriptively in this chapter.

The second part of the questionnaire was about teachers in schools and whether their use of computers is affected by the following factors:

1- Negative attitudes about computers.
Information About Schools

Table 1
Numbers of Schools Responding to the Questionnaire in Each Survey Area

<table>
<thead>
<tr>
<th>State</th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Sample</th>
<th>Sample Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>32</td>
<td>21</td>
<td>3</td>
<td>56</td>
<td>72.7%</td>
</tr>
<tr>
<td>Missouri</td>
<td>9</td>
<td>5</td>
<td>0</td>
<td>14</td>
<td>18.2%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>7</td>
<td>9.1%</td>
</tr>
<tr>
<td>Totals</td>
<td>45</td>
<td>29</td>
<td>3</td>
<td>77</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 1 illustrates the number of schools who responded to the questionnaire distributed according to their states as well as the percent from each state. Schools are also divided in this table into elementary and high according to their level. Three schools included a combination of elementary and high school grades (K - 12).

The total number of schools responding to the questionnaire was 77 schools including 45 elementary schools, 29 high schools, and three schools having overlapping grades.
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>75% or More</td>
<td>6</td>
<td>14%</td>
<td>5</td>
<td>17.2%</td>
<td>1</td>
<td>33.3%</td>
<td>12</td>
<td>16.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50% - 74%</td>
<td>2</td>
<td>4.7%</td>
<td>2</td>
<td>6.9%</td>
<td>0</td>
<td>0.0%</td>
<td>4</td>
<td>5.3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25% - 49%</td>
<td>3</td>
<td>7%</td>
<td>1</td>
<td>3.4%</td>
<td>1</td>
<td>33.3%</td>
<td>5</td>
<td>6.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1% - 24%</td>
<td>12</td>
<td>28%</td>
<td>8</td>
<td>27.6%</td>
<td>0</td>
<td>0.0%</td>
<td>20</td>
<td>26.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td>20</td>
<td>46.5%</td>
<td>13</td>
<td>44.8%</td>
<td>1</td>
<td>28.6%</td>
<td>34</td>
<td>45.3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col. Total</td>
<td>43</td>
<td>100%</td>
<td>29</td>
<td>100%</td>
<td>3</td>
<td>100%</td>
<td>75</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The last column in Table 2 (Sample Total), shows that 34 schools (45.3%) had no one to coordinate the use of computers. In the second place were the schools that had someone to coordinate the use of computers for less than 25% of the time. The number of these schools was 20 (26.7%). Only sixteen percent of the school had someone to coordinate the computer use for 75% of the time or more. Five schools (6.7%) had a coordinator for only 25 - 49% of the time and four schools (5.3%) had a coordinator for 50 - 74% of the time.

**Twenty** elementary schools (46.5%) and **thirteen** high schools (44.8%) had no one to coordinate the use of computers.
<table>
<thead>
<tr>
<th>Gender</th>
<th>Elementary</th>
<th></th>
<th>High</th>
<th></th>
<th>United</th>
<th></th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>40 88.9%</td>
<td>29 100%</td>
<td>2 100%</td>
<td>71 93.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>5 11.1%</td>
<td>0 0.0%</td>
<td>0 0.0%</td>
<td>5 6.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col. Total</td>
<td>45 100%</td>
<td>29 100%</td>
<td>2 100%</td>
<td>76 100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 shows that only five out of 76 principals were females (6.6%). Four of them (80%) were at the elementary level and one (20%) was at the high school level. Three of them were in the state of Illinois and the other two were in the state of Kentucky. No female principal was reported in the surveyed area in the state of Missouri.
Table 4

Distribution of Principals According to Their Computer Training
(By School Level)

<table>
<thead>
<tr>
<th></th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Yes        | 30         | 18   | 3      | 51    | 67.1%
| No         | 14         | 11   | 0      | 25    | 32.9%
| Col. Total | 44         | 29   | 3      | 76    | 100%

The data in Table 4 show that 68.2% of the elementary school principals had some kind of computer training and 31.8% of them had no computer training. In high schools, the percent of the principals who had some kind of computer training is 62.1% and of those who had no computer training is 37.9%. Four of the female principals (80%) had some kind of computer training and one of them (20%) had no computer training.

The overall percent is 67.1% schools principals who had computer training and 32.9% school principals with no computer training.
Table 5

Distribution of Principals According to Their Computer Training
(By State)

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Trained # (%)</th>
<th>Not trained $ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>37 (67.1%)</td>
<td>18 (32.9%)</td>
</tr>
<tr>
<td>Missouri</td>
<td>8 (57.1%)</td>
<td>6 (42.9%)</td>
</tr>
<tr>
<td>Kentucky</td>
<td>6 (85.7%)</td>
<td>1 (14.3%)</td>
</tr>
</tbody>
</table>

Sample Total 51 (67.1%) 25 (32.9%)

Table 5 presents the number and percent of principals who had been trained in the use of computers and those who had not been trained. The table shows that the overall number of principals who had been trained to use computers was 51 (67.1%). The counties from Kentucky had 85.7% of their principals trained. The counties from Illinois were next with 67.1% of their principals trained. The counties from Missouri were the last with only 57.1% of their principals trained.
<table>
<thead>
<tr>
<th>Used</th>
<th>#</th>
<th>%</th>
<th>#</th>
<th>%</th>
<th>#</th>
<th>%</th>
<th>#</th>
<th>%</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>29</td>
<td>65.9%</td>
<td>22</td>
<td>75.9%</td>
<td>3</td>
<td>100%</td>
<td>54</td>
<td>71.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>34.1%</td>
<td>7</td>
<td>24.1%</td>
<td>0</td>
<td>0.0%</td>
<td>22</td>
<td>28.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col. Total</td>
<td>44</td>
<td>100%</td>
<td>29</td>
<td>100%</td>
<td>3</td>
<td>100%</td>
<td>76</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6 shows the use of computers by the staff in the offices of the principals. In high schools, 75.9% of the principals' offices were using computers and 24.1% were not using. The percent is 65.9% for using and 34.1% for not using in elementary schools. Computers were used in four of the offices of the female principals (80%) and not used in one of them (20%).

The sample total column shows that 71.1% of the principals' offices were using computers and 28.9% were not using them.
<table>
<thead>
<tr>
<th>Area</th>
<th>#</th>
<th>(%)</th>
<th>#</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>37</td>
<td>(67.3%)</td>
<td>18</td>
<td>(32.7%)</td>
</tr>
<tr>
<td>Missouri</td>
<td>11</td>
<td>(78.8%)</td>
<td>3</td>
<td>(21.4%)</td>
</tr>
<tr>
<td>Kentucky</td>
<td>6</td>
<td>(85.7%)</td>
<td>1</td>
<td>(14.3%)</td>
</tr>
</tbody>
</table>

Sample Total 54 (71.1%) 22 (28.9%)

In Table 7, the use of computers by the staff in the principals' offices is presented. Fifty-four principals (71.1%) had computers being used in their offices and twenty-two of them (28.9%) had no use of computers in their offices. The counties from Kentucky were the top with 85.7% of their principals using computers in their offices followed by the counties from Missouri with 78.8% of their principals using computers in their offices. The last were the counties from Illinois with 67.3% of their principals using computers in their offices.
## Location of Computers in Schools

**Table 9**

<table>
<thead>
<tr>
<th>Location of Computer</th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classrooms</td>
<td>22</td>
<td>2</td>
<td>6.9%</td>
<td>1</td>
</tr>
<tr>
<td>Laboratory, Library, &amp; classrooms</td>
<td>1</td>
<td>2.3%</td>
<td>14</td>
<td>48.2%</td>
</tr>
<tr>
<td>Laboratory &amp; classrooms</td>
<td>6</td>
<td>13.6%</td>
<td>7</td>
<td>24.1%</td>
</tr>
<tr>
<td>Library and Classrooms</td>
<td>10</td>
<td>22.7%</td>
<td>4</td>
<td>13.8%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>3</td>
<td>6.8%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Library</td>
<td>1</td>
<td>2.3%</td>
<td>1</td>
<td>3.4%</td>
</tr>
<tr>
<td>Laboratory &amp; Library</td>
<td>1</td>
<td>2.3%</td>
<td>1</td>
<td>3.4%</td>
</tr>
<tr>
<td>Col. Totals</td>
<td>44</td>
<td>100%</td>
<td>29</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 8 shows the location of computers in schools. Twenty-two (50%) of the elementary schools were placing their computers in the classrooms. Ten elementary schools (22.7%) were placing them in a combination of libraries and classrooms. In the third place are those schools whose computers were placed in a combination of computer laboratories and classrooms (13.6%).
In high schools, the majority of schools (48.2%) were placing their computers in a combination of computer laboratories, libraries, and classrooms. In second place are those schools who placed their computers in a combination of computer laboratories and classrooms (24.1%). In the third place are those schools whose computers were placed in a combination of libraries and classrooms (13.8%).

The information provided in the sample total column in Table 8 shows that the majority of the schools were placing their computers in the classrooms (32.9%). This was followed by those who were placing them in a combination of the three locations (21.1%). In third place were those who were placing their computers either in a combination of computer laboratories and classrooms or a combination of classrooms and libraries (18.4%). In fourth place were those who were placing their computers in microcomputer laboratories (1.9%). The rest of them were placing their computers in either libraries only or a combination of computer laboratories and classrooms (2.6%).
Table 9
Opinions of Principals About the Best Location
For Computers in Schools
(By School Level)

<table>
<thead>
<tr>
<th>Location of Computer</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>20</td>
<td>45.5%</td>
<td>8</td>
<td>27.6%</td>
</tr>
<tr>
<td>Classrooms</td>
<td>15</td>
<td>34.1%</td>
<td>5</td>
<td>17.2%</td>
</tr>
<tr>
<td>Lab, lib. &amp; classrooms</td>
<td>1</td>
<td>2.3%</td>
<td>10</td>
<td>34.5%</td>
</tr>
<tr>
<td>Lab and Classrooms</td>
<td>3</td>
<td>6.8%</td>
<td>3</td>
<td>10.3%</td>
</tr>
<tr>
<td>Library</td>
<td>3</td>
<td>6.8%</td>
<td>1</td>
<td>3.4%</td>
</tr>
<tr>
<td>Library &amp; Classrooms</td>
<td>2</td>
<td>4.5%</td>
<td>1</td>
<td>3.4%</td>
</tr>
<tr>
<td>Lab and Library</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>3.4%</td>
</tr>
<tr>
<td>Col. Totals</td>
<td>44</td>
<td>100%</td>
<td>29</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 9 presents the opinions of school principals about the best location for computers in schools. As shown in the last column (sample total), computer laboratories were chosen by 39.5% of the principals as the best location followed by the classroom option which was selected by 27.6% of them. The combination of the three places was selected by 14.5% of the principals. In fourth place was the combination of computer laboratories and classrooms with 7.9% followed by the library which was selected by 5.3% of
the principals. In sixth place was the combination of libraries and classrooms which was selected by 1.9% of the principals. The least favored by the principals was the combination of laboratories and the libraries which was selected by only 1.3% of the principals.

Among the elementary school principals, 45.5% selected computer laboratories as the best location for computers in schools followed by those who selected classrooms as the best location (34.1%), then those principals who selected either libraries or a combination of computer laboratories and classrooms (6.8%).

The majority of high school principals (34.5%) selected the combination of the three locations as the best place for computers in schools. Computer laboratories were selected by 27.6% of the principals in high schools. Classrooms were selected by 17.2% of high school principals as the best location for computers in schools.
Comparing The Ratios

Table 10
Comparison Among the Ratios (By State)

<table>
<thead>
<tr>
<th></th>
<th>Illinois Counties</th>
<th>Missouri Counties</th>
<th>Kentucky Counties</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students/School</td>
<td>297.7</td>
<td>512.2</td>
<td>427.4</td>
<td>361.6</td>
</tr>
<tr>
<td>Students/Computer</td>
<td>22.2</td>
<td>35.9</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>Students/Teacher</td>
<td>15.1</td>
<td>16.9</td>
<td>16.4</td>
<td></td>
</tr>
<tr>
<td>Teachers/School</td>
<td>29.8</td>
<td>30.4</td>
<td>24.0</td>
<td>22.1</td>
</tr>
<tr>
<td>Computers/school</td>
<td>13.4</td>
<td>14.3</td>
<td>14.9</td>
<td>13.7</td>
</tr>
<tr>
<td>Non Using Teachers</td>
<td>32.2%</td>
<td>30.8%</td>
<td>25.6%</td>
<td>31.2%</td>
</tr>
</tbody>
</table>

Table 10 compares the ratios of students per school, students per teacher, teachers per school, students per computer, computers per school, and the percent of teachers who do not use computers in schools in the counties from three different states.

The counties from the state of Illinois were the highest in students per computer ratio (22.2) and students per teacher ratio (15.1), and they were highest in the percent of teachers who do not use computers (32.2%). The next highest computers per school ratio was in the Kentucky counties (14.9), followed by the counties from the state of Missouri (14.3). The counties from the state of Illinois come at the bottom with 13.4 computer per school ratio.
Table 11
Comparison Among the Ratios (By School Level)

<table>
<thead>
<tr>
<th></th>
<th>Elementary Schools</th>
<th>High Schools</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students/School</td>
<td>377.6</td>
<td>317.6</td>
<td>361.6</td>
</tr>
<tr>
<td>Students/Computer</td>
<td>48.5</td>
<td>19.4</td>
<td>26.4</td>
</tr>
<tr>
<td>Students/Teacher</td>
<td>17.8</td>
<td>14.7</td>
<td>16.4</td>
</tr>
<tr>
<td>Teachers/School</td>
<td>21.2</td>
<td>23.0</td>
<td>22.1</td>
</tr>
<tr>
<td>Computers/school</td>
<td>10.9</td>
<td>17.4</td>
<td>13.7</td>
</tr>
<tr>
<td>Non Using Teachers</td>
<td>23.4%</td>
<td>42.1%</td>
<td>31.2%</td>
</tr>
</tbody>
</table>

Table 11 illustrates the various ratios in elementary and high schools. High schools had 17.4 computers per school and 19.4 students per computer compared to 10.9 computers per school and 48.5 students per computer in elementary schools. However, 42.1% of the teachers in high schools were not using computers compared to 23.4% in elementary schools.
Research Question One

As perceived by school principals, do teachers have negative attitudes about computers that affect the number of computer use in schools?

Table 14

Principals' Opinions About the Effect of Negative Attitudes on the Number of Teachers Who Use Computers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>7</td>
<td>15.9%</td>
<td>5</td>
<td>18.5%</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>9.1%</td>
<td>7</td>
<td>25.9%</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
<td>6.8%</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>23</td>
<td>52.3%</td>
<td>10</td>
<td>37.0%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>7</td>
<td>15.9%</td>
<td>1</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

Col. Total 44 | 100% | 27 | 100% | 3 | 100% | 74 | 100%

Table 14 illustrates the opinions of school principals about how negative attitudes toward computers affect the number of teachers who use microcomputers in schools. As shown in the last column of table 14, 34 principals (45.9%) disagreed with the statement that teachers in their schools
have negative attitudes about computers that affect the number of computer using teachers. Nine of them (12.2%) strongly disagreed with this statement raising the disagreement to 58.1% while the total percent of those who agree and those who strongly agree with the statement was 31.1%. The undecided were 10.8% of the principals.

The total percent of principals who disagreed and strongly disagreed is 68.2% in elementary schools and 43.4% in the high schools. Those who either agreed or strongly agreed were 25% in elementary and 39.1% in high schools. The undecided were 6.8% in elementary and 17.4% in high schools.

At the elementary school level, 68.2% disagreed or strongly disagreed and 26.0% agreed or strongly agreed while at the high school level 40.7% disagreed or strongly disagreed and 44.4% agreed or strongly agreed. The undecided at the elementary school level were 6.8% and at the high school level were 17.4%.
Research Question Two

As perceived by school principals, do teachers have negative attitudes about computers that affect the frequency of computer use by teachers in schools?

Table 15
Principals' Opinions About the Effect of Negative Attitudes on the Frequency of Computer Use by Teachers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>10</td>
<td>23.8%</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>Agree</td>
<td>8</td>
<td>19.0%</td>
<td>10</td>
<td>37.0%</td>
</tr>
<tr>
<td>Undecided</td>
<td>0</td>
<td>0.0%</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>Disagree</td>
<td>22</td>
<td>52.4%</td>
<td>10</td>
<td>37.0%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>2</td>
<td>4.8%</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>Col. Total</td>
<td>42</td>
<td>100%</td>
<td>27</td>
<td>100%</td>
</tr>
</tbody>
</table>

The last column in table 15 (sample total) shows that 33 principals (45.8%) disagreed with the statement that the negative attitudes about computers in the part of teachers were affecting the frequency of their computer use. Three principals strongly disagreed raising the disagreement to 36 principals (50.0%). Two of the principals (2.8%) were undecided.
Fourteen principals (19.4%) strongly agreed and twenty principals (27.9%) agreed with the statement raising the total agreement to 47.2%. Two principals (2.8%) were undecided.

The percent of those principals who either disagreed or strongly disagreed is 57.2% in elementary schools and 40.7% in high schools. Those who either agreed or strongly agreed were 42.8% in elementary and 51.8% in high schools. No one was undecided in the elementary schools and 7.4% were undecided in high schools.
Research Question Three

As perceived by school principals, is there any relationship between the physical location of computers in schools and the number of teachers who use computers in schools?

Table 16

Principals' Opinions About the Effect of Physical Location of Computers on the Number of Teachers Who Use Computers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>( K = \bar{z} )</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>S/agree</td>
<td>1</td>
<td>1</td>
<td>-0.0%</td>
<td>2</td>
</tr>
<tr>
<td>Agree</td>
<td>17</td>
<td>2</td>
<td>7.4%</td>
<td>20</td>
</tr>
<tr>
<td>Undecided</td>
<td>4</td>
<td>6</td>
<td>22.2%</td>
<td>12</td>
</tr>
<tr>
<td>Disagree</td>
<td>16</td>
<td>16</td>
<td>59.3%</td>
<td>32</td>
</tr>
<tr>
<td>S/disagree</td>
<td>6</td>
<td>2</td>
<td>7.4%</td>
<td>8</td>
</tr>
<tr>
<td>Col. Total</td>
<td>44</td>
<td>27</td>
<td>-0.0%</td>
<td>74</td>
</tr>
</tbody>
</table>

Table 16 presents the principals' attitudes about the effect of the physical location of computers in schools on the number of teachers who use computers. Looking at the last column in the table (sample total), we see that 32 principals (43.2%) disagreed and eight principals (10.8%) strongly disagreed raising the disagreement to 40 principals (54.1%). Twenty principals (27.0%) agreed and two (2.7%)
strongly agreed raising the agreement to 72 principals (29.7%). Twelve principals were undecided.

The total percent of the principals who disagreed and strongly disagreed is 50% in elementary schools and 66.7% in high schools. The total percent of those who agreed and strongly agreed is 40.9% in elementary schools and 11.1% in high schools. Principals who were undecided were 9.1% in elementary and 22.2% in high schools.
Research Question Four

As perceived by school principals, is there any relationship between the physical location of computers in schools and how frequently teachers use computers?

Table 17
Principals' Opinions About the Effect of Physical Location of Computers on the Frequency of Computer Use by Teachers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>#</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S/agree</td>
<td>1</td>
<td>2.3%</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>Agree</td>
<td>24</td>
<td>54.5%</td>
<td>9</td>
<td>33.3%</td>
</tr>
<tr>
<td>Undecided</td>
<td>5</td>
<td>11.4%</td>
<td>5</td>
<td>18.5%</td>
</tr>
<tr>
<td>Disagree</td>
<td>9</td>
<td>20.5%</td>
<td>10</td>
<td>37.0%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>5</td>
<td>11.4%</td>
<td>2</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

Col. Total 44 100% 27 100% 3 100% 74 100%

Table 17 presents data about the effect of the physical location of computers in schools on the frequency of computer use by teachers. The last column in the table (sample total) shows that 35 principals (47.3%) agreed that the physical location has an effect on the frequency of computer use by teachers. Two principals (2.7%) strongly agreed raising the agreement to 37 principals (50.0%).
Twenty principals (27.0%) disagreed with the statement and seven of them (9.5%) strongly disagreed raising the disagreement to 27 principals (36.5%). Ten principals were undecided.

At the elementary school level, 56.8% principals either agreed or strongly agreed, 31.9% either disagreed or strongly disagreed, and 11.4% were undecided.

At the high school level, 46.0% either agreed or strongly agreed, 41.4% either disagreed or strongly disagreed, and 18.5% were undecided.
Research Question Five

As perceived by school principals, is there any relationship between the existence of someone to coordinate the use of computers in schools and the number of teachers who use computers?

Table 18
Principals' Opinions About the Effect of Computer Coordinator on the Number of Teachers Who Use Computers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>9</td>
<td>20.9%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Agree</td>
<td>15</td>
<td>34.9%</td>
<td>11</td>
<td>42.3%</td>
</tr>
<tr>
<td>Undecided</td>
<td>11</td>
<td>25.6%</td>
<td>6</td>
<td>23.0%</td>
</tr>
<tr>
<td>Disagree</td>
<td>7</td>
<td>16.3%</td>
<td>9</td>
<td>34.6%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>1</td>
<td>2.3%</td>
<td>0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Col. Total | 43 | 100% | 26 | 100% | 3 | 100% | 72 | 100% |

Table 18 illustrates the responses of the principals to items number 16 and 17 in the questionnaire. The last column in the table (sample total) shows that 26 principals (35.3%) agreed with the statement that the existence of someone to coordinate the computer use in schools would increase the number of teachers who use computers. Eleven principals (15.3%) strongly agreed with the statement.
raising the agreement to 37 principals (51.4%). Seventeen principals (23.6%) disagreed with the statement and one principal strongly disagreed with the statement raising the disagreement to 18 principals (25.0%). Seventeen principals (23.6%) were undecided.

At the elementary school level, 55.0% of the principals agreed or strongly agreed, 18.6% disagreed or strongly disagreed, and 25.6% were undecided.

At the high school level, 42.3% agreed or strongly agreed, 34.6% disagreed or strongly disagreed, and 23.0% were undecided.
Research Question Six
As perceived by schools principals, is there any relationship between the existence of someone to coordinate the use of computers in schools and the frequency of computer use by teachers?

Table 29
Principals' Opinions About the Effect of Computer Coordinator on the Frequency of Computer Use by Teachers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th></th>
<th></th>
<th>High</th>
<th></th>
<th></th>
<th>K - L2</th>
<th></th>
<th></th>
<th>Sample Total</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>%</td>
<td></td>
<td>9</td>
<td>%</td>
<td></td>
<td>1</td>
<td>%</td>
<td></td>
<td>10</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>S/agree</td>
<td>9</td>
<td>20.9%</td>
<td></td>
<td>0</td>
<td>0.0%</td>
<td></td>
<td>1</td>
<td>33.3%</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>14</td>
<td>32.6%</td>
<td></td>
<td>13</td>
<td>50.0%</td>
<td></td>
<td>2</td>
<td>66.6%</td>
<td></td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undecided</td>
<td>13</td>
<td>30.2%</td>
<td></td>
<td>4</td>
<td>15.4%</td>
<td></td>
<td>0</td>
<td>0.0%</td>
<td></td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>6</td>
<td>14.0%</td>
<td></td>
<td>9</td>
<td>34.6%</td>
<td></td>
<td>0</td>
<td>0.0%</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S/disagree</td>
<td>1</td>
<td>2.3%</td>
<td></td>
<td>0</td>
<td>0.0%</td>
<td></td>
<td>0</td>
<td>0.0%</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col. Total</td>
<td>43</td>
<td>100%</td>
<td></td>
<td>26</td>
<td>100%</td>
<td></td>
<td>3</td>
<td>100%</td>
<td></td>
<td>72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 29 shows the responses of the principals concerning the effect of the existence of someone to coordinate the computer use on the frequency of computer use by teachers. The data in the sample total column shows that 15 principals (20.8%) disagree that the existence of a coordinator has an effect on the frequency of computer use.
and one principal strongly disagreed with the statement raising the disagreement to 16 principals (22.2%). Twenty-nine of the principals (40.3%) agreed and ten of them (13.9%) strongly agreed raising the agreement to 39 principals (54.2%). Seventeen principals (23.6%) were undecided.

At the elementary school level, 53.5% the of the principals agreed or strongly agreed, 16.3% disagreed or strongly disagreed, and 30.2% were undecided.

At the high school level, 50.0% agreed or strongly agreed, 34.6% disagreed or strongly disagreed, and 15.4% were undecided.
Research Question Seven

As perceived by school principals, is the number of teachers who use computers in schools negatively affected by the lack of adequate computer training?

Table 20
Principals’ Opinions About the Effect of Computer Training on the Number of Teachers Who Use Computers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>9</td>
<td>20.5%</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>Agree</td>
<td>25</td>
<td>56.8%</td>
<td>17</td>
<td>63.0%</td>
</tr>
<tr>
<td>Undecided</td>
<td>4</td>
<td>9.1%</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>Disagree</td>
<td>6</td>
<td>13.6%</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>0</td>
<td>0.0%</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>Col. Total</td>
<td>44</td>
<td>100%</td>
<td>27</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 20 illustrates the responses of the principals to item number 18 and 19 about the statement that the lack of adequate computer training on the part of teachers is affecting the number of users and the frequency of use.

The last column in Table 20 shows that 43 of the principals (58.1%) agreed that the lack of adequate computer training is negatively affecting the number of teachers who use
computers in their schools. Thirteen principals (17.6%) strongly agreed with the statement raising the total agreement to 56 principals (75.7%). Ten principals (13.5%) disagreed with the statement and two strongly disagreed raising the disagreement to twelve principals (16.2%). Six principals (8.1%) were undecided.

At the elementary school level, 77.3% of the principals agreed or strongly agreed, 13.6% disagreed or strongly disagreed, and 9.1% were undecided.

At the high school level, 77.8% agreed or strongly agreed, 18.5% disagreed or strongly disagreed, and 3.7% were undecided.
Research Question Eight

As perceived by school principals, is the frequency of computer use by teachers in schools negatively affected by the lack of adequate computer training?

Table 21
Principals' Opinions About the Effect of Computer Training on the Frequency of Computer Use by Teachers

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>9</td>
<td>20.5%</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>Agree</td>
<td>24</td>
<td>54.5%</td>
<td>17</td>
<td>63.0%</td>
</tr>
<tr>
<td>Undecided</td>
<td>5</td>
<td>11.4%</td>
<td>2</td>
<td>7.4%</td>
</tr>
<tr>
<td>Disagree</td>
<td>6</td>
<td>13.6%</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>0</td>
<td>0.0%</td>
<td>2</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

Col. Total 44 100% 27 100% 3 100% 74 100%

The data in the last column of Table 21 shows that 42 of the principals (56.2%) agreed that the lack of adequate computer training is negatively affecting the frequency of computer use by teachers. Twelve principals (16.3%) strongly agreed with the statement raising the agreement to 54 principals (73.0%). Ten principals (13.8%) disagreed with the statement, and two strongly disagreed raising the
disagreement to 12 principals (16.2%). Eight principals (10.8%) were undecided.

At the elementary school level, 75.0% of the principals agreed or strongly agreed, 13.6% disagreed or strongly disagreed, and 11.4% were undecided.

At the high school level, 74.1% agreed or strongly agreed, 18.5% disagreed or strongly disagreed, and 7.4% were undecided.
Research Question Nine

As perceived by schools principals, is there any relationship between subjects taught by teachers and how frequently they use computers in schools?

Table 22

Frequency of Computer Use in English Teaching

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>5</td>
<td>14.7%</td>
<td>2</td>
<td>7.7%</td>
</tr>
<tr>
<td>Agree</td>
<td>5</td>
<td>14.7%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Undecided</td>
<td>7</td>
<td>20.6%</td>
<td>5</td>
<td>19.2%</td>
</tr>
<tr>
<td>Disagree</td>
<td>12</td>
<td>35.3%</td>
<td>6</td>
<td>23.1%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>5</td>
<td>14.7%</td>
<td>13</td>
<td>50.0%</td>
</tr>
<tr>
<td>Col. Total</td>
<td>34</td>
<td>100%</td>
<td>26</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 22 illustrates the frequency of computer use in teaching English Language. The last column shows that 12 principals (19.0%) agreed or strongly agreed with the statement that computers are used frequently in teaching this subject while 36 principals (60.4%) disagreed and strongly disagreed with it. Thirteen principals (20.6%) were undecided.
At the elementary school level, 29.4% of the principals agreed or strongly agreed, 50.0% disagreed or strongly disagreed, and 20.6% were undecided.

At the high school level, 73.1% agreed or strongly agreed, 73.1% disagreed or strongly disagreed, and 19.2% were undecided.

Table 23

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>2</td>
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<td>14</td>
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<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>S/Agree</td>
<td>6</td>
<td>17.1%</td>
<td>8</td>
<td>29.6%</td>
</tr>
<tr>
<td>Agree</td>
<td>6</td>
<td>17.1%</td>
<td>1</td>
<td>3.7%</td>
</tr>
<tr>
<td>Undecided</td>
<td>10</td>
<td>28.6%</td>
<td>6</td>
<td>22.2%</td>
</tr>
<tr>
<td>Disagree</td>
<td>9</td>
<td>25.7%</td>
<td>7</td>
<td>25.9%</td>
</tr>
<tr>
<td>S/Disagree</td>
<td>4</td>
<td>11.1%</td>
<td>3</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

Col. Total 35 100% 27 100% 3 100% 65 100%

Table 23 illustrates the frequency of computer use in teaching Mathematics. As shown in the last column, 23 principals (35.3%) agreed and strongly agreed with the statement that computers are used frequently in teaching this subject while 26 principals (40.0%) disagreed and
strongly disagreed with it. Sixteen principals (24.6%) were undecided.

At the elementary school level, 34.2% the of the principals agreed or strongly agreed, 37.3% disagreed or strongly disagreed, and 28.6% were undecided.

At the high school level, 32.3% agreed or strongly agreed, 44.4% disagreed or strongly disagreed, and 22.2% were undecided.

Table 24

Frequency of Computer Use in Science Teaching

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>3</td>
<td>8.6%</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td>Agree</td>
<td>1</td>
<td>2.9%</td>
<td>4</td>
<td>14.6%</td>
</tr>
<tr>
<td>Undecided</td>
<td>9</td>
<td>25.7%</td>
<td>4</td>
<td>14.6%</td>
</tr>
<tr>
<td>Disagree</td>
<td>11</td>
<td>31.4%</td>
<td>11</td>
<td>40.7%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>11</td>
<td>31.4%</td>
<td>5</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

Col. Total 35 100% 27 100% 3 100% 65 100%

Table 24 illustrates the frequency of computer use in teaching Science. The last column in the table (sample total) shows that 13 principals (20.0%) agreed or strongly
agreed with the statement that computers are used frequently in teaching science while 39 principals (60.0%) disagreed and strongly disagreed with it. Thirteen principals (20.0%) were undecided.

At the elementary school level, 11.5% of the principals agreed or strongly agreed, 62.4% disagreed or strongly disagreed, and 25.4% were undecided.

At the high school level, 25.9% agreed or strongly agreed, 59.2% disagreed or strongly disagreed, and 15.6% were undecided.
Table 25: Frequency of Computer Use in Social Studies Teaching

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K-12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>1</td>
<td>2.9</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Agree</td>
<td>2</td>
<td>5.9</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Undecided</td>
<td>6</td>
<td>17.6</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>16</td>
<td>47.1</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>S/disagree</td>
<td>9</td>
<td>26.5</td>
<td>18</td>
<td>75.0</td>
</tr>
<tr>
<td>Col. Total</td>
<td>34</td>
<td>100</td>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 25 illustrates the frequency of computer use in teaching Social Studies. Four principals (6.6%) agreed or strongly agreed with the statement that computers are used frequently in teaching Social Studies while 46 principals (75.4%) disagreed or strongly disagreed with it. Eleven principals (18.0%) were undecided.

At the elementary school level, 8.8% of the principals agreed or strongly agreed, 73.6% disagreed or strongly disagreed, and 17.6% were undecided.

At the high school level, 4.2% agreed or strongly agreed, 79.2% disagreed or strongly disagreed, and 16.7% were undecided.
Table 26

Frequency of Computer Use in Vocational Ed. Teaching

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>$K-12$</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>1</td>
<td>16.6%</td>
<td>5</td>
<td>26.3%</td>
</tr>
<tr>
<td>Agree</td>
<td>1</td>
<td>18.6%</td>
<td>1</td>
<td>5.3%</td>
</tr>
<tr>
<td>Undecided</td>
<td>0</td>
<td>0.0%</td>
<td>6</td>
<td>31.6%</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>16.6%</td>
<td>4</td>
<td>21.1%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>3</td>
<td>50.0%</td>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>Col. Total</td>
<td>6</td>
<td>100%</td>
<td>19</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 26 illustrates the frequency of computer use in teaching Vocational Education. As shown in the last column, nine principals (32.1%) agreed or strongly agreed with the statement that computers are used frequently in teaching this subject while 11 principals (39.3%) disagreed and strongly disagreed with it. Eight principals (28.6%) were undecided.

At the elementary school level, 33.2% of the principals agreed or strongly agreed, 66.6% disagreed or strongly disagreed, and no one was undecided.
At the high school level, 31.6% agreed or strongly agreed, 36.9% disagreed or strongly disagreed, and 31.6% were undecided.

Table 27

Frequency of Computer Use in Foreign Language Teaching

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th></th>
<th></th>
<th>High</th>
<th></th>
<th></th>
<th>K - 12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>6.3%</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Agree</td>
<td>1</td>
<td>14.3%</td>
<td>1</td>
<td>6.3%</td>
<td>0</td>
<td>0.0%</td>
<td>2</td>
<td>8.3%</td>
</tr>
<tr>
<td>Undecided</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>6.3%</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
<td>28.6%</td>
<td>1</td>
<td>6.3%</td>
<td>0</td>
<td>0.0%</td>
<td>3</td>
<td>12.5%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>4</td>
<td>57.1%</td>
<td>12</td>
<td>75.0%</td>
<td>1</td>
<td>100.0%</td>
<td>17</td>
<td>70.8%</td>
</tr>
</tbody>
</table>

Col. Total 7 | 100% | 16 | 100% | 1 | 100% | 24 | 100%

Table 27 illustrates the frequency of computer use in teaching Foreign Language. As shown in the last column, 3 principals (12.5%) agreed or strongly agreed with the statement that computers are used frequently in teaching this subject while 20 principals (83.3%) disagreed and strongly disagreed with it. One principal (4.2%) was undecided.
At the elementary school level, 14.3% of the principals agreed or strongly agreed, 85.7% disagreed or strongly disagreed, and no one was undecided.

At the high school level, 12.6% agreed or strongly agreed, 81.3% disagreed or strongly disagreed, and 6.3% were undecided.

Table 28

Frequency of Computer Use in Physical Ed. Teaching

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>1</td>
<td>3.8%</td>
<td>1</td>
<td>4.3%</td>
</tr>
<tr>
<td>Agree</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Undecided</td>
<td>1</td>
<td>3.8%</td>
<td>1</td>
<td>8.7%</td>
</tr>
<tr>
<td>Disagree</td>
<td>5</td>
<td>19.2%</td>
<td>3</td>
<td>13.0%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>19</td>
<td>73.1%</td>
<td>17</td>
<td>73.9%</td>
</tr>
</tbody>
</table>

Col. Total: 26 100% 23 100% 2 100% 51 100%

Table 28 illustrates the frequency of computer use in teaching Physical Education. As shown in the last column, only 3.9% agreed and strongly agreed with the statement that computers are used frequently in teaching this subject while...
90.1% disagreed and strongly disagreed with it and 5.9% were undecided.

At the elementary school level, 3.8% of the principals agreed or strongly agreed, 92.3% disagreed or strongly disagreed, and 3.8% were undecided.

At the high school level, 4.3% agreed or strongly agreed, 86.9% disagreed or strongly disagreed, and 8.7% were undecided.

Table 29

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Elementary</th>
<th>High</th>
<th>K - 12</th>
<th>Sample Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>S/agree</td>
<td>10</td>
<td>31.3%</td>
<td>9</td>
<td>37.5%</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>21.9%</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Undecided</td>
<td>5</td>
<td>15.6%</td>
<td>3</td>
<td>20.8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>7</td>
<td>21.9%</td>
<td>3</td>
<td>12.5%</td>
</tr>
<tr>
<td>S/disagree</td>
<td>3</td>
<td>9.4%</td>
<td>6</td>
<td>25.0%</td>
</tr>
</tbody>
</table>

Col. Total 32 100% 24 100% 3 100% 59 100%

Table 29 illustrates the frequency of computer use in teaching Special Education. As shown in the last column, 27 principals (45.8%) agreed or strongly agreed with the
statement that computers are used frequently in teaching this subject while 22 principals (37.2%) disagreed and strongly disagreed with it. Ten principals (16.9%) were undecided.

At the elementary school level, 53.2% the of the principals agreed or strongly agreed, 31.3% disagreed or strongly disagreed, and 15.6% were undecided.

At the high school level, 41.7% agreed or strongly agreed, 37.5% disagreed or strongly disagreed, and 20.8% were undecided.
As shown in table 31, an ANOVA test was conducted to determine whether the difference in the frequency of computer use among various subjects taught by teachers in schools was significant or not.

The table shows a probability of 0.0001 as appears in the last column. This indicates that a significant difference existed among the various subject areas with regard to the frequency of computer use by teachers in schools according to Alpha level of 0.05.
Research Question 12

Is there any difference between elementary and high schools concerning the factors affecting teachers' use of computers?

Table 32
Results of T-Tests on Differences
Between Elementary and High Schools
[Questions 1 to 8]

<table>
<thead>
<tr>
<th>Effect</th>
<th>Elementary</th>
<th>High Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>Mean</td>
</tr>
<tr>
<td>Att. on Number</td>
<td>44</td>
<td>2.5682</td>
</tr>
<tr>
<td>Att. on Freq.</td>
<td>42</td>
<td>3.0476</td>
</tr>
<tr>
<td>Loc. on Number</td>
<td>44</td>
<td>2.7955</td>
</tr>
<tr>
<td>Loc. on Freq.</td>
<td>44</td>
<td>3.1591</td>
</tr>
<tr>
<td>Cor. on Number</td>
<td>43</td>
<td>3.5581</td>
</tr>
<tr>
<td>Cor. on Freq.</td>
<td>43</td>
<td>3.5581</td>
</tr>
<tr>
<td>Trn. on Number</td>
<td>44</td>
<td>3.8409</td>
</tr>
<tr>
<td>Trn. on Freq.</td>
<td>44</td>
<td>3.8181</td>
</tr>
</tbody>
</table>

Significance level = .05

Code:
Att. = Attitudes.
schools concerning the first eight research questions and gives us the result of the t-test. As we can see from the table there were no significant differences between elementary and high schools according to Alpha .05. All the results are not significant. That means there was no significant difference between the answers of high school principals and those of elementary school principals regarding the effect of the first four factors on teachers' use of computers.
Table 33
Results of t-tests on Differences
Between Elementary and High Schools
(Subjects Taught)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Elementary</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>Mean</td>
<td>S/D</td>
<td>#</td>
<td>Mean</td>
<td>S/D</td>
<td>P-value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engl.</td>
<td>44</td>
<td>2.7941</td>
<td>1.2973</td>
<td>23</td>
<td>1.9231</td>
<td>1.1974</td>
<td>0.0100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math.</td>
<td>42</td>
<td>3.0285</td>
<td>1.2713</td>
<td>23</td>
<td>3.0000</td>
<td>1.5191</td>
<td>0.9360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soc.</td>
<td>44</td>
<td>2.2571</td>
<td>1.1967</td>
<td>23</td>
<td>2.3926</td>
<td>1.2787</td>
<td>0.2924</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soci.</td>
<td>44</td>
<td>2.1176</td>
<td>0.6176</td>
<td>23</td>
<td>1.5417</td>
<td>1.6623</td>
<td>0.0374</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voc.</td>
<td>43</td>
<td>2.3333</td>
<td>1.7812</td>
<td>22</td>
<td>3.0526</td>
<td>1.4327</td>
<td>0.3109</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fore.</td>
<td>7</td>
<td>1.7143</td>
<td>1.1127</td>
<td>16</td>
<td>1.6250</td>
<td>1.2583</td>
<td>0.8731</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phys.</td>
<td>26</td>
<td>1.4231</td>
<td>0.9021</td>
<td>22</td>
<td>1.4782</td>
<td>0.9941</td>
<td>0.8934</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spec.</td>
<td>32</td>
<td>3.4175</td>
<td>1.3898</td>
<td>22</td>
<td>3.1667</td>
<td>1.6194</td>
<td>0.5095</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Code:
Engl. = English (Reading and Language Arts).
Soci. = Sociology.
Soci. = Social Studies.
Voc. = Vocational Education.
Fore. = Foreign Language.
Phys. = Physical or Health Education.
Spec. = Special Education.

Table 33 shows the results of the two-sample t-tests comparing the difference between responses of elementary school principals and high schools principals concerning the question about the subjects.
The p-Value column shows the significance level of each one of these tests. According to a significance level of 0.05, the data presented in the p-Value column shows significant differences with two subjects, English (0.01) and Social Studies (0.0374). For the rest of the subjects, there was no significant difference.

Chapter Summary

A total of 99 public school principals in 34 counties from the areas of Southern Illinois, Southeastern Missouri, and Southwestern Kentucky were surveyed by the researcher in order to obtain their perceptions of how teachers' computer use is affected by negative attitudes toward computers, the physical location of computers in schools, the availability of a computer coordinator, the lack of computer training, and the subjects taught by them. Seventy-seven of the principals (77.8%) responded to the questionnaire including 93.4% males and 6.6% females. Fifty-four of the principals (67.1%) had some kind of computer training and 32.9% of them did not have any kind of computer training. At the elementary school level, 68.2% of the principals were trained while at the high school level 56% of them were trained. Computers were used in 63.9% of the offices of elementary school principals and 85.7% of the high school principals. No computer coordinator was available for 46.5% of the elementary schools and 28.4% of the high schools.
on this area.

As shown in Table 30 the majority of school principals selected Special Education as the subject in which teachers use computers the most followed by Mathematics. The least was Physical and Health Education. In the extra lines at the end of this question, some principals added Business Education and Computer Education which are included in the category of Vocational Education.

The results of the two-sample t-tests comparing elementary schools to high schools showed a significant difference between the two levels with regard to the frequency of computer use in English and Social Studies. No significant difference was observed in the other subject areas. The two-sample t-tests showed no significant difference between elementary and high schools concerning the effects of negative attitudes, computer location, computer training, and computer coordinator on the number of teachers using computers and the frequency of their computer use.
CHAPTER V

Summary, Conclusions, and Recommendations

Summary of the Research

Purpose of the Study

The purpose of this research was to study the effect of negative attitudes in the part of teachers, physical location of computers in schools, lack of computer training, and availability of a computer coordinators in schools on the number of teachers who use computers in schools and their frequency of computer use. In addition to this, the effect of different subject areas on the frequency of computer use by teachers was also under investigation. The approach to this study was the perceptions of rural school principals.

Ten research questions were developed for the purpose of this study. The first eight questions were related to the effects of the first four factors on the number of teachers who use computers and on the frequency of their computer use. The ninth question was related to the frequency of computer use in different subjects taught by teachers. The tenth question was related to the differences between elementary and high schools regarding the effect of all the factors.
Sample and Data Collection

A stratified random sample of 62 elementary school and 37 high school (a total of 99 public schools) was drawn from a frame of 246 elementary school and 149 high school (a total of 395 public schools). This sample represents 25% of the public schools in this area. The area from which the sample was drawn is the 34 counties falling within a 65 miles radius circle around the city of Carbondale, Illinois. St. Clair County was excluded from this sample because of its high population density (260,000) and its closeness to the city of St. Louis.

A questionnaire, developed by the researcher along with a cover letter and a self addressed stamped envelope were mailed to the 99 principals at their school addresses. A second follow-up mailing with a different cover letter and another self addressed stamped envelope were sent to the principals who had not responded.

The first mailing netted a return rate of 70 (70.7%) usable responses. The second mailing increased the responses to 77 (77.2%) among which 45 schools were elementary, 25 were high schools, and 7 were having overlapping grades.
Instrumentation

A questionnaire was developed by the researcher for the purpose of collecting data relative to the study. The questionnaire was then modified according to the recommendations of the professors and doctoral students to whom it was presented and to the recommendations of the public school principals who participated in the pilot study.

Statistical Analysis of the Data

The Statistical Analysis System (SAS) was used to analyze the data. Frequencies, percentages, two-sample t-tests, and one-way analysis of variance (ANOVA) were utilized for this analysis of data.

Conclusions

The following conclusions were drawn from the results of the data analysis.

Question 1: One

As perceived by rural school principals, do teachers have a negative attitude about computers that affect the number of computer using teachers in schools?

A total of forty-three of the principals (58.1%) disagreed and strongly disagreed with this item while those who agreed and strongly agreed were 23 principals (31.1%).
Eight principals (10.8%) were undecided. The mean score for this question was 2.77.

It could be hypothesized from the data that the majority of the principals do not perceive negative attitudes as one of the factors that limit the number of teachers who use computers in schools.

This finding of this study contradicts Becker (1985) who suggested that teachers express a basic fear of computers. However, the finding did support the argument of Allan (1985) and Harmon (1986) which suggested that teachers do not fear computers and do not have negative attitudes toward them.

**Question Two**

As perceived by rural school principals, do teachers have negative attitudes toward computers that affect the frequency of computer use by teachers in schools?

The total number of those who disagreed and those who strongly disagreed with the item related to this question was 36 representing 30.0% of the principals. The number of those who agreed or strongly agreed was 34 representing 47.2% of the principals. Two principals (2.8%) were undecided. The mean score for the item was 3.13.

From this result, we could see how close the difference between principals who agreed and principals who disagreed on this question. It appears that the majority of the
principals do not agree that negative attitudes are among the factors which limit the number of teachers who use computers in schools.

Question # Three

As perceived by rural school principals, is there any relationship between the physical location of computers in schools and the number of teachers who use computers?

Forty principals (54.0%) either disagreed or strongly disagreed that physical location has an effect on the number of teachers who use computers in schools. The number of those who agreed or strongly agreed with this was 22 principals (29.7%). The number of those who were undecided was 12 (16.2%). The mean score for this item was 2.68.

Physical location was not perceived by rural school principals as one of the factors that affect the number of teachers who use computers in their schools. This observation is consistent with the result of the national survey which showed computer laboratories as having the most positive effects reported (Becker, 1985).
Question 4: Four

As perceived by rural school principals, is there any relationship between the physical location of computers in schools and how frequently teachers use computers?

The number of the principals who either agreed or strongly agreed that the physical location of computers in schools has an effect on the frequency of computer use by teachers was 37 (50.0%). Twenty-seven of the principals (36.3%) either disagreed or strongly disagreed with it. The number of those who were undecided was 10 (13.5%). The mean score for this item was 3.07.

These numbers suggest that the majority of rural school principals agree that the physical location of computers in schools has an effect on how frequently teachers use computers. This conclusion is supported by the data in tables 6 and 7. The data presented in tables 6 and 7 show that 37.9% of the principals look at the microcomputer labs as the best location for computers even though only 3.9% of the schools were placing their computers in them. It could be hypothesized that rural school principals believe that changing the location of computers in their schools would improve the frequency of computer use by teachers.
Question 6 Five

As perceived by school principals, is there any positive relationship between the existence of someone to coordinate the use of computers in schools and the number of teachers who use computers?

The finding of this study about the existence of a computer coordinator did not contradict the findings of Mason (1987), Fisher & Finkel (1984), Edmundson (1986) and Kegner (1986) which suggested that the existence of a computer coordinator in schools has positive effects on computer use.

Thirty-seven principals (51.4%) either agreed or strongly agreed that the existence of a computer coordinator would increase the number of teachers who use computers in schools. Eighteen principals (25.0%) either disagreed or strongly disagreed with this. Seventeen principals (23.6%) were undecided. The mean score for this item is 3.40.

From the percent of the agreement (51.4%) versus the percent of disagreement (25.0%), a conclusion could be reached that the availability of a computer coordinator was perceived by rural school principals as a positive factor that would increase the number of teachers who use computers in schools.
Question # Six

As perceived by school principals, is there any positive relationship between the existence of someone to coordinate the use of computers in schools and the frequency of computer use by teachers?

Thirty-nine of the principals (54.2%) either agreed or strongly agreed that the existence of a computer coordinator in schools would increase the frequency of computer use by teachers. Sixteen principals (21.2%) either disagreed or strongly disagreed with this. Seventeen principals (23.6%) were undecided. The mean score for this item was 3.44.

The data suggested that rural school principals believe that the existence of a computer coordinator has a positive effect on the frequency of computer use by teachers. It could be hypothesized that principals believe that their teachers are not knowledgeable enough about instructional or other applications of computers and they need someone to help them.

Question # Seven

As perceived by school principals, is the number of teachers who use computers in school negatively affected by the lack of adequate computer training?

Computer training was reported as a factor affecting the use of computers by Harburger (1987), National Task

Fifty-six principals (75.7%) either agreed or strongly agreed that the lack of adequate computer training negatively affects the number of teachers who use computers in schools. Twelve principals (16.2%) either disagreed or strongly disagreed with this. The number of those who were undecided was 8 principals (8.1%). The mean score for this item was 3.74.

It could be concluded from the data that school principals believe that lack of adequate training has a negative effect on the number of teachers who use computers in schools. Principals have the opportunity to observe the effect of computer training on their staff. These observations suggest the hypothesis that further computer training for teachers in their schools is beneficial.

**Question 4: Eight**

As perceived by school principals, is the frequency of computer use by teachers in schools negatively affected by the lack of adequate computer training?

Fifty-four principals (73.0%) either agreed or strongly agreed that the lack of adequate computer training negatively affects the frequency of computer use by teachers in schools. Twelve principals (16.2%) either disagreed or
of perceive use at both the elementary and high school levels which differs from previously reported national studies. It could be hypothesized that the emergence of special education as a leading subject area is due to continued Public Law 94.142 reporting requirement at the local educational agency level places such a heavy time requirement on special education teachers. New commercial computer software to overcome this problem is perhaps being adopted and being used by special education teachers for such activities as generating individual educational plans and reports. It could also be the availability of the national clearing-houses for special education software.

In a comparison with relative subject area positions among earlier national studies, the use of computers in mathematics has gone from a first place status in 1992 to a second or third place status. One may hypothesize several reasons for this shift. It could be that there has really been no change in the amount of computer use in mathematics and just an increase in other areas. On the other hand, it could be saturation of and disappointment with respect to the quality and availability of certain drill type as well as tutorial programs.

In a comparison with relative subject area positions among earlier national studies, the use of computers in science at the elementary and at the high school level has gone from a high of second place, with mathematics being
first, to new lows of fourth and fifth places. One may hypothesize several reasons for this shift. It could be that there has really been no change in the amount of computer use in the teaching of science and just an increase in other areas. On the other hand, it could be saturation of and disappointment with respect to the quality and availability of certain drill type as well as tutorial programs. It also could be lack of availability of supporting software in the new science areas which have been focusing upon the integration of science, technology and society.

The one-way analysis of variance test (ANOVA) resulted in a probability of 0.0001. Comparing this probability level to the significance level set by the researcher (0.05), it could be concluded that a significant difference existed among the subject areas concerning the frequency of computer use by teachers. Since the ANOVA test showed a significant difference among the subjects, it could be concluded that different subjects taught by teachers have an effect on the frequency of their computer use.
Question 6. Ten

Is there any difference between elementary and high schools concerning the factors affecting teachers' use of computers?

The study of Becker (1985) showed a difference between elementary and high school in computer use in favor of high schools. The results of Nelson & Waack (1985) showed differences even in principals' attitudes. The results of this study contradict with these results by showing no difference between elementary and high schools.

It could be hypothesized that the gap between elementary and high schools in computer use has been filled by the rapid change in elementary schools toward the use of computers. The percent of elementary schools using computers jumped from 62.4% in 1984 to 84.0% in 1987. The intensity of computers (number of students per computer) decreased from 112.4 in 1984 to 43.7 in 1987. The number of computers per school increased from 3.6 in 1984 to 5.4 in 1987 (The Staff of Curriculum Information Center, 1987).

The first part of this question is about the differences between elementary and high schools concerning principals' responses to items 12 through 19 in the questionnaires about the effect of negative attitudes, location of computers, computer coordinator, and computer training on the number of teachers who use computers in schools and their frequency of computer use. The two-sample
t-tests results showed no significant difference in any one of the eight items. This indicates that there was no significant difference between the responses of elementary school principals and high school principals for these eight items. The second part of this question deals with the frequency of computer use in different subjects as shown in item 20 in the questionnaire (see Appendix D). The two-sample t-tests results showed a significant difference between the two levels in English Language and Social Studies. No significant difference was observed in the rest of the subject areas. What could be concluded from these results is that the opinions of rural elementary school principals and rural high school principals are different regarding the frequency of computer use in English and Social Studies but they are not significantly different regarding the other subjects.

**Recommendations**

From what was revealed in the literature review and the results of this study, some recommendations could be stated:

1. The literature review and the results of this study revealed that the lack of computer training is one of the most important factors affecting teachers’ use of computers in schools. It is recommended that rural school districts, the boards of education, and the colleges of education try to
increase the in-service and pre-service computer training for the teachers and those who are going to be teachers.

2. The data revealed that the majority of the schools do not have anyone to coordinate the use of computers in schools while the principals selected this factor as one of the factors that affects teachers' use of computers in schools. It could be recommended a person should be provided for each school to coordinate the use of computers at least part of the time.

3. The physical location of computers in schools was found to have an effect on the frequency of computer use by teachers. This was more obvious at the elementary school level. It was shown by the demographic data that the majority of the rural school principals were not satisfied with the current location of computers at their schools because the location they selected as the best location for computers in schools was not the one they were using. Based on this information, it could be recommended that rural school principals consider changing the physical location of computers at their schools to allow more teachers and students to use them more effectively.
Suggestions For Further Studies

Based on what was revealed by the literature review and the findings of this study, the following suggestions seem appropriate:

1. This study be replicated.

2. This study be expanded to include urban areas to see the perceptions of urban school principals and how they differ from rural school principals.

3. This study be replicated using a different set of factors such as hardware, software, administrative support, budget, time availability for teachers, etc.

4. A study be conducted on teachers' perceptions of the factors affecting their use of computers in schools.

5. A study be conducted to compare the perceptions of teachers and school principals concerning the factors affecting the use of computers.

6. A study be conducted on the different kinds of computer training teachers had and their effect on the use of computer.

7. A study be conducted on the relationship between the principals' computer training and the use of computers by teachers in their schools.

8. A study be conducted on the relationship between the existence of someone to coordinate computer use and the use of computers in schools.
9. A study be conducted on why teachers in some subjects use computers more than the others.

10. A study be conducted examining teachers’ trends in the use of computers across interdisciplinary subject areas and levels in science and social studies.

11. A study be conducted which examines gender and computer training of school principals as a function of perceived use of computers by the teachers.


6. Hardin  Illinois
7. Jackson  Illinois
8. Jefferson  Illinois
9. Johnson  Illinois
10. Marion  Illinois
11. Massac  Illinois
12. Monroe  Illinois
13. Perry  Illinois
14. Pope  Illinois
15. Pulaski  Illinois
16. Randolph  Illinois
17. Saline  Illinois
18. St. Clair  Illinois
19. Union  Illinois
20. Washington  Illinois
21. Wayne  Illinois
22. White  Illinois
23. Williamson  Illinois
24. Bolivar  Missouri
25. Cape Girardeau  Missouri
26. Madison  Missouri
27. Mississippi  Missouri
28. Perry  Missouri
29. Scott  Missouri
30. Ste. Genevieve  Missouri
31. Ballard  Kentucky
32. Carlisle  Kentucky
33. Crittenden  Kentucky
34. Livingston  Kentucky
35. McCracken  Kentucky
parts of Illinois, Kentucky, and Missouri.

My study deals with principals' perceptions of factors affecting teachers' use of computers for instructional purposes.

The questionnaire is basically simple to complete. Most of the items are in a multiple choice format in which you select your response by circling it. I have enclosed a self-addressed, stamped envelope for the prompt return of your completed questionnaire.

You are guaranteed complete anonymity as an individual respondent. The number on the questionnaire is used only to exclude your name from follow-up mailings. Your responses are of great importance to the study, so please take a few minutes now and fill out the questionnaire. Its prompt return and your cooperation are appreciated.

If you would like to have a summary of the results, please feel free to include your name and address.

Sincerely,

Mudawi N. Elmusharaf
APPENDIX C

February 28, 1989

Dear principal:

More than two weeks ago, a survey on perceptions by school principals in parts of Illinois, Kentucky, and Missouri was sent to you. To date, I have not received your response. Therefore, I am enclosing another copy of the questionnaire in case you have misplaced the one sent to you previously.

I realize that you are busy, but please take a few minutes to show your ideas and opinions on this research topic.

Please return the enclosed questionnaire in the self-addressed, stamped envelope.

Thank you for your time and cooperation.

Sincerely,

Mudawi M. Elmusharaf

Doctoral student at
Southern Illinois University

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Dear Principal:

Please respond to these items either by circling the letter of the item that applies to the situation in your school in the multiple choice questions, or by directly answering the question in the fill-in lines.

(1) I am ___
   a. Male
   b. Female

(2) Please circle the grade which available in your school.
   X 1 2 3 4 5 6 7 8 9 10 11 12

(3) Does the staff in your office use old computers?
   a. Yes
   b. No

(4) Have you had any computer training?
   a. Yes
   b. No

(5) How many students are enrolled in your school?

(6) How many full-time teachers are in your school?

(7) How many computers are available for instruction in your school?

(8) How many teachers in your school use computers:
   (a) One day a week or more?
   (b) 2-3 days a week?
   (c) One day a month or less?
   (d) Has at all?

(Please circle the answer(s) that apply to your school)

(9) Computers in your school are placed in...
   a. Computer lab
   b. Classroom
   c. Library/Media center
   d. Other (Please specify) __________

(10) In my opinion, the best placement of computers in schools is:
   a. In a computer lab
   b. In the classroom
   c. In the library/Media center
   d. Other (Please specify) __________

(11) Does your school have a person to coordinate the use of computers?
   a. Yes, 75% - Full-time
   b. Yes, 50% - 74% of the time
   c. Yes, 25% - 49% of the time
   d. Yes, 15 - 24% of the time
   e. No, it doesn't
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Dissertation Title: Factors Affecting Teachers' Use of Computers as Perceived by Rural School Principals.

Major Professor: Pierre Barrette, Ed.D.